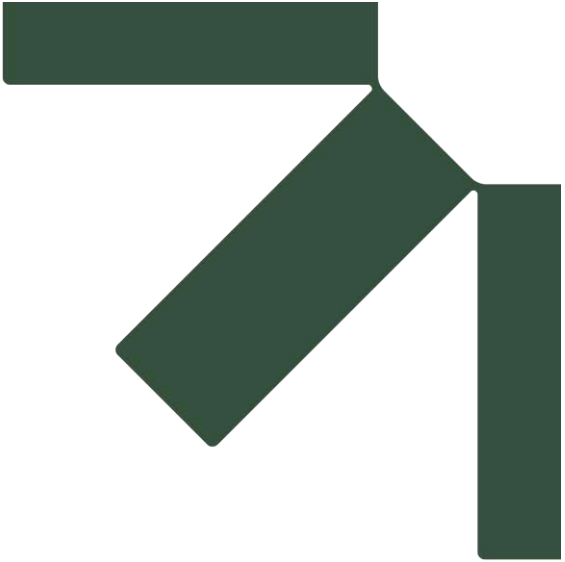




Appendix G Aquatic Survey Report

Appropriate Assessment Screening Report and Natura Impact Statement

Cush Wind Farm Phase II

Cush Wind Limited

SLR Project No.: 501.065723.00001

23 October 2026



Aquatic baseline report for the proposed Cush wind farm, Co. Offaly (2025)



Prepared by Triturus Environmental Ltd. for SLR Consulting Ireland

January 2026

Please cite as:

Triturus (2026). Aquatic baseline report for Cush wind farm, Co. Offaly (2025). Report prepared by Triturus Environmental Ltd. for SLR Consulting Ireland. January 2026.

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1. Introduction

1.1 Background

Triturus Environmental Ltd. were commissioned by SSLR Consulting Ireland to conduct baseline aquatic surveys to inform EIAR preparation for the proposed Cush wind farm development located c. 6km north of Birr, Co. Offaly (**Figure 2.1**). The baseline surveys would update and expand upon those previously completed in August 2022 (Triturus, 2022).

Undertaken on a catchment-wide scale, this report provides a baseline assessment of the aquatic ecology including fisheries and biological water quality, as well as protected species and habitats in the vicinity of the proposed development, inclusive of the proposed site boundary and internal cable route. Aquatic surveys were undertaken in August 2025.

1.2 Development description

A full description of the proposed development will be provided in the Environmental Impact Assessment Report (EIAR) used to support consenting applications.

2. Methodology

2.1 Selection of watercourses for assessment

All freshwater watercourses which could be affected directly or indirectly by the proposed wind farm development and associated infrastructure were considered as part of the current assessment. This included sites in vicinity of the site boundary and the proposed internal cable route. Thus, a total of 14 no. sites were selected for detailed aquatic assessment (see **Table 2.1, Figure 2.1**). The courses and nomenclature for the watercourses surveyed followed Environmental Protection Agency (EPA) mapping.

Aquatic survey sites were present on the Rapemills River (EPA code: 25R01), Eglis Stream (25E18), West Galros Stream (25W44) and Whigsborough Stream (25W43) in addition to several lake/wetland and pond features (**Table 2.1**). The survey sites were located within within the Brosna_SC_080 and the Shannon (Lower)_SC_040 river sub-catchments. The proposed wind farm and associated infrastructure was not located within a European site although all riverine sites shared downstream hydrological connectivity with the River Shannon Callows SAC (000216) and the Middle Shannon Callows SPA (004096).

Please note this aquatic report should be read in conjunction with the final Environmental Impact Assessment Report (EIAR) prepared for the proposed development.

2.2 Aquatic site surveys

Aquatic surveys were conducted on the 14th, 15th and 16th August 2025. Survey effort focused on both instream and riparian habitats at each aquatic sampling location included a fisheries assessment (electro-fishing and or fisheries habitat appraisal), white-clawed crayfish survey, otter sign survey (within 150m radius), macrophyte and aquatic bryophyte survey and biological water quality (Q-sampling) or macro-invertebrate sweep sampling (**Figure 2.1**). Environmental DNA samples were also collected from 3 no. riverine sites. This holistic approach informed the overall aquatic ecological evaluation of each site in context of the proposed development and ensured that any habitats and species of high conservation value would be detected to best inform mitigation.

In addition to the ecological characteristics of the site, a broad aquatic and riparian habitat assessment was conducted utilising elements of the methodology given in the Environment Agency's 'River Habitat Survey in Britain and Ireland Field Survey Guidance Manual 2003' (EA, 2003) and the Irish Heritage Council's 'A Guide to Habitats in Ireland' (Fossitt, 2000). This broad characterisation helped define the watercourses' conformity or departure from naturalness. All sites were assessed in terms of:

- Physical watercourse/waterbody characteristics (i.e. width, depth, channel form) including associated evidence of historical drainage
- Substrate type and relative condition, listing substrate fractions in order of dominance (i.e. bedrock, boulder, cobble, gravel, sand, silt etc.)
- Flow type by proportion of riffle, glide and pool in the sampling area
- An appraisal of the macrophyte and aquatic bryophyte community at each site
- Riparian vegetation composition and bordering land use practices

Table 2.1 Location of 14 no. aquatic survey sites in the vicinity of the proposed Cush wind farm, Co. Offaly

Site no.	Watercourse	EPA code	Location	X (ITM)	Y (ITM)
A1	Rapemills River	25R01	Eglish	608544	709345
A2	Eglish Stream	25E18	Eglish	608194	709857
A3	Eglish Stream	25E18	Eglish	607766	709311
A4*	Rapemills River	25R01	Boolinarig Bridge	607478	709372
A5	West Galros Stream	25W44	Eglish	608084	710542
A6*	West Galros Stream	25W44	N62 road crossing	607627	710485
A7	Rapemills River	25R01	R439 road crossing	604773	710211
A8*	Rapemills River	25R01	Lusmagh Bridge	600128	714644
B1	Drainage channel	n/a	Clooneen	607887	712615
C1	Whigsborough Stream	25W43	Clooneen	608671	712865
L1	Lake/wetland	n/a	Eglish	608291	710532
L2	Lake/wetland	n/a	Clooneen	607832	713182
P1	Pond	n/a	Galros East	607783	710585
P2	Pond	n/a	Galros East	607982	710624

*eDNA sampling for Atlantic salmon, brown trout, lamprey (*Lampetra* sp.), European eel and or white-clawed crayfish

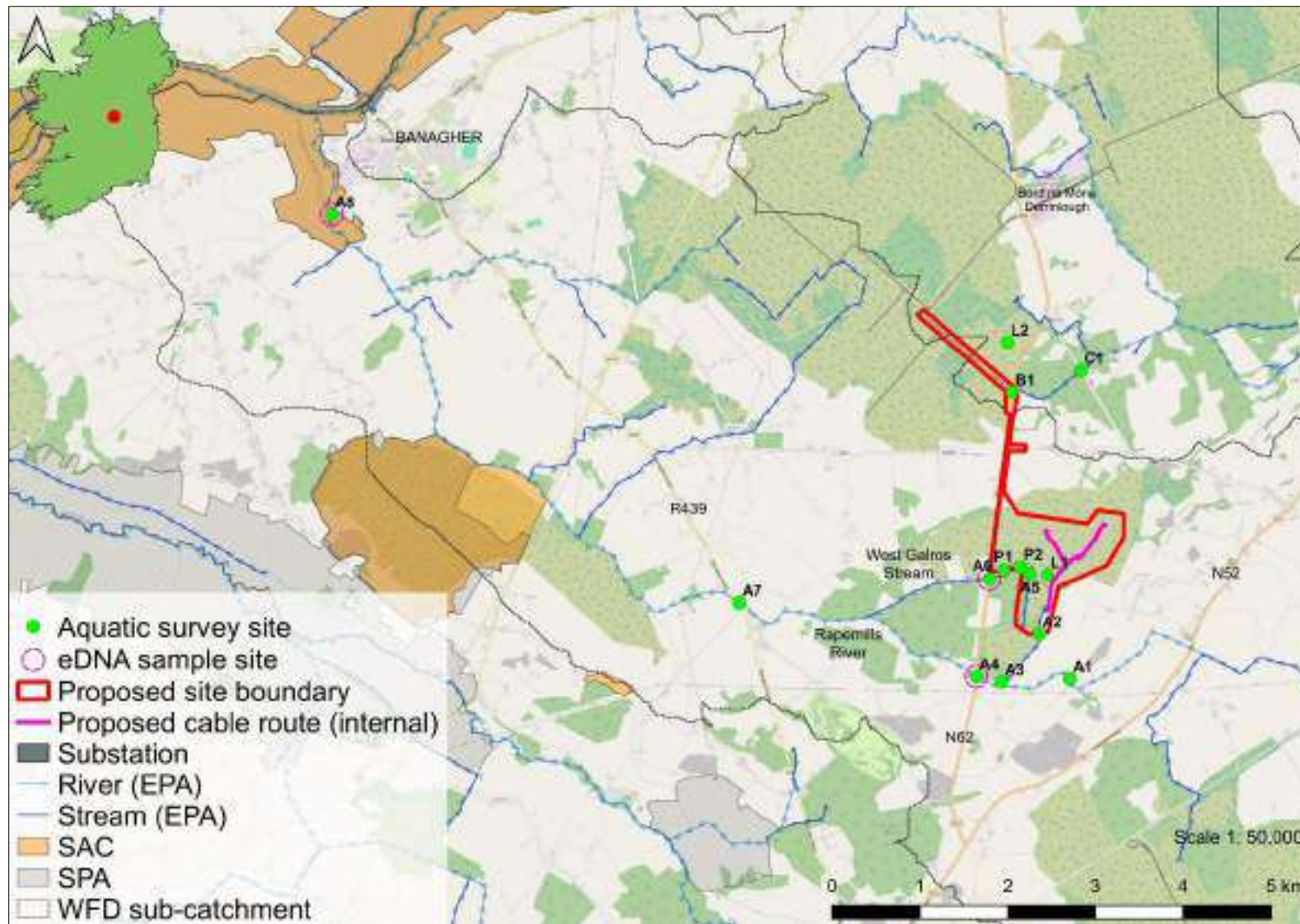


Figure 2.1 Overview of the aquatic survey sites, August 2025

2.3 Fisheries assessment (electro-fishing)

To collate a more accurate baseline, a catchment-wide approach was adopted and the electro-fishing survey was undertaken across 10 no. riverine sites (**Table 2.1, Figure 2.1**). A single anode Smith-Root LR24 backpack (12V DC input; 300V, 100W DC output) was used to electro-fish riverine sites on Thursday 14th, Friday 15th and Saturday 16th August 2025 following notification to Inland Fisheries Ireland and under the conditions of a Department of Climate, Energy and the Environment (DCEE) licence. The survey was undertaken in accordance with best practice (CFB, 2008; CEN, 2003) and Section 14 licencing requirements.

Furthermore, a fisheries habitat appraisal of all aquatic survey sites (**Table 2.1**) was undertaken to establish their importance for salmonid, lamprey, European eel (*Anguilla anguilla*) and other fish species. The baseline assessment also considered the quality of fisheries habitats within the vicinity of the survey sites. For detailed survey methodology, please refer to accompanying fisheries assessment report in **Appendix A**.

2.4 White-clawed crayfish survey

White-clawed crayfish (*Austropotamobius pallipes*) surveys were undertaken at the aquatic survey sites in August 2025 under a National Parks and Wildlife (NPWS) open national licence (C164/2025) as prescribed by Sections 9, 23 and 34 of the Wildlife Act (1976-2023), to capture and release crayfish to their site of capture. As per Inland Fisheries Ireland aquatic biosecurity recommendations, the crayfish sampling started at the uppermost site(s) of each catchment or sub-catchment in the survey area to minimise the risk of transfer invasive propagules (including crayfish plague) in an upstream direction.

Hand-searching of instream refugia and sweep netting was undertaken according to Reynolds et al. (2010). An appraisal of white-clawed crayfish habitat at each site was conducted based on physical habitat attributes (Gammell et al., 2021; Peay, 2003), water chemistry and incidental records in mustelid spraint. Additionally, a desktop review of crayfish records within the wider survey area was completed.

2.5 eDNA analysis

To further validate site surveys and to detect potentially cryptically low populations of high conservation value aquatic species within the survey area, composite water samples were collected from the Rapemills River (sites A4, A8) and the West Galros Stream (A6) on the 14th August 2025 (**Figure 2.1; Table 2.1**). This was analysed for Atlantic salmon (*Salmo salar*) or brown trout (*Salmo trutta*), European eel, lamprey (*Lampetra* sp.) and white-clawed crayfish eDNA, with the sites strategically chosen to maximise longitudinal (instream) coverage within the catchment (i.e. facilitating a greater likelihood of species detection).

In accordance with laboratory guidance, a composite (500ml) water sample was collected from the sampling point, maximising the geographic spread at the site (20 x 25ml samples at each site), thus increasing the chance of detecting the target species' DNA. The composite sample was filtered and fixed on site using a sterile proprietary eDNA sampling kit. The sample was stored at room temperature and sent to the laboratory for analysis with 48 hours of collection. A total of $n=12$ qPCR replicates were analysed for the site. Given the high sensitivity of eDNA analysis, a single positive qPCR

replicate is considered as proof of the species' presence (termed qPCR No Threshold, or qPCR NT). Whilst an eDNA approach is not currently quantitative, the detection of the target species' DNA indicates the presence of the species at and or upstream of the sampling point. Please refer to **Appendix A** for full eDNA laboratory analysis methodology.

2.6 Biological water quality (Q-sampling)

The 10 no. riverine survey sites were assessed for biological water quality through Q-sampling in August 2025 (**Figure 2.1**). All samples were taken with a standard kick sampling hand net (250mm width, 500µm mesh size) from areas of riffle/glide utilising a 2-minute kick sample, as per Environmental Protection Authority (EPA) methodology (Feeley et al., 2020). Large cobble was also washed at each site for 1-minute (where present) to collect attached macro-invertebrates (as per Feeley et al., 2020). Samples were elutriated and fixed in 70% ethanol for subsequent laboratory identification to species level. Samples were converted to Q-ratings as per Toner et al. (2005) and assigned to WFD status classes (**Table 2.2**). Any rare invertebrate species were identified from the NPWS Red List publications for beetles (Foster et al., 2009), mayflies (Kelly-Quinn & Regan, 2012), stoneflies (Feeley et al., 2020) and other relevant taxa (i.e. Byrne et al., 2009; Nelson et al., 2011).

Table 2.2 Reference categories for EPA Q-ratings (Q1 to Q5) (Toner et al., 2005)

Q value	WFD class	Pollution status	Condition
Q5 or Q4-5	High status	Unpolluted	Satisfactory
Q4	Good status	Unpolluted	Satisfactory
Q3-4	Moderate status	Slightly polluted	Unsatisfactory
Q3 or Q2-3	Poor status	Moderately polluted	Unsatisfactory
Q2, Q1-2 or Q1	Bad status	Seriously polluted	Unsatisfactory

2.7 Lacustrine macro-invertebrate communities

Lacustrine sites L1, L2, P1 and P2 were sampled for macro-invertebrates via sweep netting in August 2025. A standard pond net (250mm width, mesh size 500µm) was used to sweep macrophytes and submerged vegetation to capture macro-invertebrates. The net was also moved along the lake bed to collect epibenthic and epiphytic invertebrates from the substratum (as per Cheal et al., 1993). A 3-minute sampling period was employed. To ensure appropriate habitat coverage, the sampling period was also divided amongst the range of meso-habitats present at the survey sites to get a representative sample for sub-habitats.

2.8 Macrophytes and aquatic bryophytes

Surveys of the macrophyte and aquatic bryophyte community were conducted by instream wading at each of the survey sites, with specimens collected (by hand or via grapnel) for on-site identification. An assessment of the aquatic vegetation community helped to identify any rare macrophyte species listed under the Flora (Protection) Order, 2022, Irish Red list for vascular plants (Wyse-Jackson et al.,

2016) and or aquatic bryophytes (Lockhart et al., 2012), or habitats corresponding to Annex I habitats, such as floating river vegetation (3260) or hydrophilous tall herb (6430).

2.9 Otter signs

The presence of otter (*Lutra lutra*) was determined through the recording of otter signs within 150m radius of each survey site. Notes on the age and location of signs (ITM coordinates) were made, in addition to the quantity and visible constituents of spraint (i.e. remains of fish, crustaceans, molluscs etc.).

2.10 Biosecurity

A strict biosecurity protocol following IFI (2010) and the Check-Clean-Dry approach was adhered to during surveys for all equipment and PPE used. Disinfection of all equipment and PPE before and after use with Virkon™ was conducted to prevent the transfer of pathogens or invasive propagules between survey sites. Surveys were undertaken at sites in a downstream order to minimise the risk of upstream propagule mobilisation. Particular cognisance was given towards preventing the spread or introduction of highly virulent crayfish plague (*Aphanomyces astaci*). Any aquatic invasive species or pathogens recorded within or adjoining the survey areas were geo-referenced. All Triturus staff are certified in 'Good fieldwork practice: slowing the spread of invasive non-native species' by the University of Leeds.

3. Desktop review

3.1 Survey area description

The proposed Cush wind farm is located c. 6km north of Birr, Co. Offaly within the Shannon River Basin District and hydrometric area 25 (Lower Shannon) (**Figure 2.1**). The survey watercourses are typically lowland depositing rivers (FW2; Fossitt; 2000) which have been historically modified (drained) and drainage channels (FW4) present in a landscape dominated by cutover bog adjoining agricultural pasture (CORINE landcover). The survey area is underlain by Tournaisian limestone and Visean limestone & calcareous shale (Geological Survey of Ireland data).

3.2 Fisheries

Previous surveys for the development recorded a low diversity of fish species. The Rapemills River, a tributary of the River Shannon, is known to support brown trout (*Salmo trutta*), lamprey (*Lampetra* sp.), pike (*Esox lucius*), minnow (*Phoxinus phoxinus*), stone loach (*Barbatula barbatula*) and three-spined stickleback (*Gasterosteus aculeatus*) (Triturus 2022 data).

The West Galros Stream, a heavily modified tributary of the Rapemills River, was found to support three-spined stickleback only (Triturus 2022 data). No fish were recorded from the heavily modified Eglish Stream at proposed survey site A2 or the heavily modified Whigsborough Stream at survey site C1 in 2022 (Triturus data).

3.3 Protected & rare aquatic species

A comprehensive desktop review of available data from the National Parks and Wildlife Service (NPWS), National Biodiversity Data Centre (NBDC), Inland Fisheries Ireland (IFI), Botanical Society of Britain and Ireland (BSBI), National Crayfish Plague Surveillance Programme (NCPSP), Environmental Protection Agency (EPA) and Triturus databases for the 10km grid squares containing and adjoining the development (i.e. N00 & N01) identified a low number of records for rare and or protected aquatic species within the vicinity of the proposed wind farm.

A low number of Annex II otter (*Lutra lutra*) records were available in the vicinity of the proposed development although most were historical only (i.e. 1980). More contemporary records (2005-2022) were available for the Rapemills River and Grand Canal (Triturus, NPWS & NBDC data; **Figure 3.1**).

A low number of records for Annex II white-clawed crayfish (*Austropotamobius pallipes*) were available for several watercourses within the respective grid squares, including the West Galros Stream (**Figure 3.1**). White-clawed crayfish remains were recorded in otter spraint on both the Rapemills River and West Galros Stream during the previous survey (Triturus, 2022).

No contemporary NPWS records for macrophytes or aquatic bryophytes protected under the Flora (Protection) Order, 2022 or Red listed (Wyse-Jackson et al., 2016; Lockhart et al., 2012) were available for the respective grid squares.

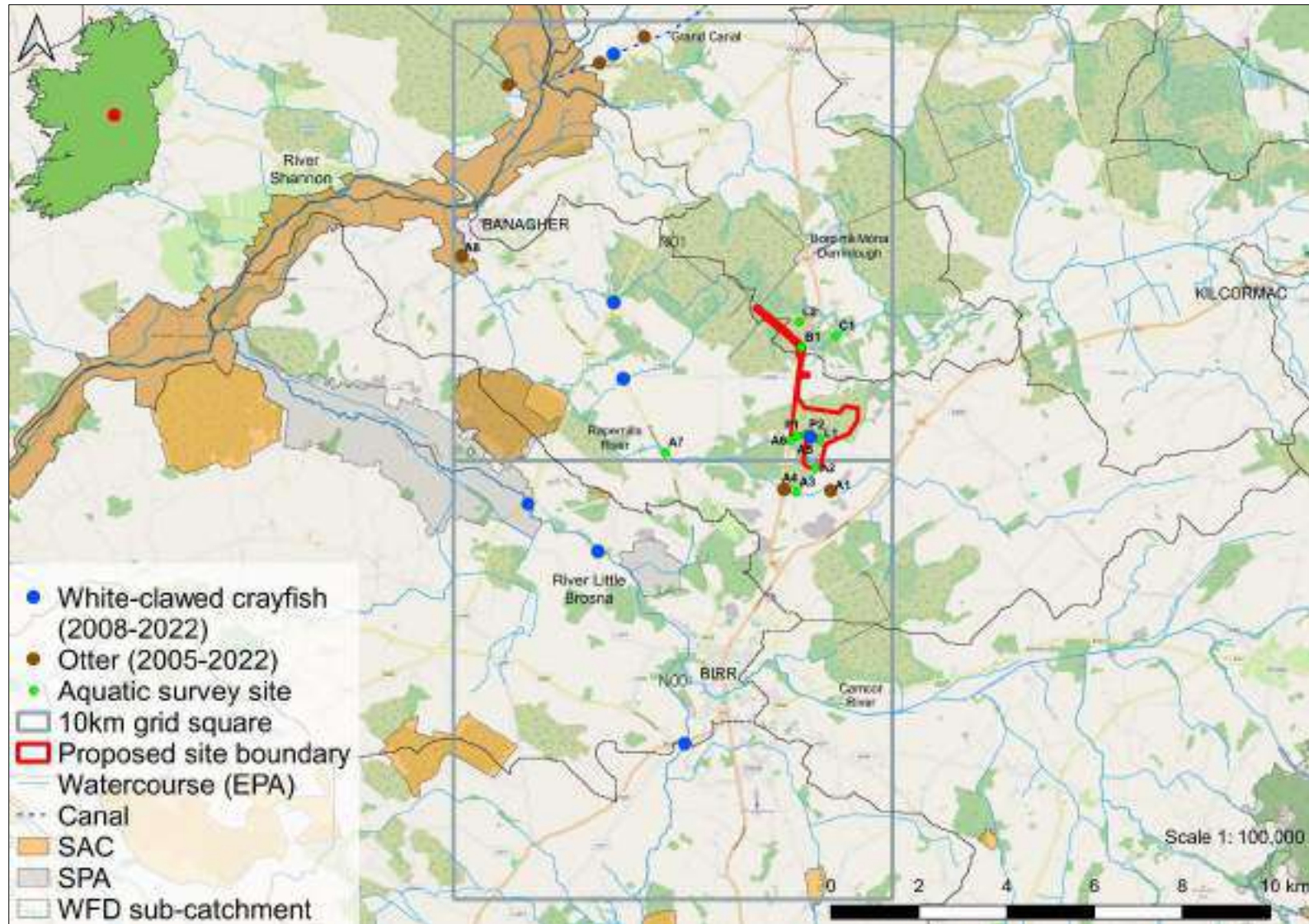


Figure 3.1 Selected protected aquatic species records in the vicinity of the proposed development (source: NPWS, NBDC, EPA, NCPSP & Triturus data)

4. Results of aquatic surveys

The following section summarises each of the 14 no. survey sites in terms of aquatic habitats, physical characteristics and overall value for fish, white-clawed crayfish, otter and macrophyte/aquatic bryophyte communities. Biological water quality (Q-sample) results are summarised for each riverine sampling site and presented in full in **Appendix C**. A summary of the fish species recorded at each survey site is provided in **Table 4.3**. A summary of the aquatic species and habitats of high conservation value recorded during the surveys is provided in **Table 4.4**. Habitat codes are according to Fossitt (2000). Scientific names are provided at first mention only. Sites were surveyed in August 2025.

4.1 Aquatic survey sites

4.1.1 Site A1 – Rapemills River, Eglish

Site A1 was located on the Rapemills River (EPA code: 25R01) at quarry access bridge upstream of the proposed development (i.e. an upstream control site). The small lowland alkaline river (FW2; Fossitt, 2000) had been deepened and locally straightened historically but demonstrated good instream recovery in many areas. The meandering river was 3-4m wide and 0.3-0.8m deep, with locally deeper areas to >1m. The profile comprised heavily vegetated glide and pool with occasional riffle areas only. The substrata were dominated by fine to medium gravels with scattered cobble and small boulder. These were often relatively clean with widespread calcification. However, siltation was evident with organic rich soft sediment deposits on meanders and in depositing areas. The site supported profuse growth of macrophytes with abundant fool's watercress (*Helosciadium nodiflorum*) and watercress (*Nasturtium officinale*) - stands of these often covered the full channel width. Iris (*Iris pseudacorus*) and branched bur-reed (*Sparganium erectum*) stands were frequent instream. Common water starwort (*Callitriche stagnalis*) was occasional with water mint (*Mentha aquatica*) and brooklime (*Veronica beccabunga*) along the littorals. Aquatic bryophyte coverage was low due to the paucity of larger substrata but some *Fontinalis antipyretica* and *Pellia endiviifolia* were present. The river meandered along a narrow but mature buffers of herb rich nitrophilous vegetation dominated by reed canary grass (*Phalaris arundinacea*), great willowherb (*Epilobium hirsutum*), hedge bindweed (*Calystegia sepium*) and meadowsweet (*Filipendula ulmaria*). Scattered grey willow (*Salix cinerea* sp. *oleifolia*), hawthorn (*Crataegus monogyna*) and ash (*Fraxinus excelsior*) provided valuable shading to the narrow channel. Tunnelling due to steeper banks was present downstream of the survey reach. The site was bordered by improved pasture (GA1) with mature fenced buffers (GS2/GS4) with an active quarry (ED4) upstream.

Brown trout (*Salmo trutta*), lamprey (*Lampetra* sp.) and three-spined stickleback (*Gasterosteus aculeatus*) were recorded via electro-fishing at site A1 (**Appendix A**). The site was of good value for salmonids although primarily suited adults rather than juveniles given the predominance of deep pool, glide and bank scours/undercuts with high vegetation cover. Nonetheless, a mixed cohort trout population was present. Spawning habitat was widespread for both salmonids and lamprey. Organic rich soft sediment accumulations were frequent throughout but *Lampetra* sp. ammocoetes were highly localised, with most being confined to accumulations under the bridge (as per 2022 survey). Despite good suitability for European eel and white-clawed crayfish, neither were recorded. A regular otter spraint site with prints and a slide were recorded under the bridge on a muddy ledge.

Biological water quality, based on Q-sampling, was calculated as **Q3 (poor status) (Appendix C)**. No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.



Plate 4.1 Representative image of site A1 on the Rapemills River upstream of the proposed development, August 2025

4.1.2 Site A2 – Eglish Stream, Eglish

Site A2 was located on the upper reaches of the Eglish Stream (25E18), adjoining the proposed site boundary. The channel had been extensively straightened and deepened along field boundaries and was 1-2m wide with a mostly trapezoidal profile and soft pea banks. The stream was dry at this location at the time of survey with a damp muddy base and no standing water. The channel heavily shaded by dense scrub comprising bramble (*Rubus fruticosus* agg.), bracken (*Pteridium aquilinum*) and grey willow, with high levels of terrestrial encroachment in the channel further indicating its ephemeral nature. The site was bordered by scrubby woodland (WN7) dominated by willow and downy birch (*Betula pubescens*) to the west and intensive pasture (GA1) to the east.

Site A2 was not of fisheries value given its dry, ephemeral nature and absence of aquatic habitats. No otter signs were recorded in the vicinity of the site.

Given the dry nature of the site, it was not possible to collect a biological water quality sample at the time of survey.



Plate 4.2 Representative image of site A2 on the Eglish Stream, August 2025 (dry, ephemeral channel)

4.1.3 Site A3 – Eglish Stream, Eglish

Site A3 was located on the lower reaches of the Eglish Stream (25E18) c. 750m downstream of site A2. In contrast to upstream, the stream (FW2) at this location contained water at the time of survey although this was stagnant and likely originated from the downstream-connecting Rapemills River. The stream had been heavily modified historically with deepening throughout and local straightening along field boundaries. The channel had also been re-excavated in the recent past with spoil visible on the steep trapezoidal banks. The stream was 1.5-2m wide and 0.05-0.1m deep with no flows of water. The bed comprised argillaceous soft sediment with scattered boulder and gravels which had slumped from the steep banks. The lower reaches supported a diverse range of macrophytes with scattered stands of branched bur-reed, bulrush (*Typha latifolia*) and broad-leaved pondweed (*Potamogeton natans*). Small pondweed (*Potamogeton berchtoldii*), common water starwort, water plantain (*Alisma plantago-aquatica*) and water horsetail (*Equisetum fluviatile*) were also present locally. Encroachment of the narrow channel by terrestrial plants was common with purple loosestrife (*Lythrum salicaria*), great willowherb and meadowsweet (*Filipendula ulmaria*) often present instream. Aquatic bryophytes were not present. The east and south bank had been cleared recently but the north bank was well shaded with abundant gorse (*Ulex europaeus*), grey willow and scrub adjoining a coniferous plantation (WD4). The site was also bordered by improved pasture (GA1).

No fish were recorded via electro-fishing at site A3 (**Appendix A**). With the exception of low suitability for ubiquitous species such as three-spined stickleback (not recorded), the stream was not of fisheries value given its heavily modified, silted and shallow nature with an absence of flows. There was no suitability for white-clawed crayfish. No otter signs were recorded along the stream with very limited foraging opportunities present given an absence of fish. However, a spraint site was recorded on boulders at a livestock access point on the Rapemills River at the confluence, c. 60m downstream (ITM 607733, 709273).

Biological water quality, based on Q-sampling, was calculated as **Q2-3 (poor status) (Appendix B)**. However, it should be noted that this was a tentative rating given an absence of suitable riffle areas for sampling (Toner et al., 2005). No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.



Plate 4.3 Representative image of site A3 on the lower reaches of the Eglish Stream, August 2025

4.1.4 Site A4 – Rapemills River, Boolinarig Bridge

Site A4 was located on the Rapemills River (25R01) at Boolinarig Bridge (N62 road crossing). The swift flowing lowland alkaline river (FW2) had been historically deepened and straightened although demonstrated some recovery locally. The river was 4-5m wide and 0.2-0.75m deep with locally deeper areas to >1.2m. The profile comprised glide and pool with riffle confined to the cobbled bridge apron. Near the bridge, the substrata were dominated by heavily calcified cobbles and gravels (the cyanobacteria *Phormidium incrustatum*) with scattered boulder. However, elsewhere deep soft sediment deposits dominated, some up to 0.5m in depth. Macrophyte growth was localised with scattered stands of unbranched bur-reed (*Sparganium emersum*) and fool's watercress in addition to common duckweed (*Lemna minor*) and ivy-leaved duckweed (*Lemna trisulca*). Hard substrata supported abundant calcicolous liverwort *Riccardia chamedryfolia* with some *Fontinalis antipyretica*, *Rhynchostegium riparioides* and *Leptodictyum riparium*. Filamentous algal cover was low. The channel was well shaded by mature broadleaved woodland (WD1) and treelines dominated by grey willow and ash with bramble scrub. The site was also bordered by improved pasture (GA1) and dry meadows habitat (GS2).

Brown trout and lamprey (*Lampetra* sp.) were the only fish species recorded via electro-fishing at site A4 (**Appendix A**). The site was of good value for salmonids despite evident siltation and hydromorphological pressures, with a mixed cohort population present (as per 2022). Spawning habitat for salmonids and lamprey was limited given the general paucity of gravels/cobbles in addition

to natural bed calcification (colmation). Nursery habitat was also limited due to the highly localised nature of riffle and faster flowing glide areas. Deep pool and glide with bank scours and occasional macrophyte stands were of value as holding areas for adult salmonids. Abundant soft sediment deposits supported only a low density of *Lampetra* sp. ammocoetes. Despite good suitability for European eel, none were recorded, primarily reflecting downstream barriers in the Shannon catchment – however, the species was detected via eDNA sampling, indicating their presence at and or upstream of the sampling location (**Table 4.1**). Suitability for white-clawed crayfish was good (despite bed calcification & historical modifications) although none were recorded via targeted surveys or eDNA sampling (**Table 4.1**). A single old otter spraint was recorded on a boulder under the road bridge - this did not contain crayfish remains.

Biological water quality, based on Q-sampling, was calculated as **Q3 (poor status)** (**Appendix C**). No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.



Plate 4.4 Representative image of site A4 on the Rapemills River at Boolinarig Bridge, August 2025

4.1.5 Site A5 – West Galros Stream, Eglish

Site A5 was located on the upper reaches of the West Galros Stream (25W44). The stream (FW2) had been extensively straightened and over-deepened historically (peat drainage) and represented a canalised habitat throughout with no perceptible flow. The heavily modified U-shaped channel had been historically realigned from its mapped course and flowed through a series of peat settlement ponds (sites P1 & P2). The stream was 4-5m wide and 1-1.8m deep with a bed composed entirely of clay and silt (often up to 0.3m in depth). The sloping banks were composed of clay and peat. Clay agglomerations (from bank slumping) were frequent instream. Due to riparian shading and depths, macrophyte cover was low with rare bladderwort (*Utricularia* sp.) and water horsetail. The steep banks were fringed by abundant common reed (*Phragmites australis*) with scattered water mint. The

liverwort *Pellia endiviifolia* was abundant on the sloping clay banks. The riparian zone supported abundant herbaceous vegetation including bramble, purple loosestrife, meadowsweet, hedge bindweed, common knapweed (*Centaurea nigra*) and abundant bracken. To the west, the channel was lined by very dense scrubby woodland of downy birch, guelder rose (*Viburnum opulus*), alder (*Alnus glutinosa*) and grey willow. Coniferous afforestation (WD4) was present upstream. Recolonising cutover bog (PB4) was present to the north.

Electro-fishing was not undertaken at site B5 given prohibitive depths of >1.5m and a deep silt base. With the exception of three-spined stickleback (recorded in sweep samples), site A5 was of poor fisheries value given poor hydromorphology, low flows and poor fluvial connectivity. However, there was some suitability for European eel (eDNA detected downstream at site A6). Soft clay banks provided ideal opportunities for white-clawed crayfish burrowing and indeed many burrows were observed along the banks (but activity status unknown). In light of this potential prey resource, otter suitability was good although no signs were recorded in the vicinity of the site with limited marking opportunities present.

Biological water quality, based on Q-sampling, was calculated as **Q3 (poor status) (Appendix C)**. However, it should be noted that this was a tentative rating given an absence of suitable riffle areas for sampling (Toner et al., 2005). No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.



Plate 4.5 Representative image of site A5 on the West Galros Stream, August 2025

4.1.6 Site A6 – West Galros Stream, N62 road crossing

Site A6 was located on the West Galros Stream (25W44) at the N62 road crossing, c.0.5km downstream of site A5. Downstream of online peat settlement ponds (sites P1 & P2), the stream had been extensively straightened and over-deepened historically resulting in a canalised channel with a steep U-shaped profile (banks of 2m). The stagnant stream was a homogenous 5-7m wide and 1.2-2m

deep with a bed composed entirely of soft agaricaceous sediment. The sloping banks were composed of clay and peat. Clay agglomerations (from bank slumping) were frequent instream. Due to riparian shading and modifications, macrophyte cover was low with only scattered stands of broad-leaved pondweed, yellow lily (*Nuphar lutea*) and rare bladderwort (*Utricularia* sp.) along the upper littorals. Common water starwort was present but rare. The liverwort *Pellia endiviifolia* was frequent on the sloping clay banks. The steep banks were lined by abundant common reed. The north bank supported abundant herbaceous vegetation with a broadleaved plantation (WS2) and some bog woodland (WN7) along the channel. The site was bordered upstream by extensive areas of cutover bog (PB4).

Electro-fishing was not undertaken at site A6 given prohibitive depths of >1.5-2m. With the exception of three-spined stickleback (recorded via sweep sampling), site A6 was of poor fisheries value given poor hydromorphology, low/absent flows and heavy siltation. However, whilst salmonid spawning and nursery habitat was absent, the site had some low value as a holding habitat for adult trout given the high average depth. Argillaceous sediment deposits were unsuitable for lamprey ammocoete burial (no lamprey eDNA detected). Suitability for European eel was high and indeed the species was detected via eDNA sampling, alongside brown trout (**Table 4.1**). Whilst no white-clawed crayfish were recorded by sweep netting, burrows in the soft clay banks were abundant (as per upstream site A5). However, the species was not detected through eDNA sampling at the site (**Table 4.1**). In light of this potential prey resource, otter suitability was good although no signs were recorded in the vicinity of the site (poor marking opportunities).

Biological water quality, based on Q-sampling, was calculated as **Q3 (poor status)** (**Appendix C**). However, it should be noted that this was a tentative rating given an absence of suitable riffle areas for sampling (Toner et al., 2005). No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.



Plate 4.6 Representative image of site A6 on the West Galros Stream, August 2025

4.1.7 Site A7 – Rapemills River, R439 road crossing

Site A7 was located on the Rapemills River (25R01) at the R439 road c.3km downstream of site A4 and at the confluence with a small unmapped stream. With the exception of some local bank modifications in vicinity of the pipe culvert and along the roadside, the alkaline river retained a largely natural profile. The high energy lowland river (FW2) was 3-5m wide and 0.2-0.75m deep with a profile comprised on swift glide and riffle with frequent small pool. The substrata were dominated by abundant cobble and boulder with occasional areas of mixed gravels. However, bed calcification by the cyanobacteria *Phormidium incrustatum* was widespread (**Plate 4.8**). This had also caused some riverine tufa formations instream (but not representative of the submerged from of Annex I petrifying springs 7220 habitat). Soft sediment accumulations were shallow and superficial where present (in stark contrast to upstream sites). Livestock poaching was present downstream of the survey site (at a ford crossing). Given high flow rates and high shading, macrophytes were limited to occasional fool's watercress, water mint and heterophyllus lesser water parsnip (*Berula erecta*). The bed was dominated by aquatic bryophytes with very abundant *Riccardia chamedryfolia* in addition to *Pellia endiviifolia*, *Leptodictyum riparium* and occasional *Rhynchostegium riparioides*. A mature treeline of ash, sycamore (*Acer pseudoplatanus*), elder (*Sambucus nigra*) and hawthorn provided valuable shading from the west bank. Upstream of the culvert, the channel was heavily shaded (also with mature trees). The site was bordered by the R498 road and improved pasture (GA1).

Brown trout was the only species recorded via electro-fishing at site A7 (**Appendix A**). The site was of high value for salmonids, supporting a moderate density of mixed-cohort brown trout. Whilst bed calcification reduced the spawning capacity of the site (colmation of gravels), some limited spawning habitat for both salmonids and lamprey was present in pool tailings. Abundant bryophyte rich boulder and cobble provided some good quality salmonid nursery refugia with frequent small shaded pools of value as holding areas for adults. Lamprey ammocoete habitat was absent. Despite some good suitability for both European eel and white-clawed crayfish, neither were recorded, with bed calcification reducing the availability of instream refugia. A regular otter spraint site (containing fish & diving beetle remains) was recorded on marginal bedrock along the roadside (ITM 604794, 710200).

Biological water quality, based on Q-sampling, was calculated as **Q3 (poor status) (Appendix C)**. No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.



Plate 4.7 Representative image of site A7 on the Rapemills River, August 2025



Plate 4.8 Cyanobacterial crusts (*Phormidium incrustatum*) and the calcicolous liverwort *Riccardia chamedryfolia* on the riverbed at site A7 on the Rapemills River, August 2025

4.1.8 Site A8 – Rapemills River, Lusmagh Bridge

Site A8 was located on the lower reaches of the Rapemills River (25R01) at Lusmagh Bridge, c.4.5km downstream of site A7 and 1.2km upstream of the River Shannon confluence. The lowland depositing river (FW2) had been straightened and deepened historically but retained some good semi-natural features. The river was 6-8m wide and 0.5-1.8m deep with a profile of deep glide and pool (no riffle).

Shallower water (ranging from 0.2-1m) was present in the vicinity of the bridge. The substrata comprised cobble and boulder with occasional coarse gravels that were heavily silted. Elsewhere, in deeper depositional habitat, the bed was dominated by silt with occasional bedded boulder. Siltation was high overall. Calcification of hard substrata was also evident. The site supported a range of macrophytes with frequent common clubrush (*Schoenoplectus lacustris*), branched bur-reed, unbranched bur-reed and yellow lily. Beds of fool's watercress, water starwort (*Callitriche* sp.), lesser water parsnip, blue water speedwell (*Veronica anagallis-aquatica*), water forget-me-not (*Myosotis scorpioides*) and invasive Canadian pondweed (*Elodea canadensis*) were occasional. Mare's-tail (*Hippuris vulgaris*) and arrowhead (*Sagittaria sagittifolia*) were rare. The littorals were dominated by reed canary grass with frequent water mint and scattered iris, blue water speedwell and water plantain. Larger substrata supported the aquatic moss *Leptodictyum riparium* with rare *Fontinalis antipyretica*. Filamentous algae and floc were abundant, indicating significant enrichment. The banks were typically open and grazed with occasional patches of bramble scrub with scattered hawthorn. The site was bordered by improved pasture (GA1) with frequent livestock poaching.

Brown trout, pike (*Esox lucius*), gudgeon (*Gobio gobio*), minnow (*Phoxinus phoxinus*), stone loach and three-spined stickleback were recorded via electro-fishing at site A8 (**Appendix A**). A short section near the bridge was shallow enough to undertake backpack electro-fishing (too deep elsewhere). The site was of relatively poor value for salmonids given a paucity of suitable spawning and nursery habitat although deep glide and pool were valuable holding areas for adult salmonids (albeit none recorded). These areas were also of high value for a range of coarse fish species. Soft sediment accumulations did not support lamprey ammocoetes and the site was not of value for spawning lamprey given siltation pressures. Despite some good physical suitability, no European eel or white-clawed crayfish were recorded. Atlantic salmon, *Lampetra* sp. and European eel but not crayfish were detected via eDNA sampling, indicating their presence at and or upstream of the sampling location (**Table 4.1**). No otter signs were recorded in vicinity of the site despite the presence of good quality foraging habitat.

Biological water quality, based on Q-sampling, was calculated as **Q3 (poor status)** (**Appendix C**). However, it should be noted that this was a tentative rating given an absence of suitable riffle areas for sampling (Toner et al., 2005). No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.



Plate 4.9 Representative image of site A8 on the Rapemills River at Lusmagh Bridge, August 2025

4.1.9 Site B1 – Drainage channel, Clooneen

Site B1 was located on a drainage channel perpendicular to a dry roadside drain within the proposed site boundary. The small drainage channel was intermittent in nature being impounded between peat dams in extensive cutover bog. The channel was 1-1.5m wide and 0.1-0.2m deep with a bed of deep humic soft sediment (peat, up to 1m in depth). The series of impounded sections supported frequent bog pondweed (*Potamogeton polygonifolius*) and bladderwort (*Utricularia* sp.). Filamentous algae and floc was abundant throughout given nutrient escapement from the surrounding cutover bog. The channel was cut through cutover bog (PB4) with low lying open banks supporting abundant heather (*Calluna vulgaris*), bog asphodel (*Narthecium ossifragum*), sedges (*Carex* spp.), purple moor grass (*Molinia caerulea*) and occasional downy birch saplings.

No fish were recorded via electro-fishing at site B1 (**Appendix A**). The intermittent drainage channel was unsuitable for fish given its shallow heavily silted nature and isolation from other habitats. However, there was some good suitability for amphibians (none recorded) and invertebrates. There was no suitability for white-clawed crayfish. No otter signs were recorded in vicinity of the site.

Biological water quality, based on Q-sampling, was calculated as **Q3 (poor status)** (**Appendix C**). However, it should be noted that this was a tentative rating given an absence of suitable riffle areas for sampling (Toner et al., 2005). No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.



Plate 4.10 Representative image of site B1 on an impounded peat drainage channel, August 2025

4.1.10 Site C1 – Whigsborough Stream, Clooneen

Site C1 was located on the Whigsborough Stream (25W43) at a local road crossing downstream (east) of the proposed site boundary. The lowland stream (FW2) had been extensively straightened and deepened historically as part of peatland drainage, resulting in a homogenous channel with very poor hydromorphology that was 1-1.5m wide and <0.1m deep with no flows at the time of survey (stagnant pools only). The bed was comprised entirely of deep soft flocculent peat (up to 1m in depth). Peat dams, impeding water flow and restricting fluvial connectivity. Given very high shading, macrophytes were limited to occasional water mint, fool's watercress and common duckweed in more open areas of channel. Aquatic bryophytes were not recorded. Encroachment of the channel by terrestrial vegetation was high with abundant bramble along channel margins. The site was located in an area of heavily-scrubbed, wet mixed broad-leaved woodland (WD1/WN7) supporting abundant sycamore with ash, hawthorn, alder, hazel (*Corylus avellana*), elder and grey willow. Coniferous plantations (WD4) were present upstream.

No fish were recorded via electro-fishing at site C1 (**Appendix A**). The site was not of fisheries value given gross siltation, poor hydromorphology and absent flows, in addition to poor connectivity with downstream habitats (frequent peat blockages instream). No white-clawed crayfish were recorded by sweep netting and there was no suitability. No other signs were recorded in the vicinity of the site.

Biological water quality, based on Q-sampling, was calculated as **Q2-3 (poor status) (Appendix B)**. However, it should be noted that this is a tentative rating given poor flows and lack of suitable riffle areas for sampling (as per Toner et al., 2005). No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.



Plate 4.11 Representative image of site C1 on the Whigsborough Stream, August 2025

4.1.11 Site L1 – Lake/wetland, Eglish

Site L1 was located at a small wetland within the proposed site boundary. The small irregular shaped wetland featured a main basin of water of c.0.2ha with several smaller satellite ponds which would be interconnected at higher water levels. Where present, the water was shallow and often <0.2m. The bed was composed entirely of peat (humic sediment). The shallow sloping open banks of exposed peat supported abundant sharp-flowered rush (*Juncus acutiflorus*), marsh arrow-grass (*Triglochin palustre*), water horsetail and bottle sedge (*Carex rostrata*) which extended into the littorals. Submerged macrophytes were limited to very scattered delicate stonewort (*Chara virgata*), bladderwort (*Utricularia* sp.) and bog pondweed. The wetland/marsh surrounding the basin supported common species such as marsh pennywort (*Hydrocotyle vulgaris*), sedges, bog cotton (*Eriophorum* sp.) and purple loosestrife. The site was bordered by extensive areas of cutover bog (PB4), some of which was recolonising.

Electro-fishing was not undertaken at site L1 given the lacustrine conditions and deep silt bed. The wetland was of poor fisheries value given very shallow depths, siltation and isolation from other habitats. However, the site was of good suitability for amphibians (none recorded). There was no suitability for white-clawed crayfish. No otter signs were recorded in vicinity of the site.

No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via sweep sampling (**Appendix C**).



Plate 4.12 Representative image of site L1, August 2025

4.1.12 Site L2 – Lake/wetland, Clooneen

Site L2 was located at a large lake/wetland complex adjacent to Derrinlough wind farm and the proposed site boundary. The large surface water feature covered approximately 20ha with a highly complex margin featuring abundant bays, back-channels and small islands. The lake was shallow, being mostly <1m depth, with a bed composed entirely of silt silt (peat). The margins were gently sloping and supported extensive stands of bottle sedge and more localised bog pondweed and bulrush. Small stunted willow and downy birch were abundant in the littorals and also scattered throughout open water on plateaux of peat. The banks were dominated by exposed peat with scattered scrub (WS1) of heather, downy birch, lodgepole pine (*Pinus contorta*), gorse, cotton grass (*Eriophorum* sp.), deergrass (*Trichophorum cespitosum*) and purple moor grass.

Electro-fishing was not undertaken at site L2 given the lacustrine conditions and deep silt bed. The wetland was of some fisheries value despite its generally shallow depths, siltation and isolation from other habitats. Three-spined stickleback were visibly plentiful and recorded in sweep samples. The site was of high biodiversity value, including for aquatic species, including amphibians (none recorded). There was no suitability for white-clawed crayfish. No otter signs were recorded in vicinity of the site although utilisation is likely.

No macro-invertebrate species of conservation value greater than ‘least concern’, according to national red lists, were recorded via sweep sampling (**Appendix C**).



Plate 4.13 Representative image of site L2, August 2025

4.1.13 Site P1 – Pond, Galros East

Site P1 was located at a former peat settlement pond adjacent to the West Galros Stream. The small 0.2ha clear water linear pond had a canal-like profile being 175m long and just 12m wide. The pond was connected to the adjacent stream via a pipe culvert (western end) and a cut channel (eastern end). Given its artificial nature, the banks were steep and dropped into >0.5m of water at the base of the slope. The pond was a homogenous 1.6-2m deep with a bed comprised entirely of argillaceous soft sediment. The bank slopes were also composed of clay. The shallow pond was heavily vegetated with abundant broad-leaved pondweed and more localised yellow lily and bottle sedge. Small pondweed, unbranched bur-reed and bladderwort (*Utricularia* sp.) were rare. Common reed dominated the steep banks and deep littorals. The semi-aquatic liverwort *Pellia endiviifolia* was present locally on exposed muddy bank sections. The pond was bordered by recolonising historical cutover bog (PB4), much of which had recolonised with abundant grey willow, downy birch and gorse scrub (WS1) and wetland vegetation including purple loosestrife, meadowsweet, tormentil (*Potentilla erecta*), hedge bindweed and purple moor grass.

Electro-fishing was not undertaken at site P1 given the deep lacustrine conditions. However, three-spined stickleback were recorded via sweep sampling and were present in high numbers. The alkaline pond was of good suitability for European eel and had some suitability for brown trout although the absence of suitable spawning habitat likely precluded the species. The alkaline pond was also of high suitability for white-clawed crayfish. Whilst none were recorded via sweep sampling, the steep clay banks featured many crayfish burrows. No otter signs were recorded in vicinity of the site although there was good foraging suitability.

No macro-invertebrate species of conservation value greater than ‘least concern’, according to national red lists, were recorded via sweep sampling (**Appendix C**).



Plate 4.14 Representative image of site P1, August 2025

4.1.14 Site P2 – Pond, Galros East

Site P2 was located at a former peat settlement pond adjacent to site P1 and the West Galros Stream. The small 0.3ha linear pond had a canal-like profile being 200m long and 15m wide. The pond was connected to the adjacent stream via cut channels (both ends). The banks were steep and dropped into >0.5-1m of water at the base of the slope. The pond was 1.5-2.5m deep with a bed comprised of clay and silt. The bank slopes were also composed of clay with areas of exposed peat. In contrast to site P1, the water was quite turbid (diatom or algal bloom) resulting in significantly less macrophyte growth. Whilst the margins were fringed with abundant common reed and occasional water horsetail, the open water supported only scattered stands of small pondweed and rare bladderwort (*Utricularia* sp.) and broad-leaved pondweed. The semi-aquatic liverwort *Pellia endiviifolia* was present locally on exposed muddy bank sections with *Conocephalum conicum* rare. The pond was bordered by historical cutover bog (PB4), much of which had recolonised with abundant grey willow, downy birch and gorse scrub (WS1) and wetland vegetation including bracken, purple loosestrife, meadowsweet, tormentil, hedge bindweed and purple moor grass.

Electro-fishing was not undertaken at site P2 given the deep lacustrine conditions. However, three-spined stickleback were recorded via sweep sampling and were present in moderate numbers. The alkaline pond was of good suitability for European eel and had some suitability for brown trout although the absence of suitable spawning habitat likely precluded the species. The alkaline pond was of high suitability for white-clawed crayfish. Whilst none were recorded via sweep sampling, the steep clay banks featured many crayfish burrows. No otter signs were recorded in vicinity of the site although there was good foraging suitability.

No macro-invertebrate species of conservation value greater than ‘least concern’, according to national red lists, were recorded via sweep sampling (**Appendix C**).



Plate 4.15 Representative image of site P2, August 2025

Table 4.1 2025 eDNA results in the vicinity of the proposed Cush wind farm, Co. Offaly (positive qPCR replicates out of 12 in parentheses)

Site	Watercourse	Atlantic salmon	Brown trout	Lamprey (<i>Lampetra</i> sp.)	European eel	White-clawed crayfish
A4	Rapemills River	Negative (0/12)	n/a	Positive (2/12)	Positive (12/12)	Negative (0/12)
A6	West Galros Stream	n/a	Positive (12/12)	Negative (0/12)	Positive (10/12)	Negative (0/12)
A8	Rapemills River	Positive (1/12)	n/a	Positive (2/12)	Positive (11/12)	Negative (0/12)

4.2 White-clawed crayfish

No live white-clawed crayfish were recorded via hand-searching or sweep netting of instream refugia during the survey of 14 no. survey sites. Furthermore, field inspection of otter spraint at 4 no. sites on the Rapemills River did not reveal the presence of white-clawed crayfish remains. Crayfish burrows were visibly widespread at sites A5 and A6 on the West Galros Stream and the adjacent settlement pond sites P1 and P2, although no live crayfish were recorded.

Environmental DNA sampling failed to detect the presence of crayfish from the West Galros Stream or Rapemills River (see section 4.3 below).

4.3 eDNA sampling

In support of previous and current targeted surveys, no white-clawed crayfish eDNA was detected at sites A4 and A8 on the Rapemills River nor site A6 on the West Galros Stream (0 positive qPCR replicates out of 12, respectively) (**Table 4.1; Appendix B**).

A weak signature (1 positive qPCR replicate out of 12) of Atlantic salmon was detected at site A8 on the lower reaches of the Rapemills River. Lamprey (*Lampetra* sp.) were also detected at both sites A4 and A8 on the Rapemills River, despite an absence during the electro-fishing survey.

Although none were recorded during the electro-fishing survey, European eel was detected at all three sampling locations on the Rapemills River and West Galros Stream (**Table 4.1; Appendix B**). Brown trout were also detected at site A6 on the West Galros Stream.

4.4 Biological water quality (macro-invertebrates)

No rare or protected macro-invertebrate species (according to national red lists) were recorded in the biological water quality samples taken from 10 no. riverine sites or sweep samples collected at 4 no. lacustrine sites in August 2025 (**Appendix C**).

All 10 no. riverine sites achieved **Q2-3 or Q3 (poor status)** based on a dominance of pollution tolerant EPA group C and D species such as the mayfly *Baetis rhodani*, freshwater shrimp (*Gammarus duebeni*), freshwater hoglouse (*Asellus aquaticus*) and common molluscs such as the margined ramshorn (*Planorbis planorbis*), wandering snail (*Ampullacaena balthica*) and New Zealand mud snail (*Potamopyrgus antipodarum*) (**Appendix C**). None of the sampling sites supported group A (most pollution sensitive) species with only low numbers of group B taxa present including the mayfly *Alainites muticus*, cased caddis species such as *Sericostoma personatum* and Coenagrionidae species damselflies.

The backswimmer *Notonecta obliqua* was recorded from the impounded peat channel at site B1. Whilst not protected, this is an uncommon species with a restricted distribution in Ireland (Nelson, 2022).

It should be noted that the rating for sites A3, A5, A6, A8, B1 and C1 were tentative due to poor flows and or an absence of riffle areas for sampling at the time of survey (as per Toner et al., 2005).

Table 4.2 Comparison of 2022 and 2025 biological water quality (Q-ratings) at riverine sites in vicinity of the proposed Cush wind farm

Site no.	Watercourse	EPA code	August 2022		August 2025	
			Q-rating	WFD status	Q-rating	WFD status
A1	Rapemills River	25R01	Q3-4	Moderate	Q3	Poor
A2	Eglish Stream	25 E18	n/a – dry channel		n/a – dry channel	
A3	Eglish Stream	25 E18	Not surveyed		Q2-3*	Poor
A4	Rapemills River	25R01	Q3-4	Moderate	Q3	Poor
A5	West Galros Stream	25W44	Q3*	Poor	Q3*	Poor
A6	West Galros Stream	25W44	Q3*	Poor	Q3*	Poor
A7	Rapemills River	25R01	Q3	Poor	Q3	Poor
A8	Rapemills River	25R01	Q3*	Poor	Q3*	Poor
B1	Drainage channel	n/a	Not surveyed		Q3*	Poor
C1	Whigsborough Stream	25W43	Q2-3*	Poor	Q2-3*	Poor

* tentative Q-rating given poor flows or absence of suitable riffle areas for sampling (Toner et al., 2005)

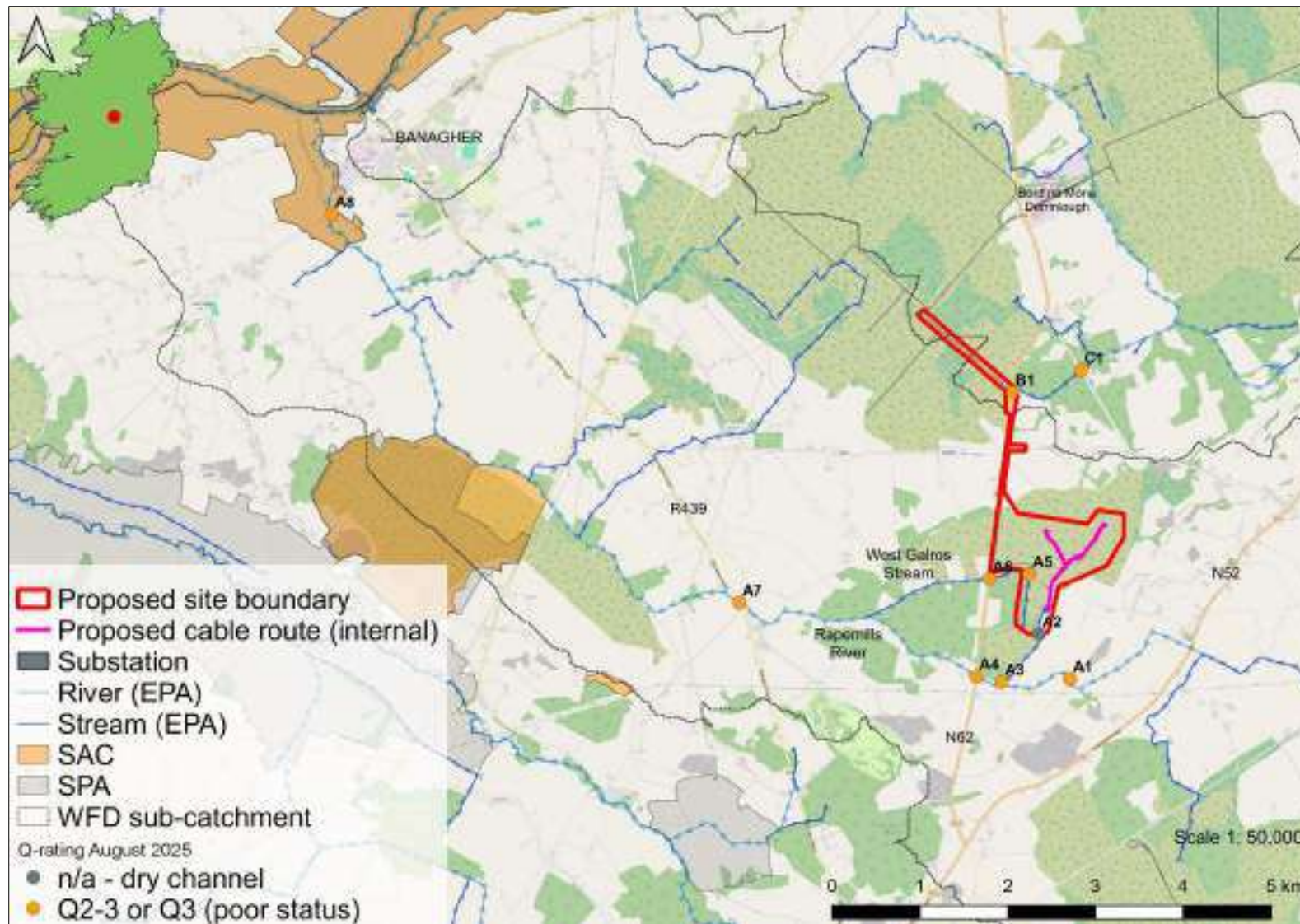


Figure 4.1 Overview of the biological water quality status in the vicinity of the proposed development, August 2025

4.5 Lacustrine macro-invertebrate communities

No rare or protected macro-invertebrate species (according to national red lists) were recorded in the composite sweep samples collected from the 4 no. lacustrine sites in August 2025.

The peatland wetland/lake site L1 was dominated by Coenagrionidae damselflies, lake olive mayfly (*Cloeon simile*) and Dipteran larvae with a modest species diversity (13) (**Appendix C**). The larger site L2 supported a much lower diversity of macroinvertebrates, again dominated by Coenagrionidae damselflies, lake olive mayfly (*Cloeon simile*). The non-native shrimp species *Crangonyx* sp. was recorded from site L2 (the only site it was recorded from in the current survey).

The highly alkaline and deeper pond sites P1 and P2 supported a higher species diversity relative to the wetland/lake sites (22 & 17, respectively; **Appendix C**). The communities were broadly similar with Coenagrionidae damselflies, lake olive mayfly, freshwater hoglouse and gastropod molluscs such as great pond snail (*Lymnaea stagnalis*) and pea mussels (Sphaeriidae) dominating.

4.6 Otter signs

Whilst a full otter survey was beyond the scope of this survey, signs were recorded within a 150m radius of the survey sites in August 2025.

Otter signs (typically spraints) were identified at a total of 4 no. sites on the Rapemills River at sites A1, A4, A7 and near site A3.

No breeding (holts) or resting (couch) areas were identified in the vicinity of the survey sites in August 2025 or August 2022.



Plate 4.16 Old, disintegrating otter spraint located under a quarry access bridge on the Rapemills River at site A1, August 2025 (spraint also recorded here in August 2022)

Table 4.3 Relative abundance of fish species of higher conservation value recorded via **electro-fishing** in the vicinity of the proposed development, August 2025 (blank cell = not recorded)

Site	Watercourse	Atlantic salmon	Brown trout	<i>Lampetra</i> sp.	European eel	Other species
A1	Rapemills River		Medium	Low		Three-spined stickleback
A2	Eglish Stream	No fish recorded – dry, ephemeral channel				
A3	Eglish Stream	No fish recorded				
A4	Rapemills River	Negative eDNA	Medium	Low	Positive eDNA	
A5	West Galros Stream	Fisheries appraisal only				
A6	West Galros Stream	Fisheries appraisal only – negative brown trout & <i>Lampetra</i> sp. but positive European eel eDNA				
A7	Rapemills River		High			
A8	Rapemills River	Positive eDNA	Low	Positive eDNA	Positive eDNA	Minnow, stone loach, pike, three-spined stickleback, gudgeon
B1	Drainage channel	No fish recorded				
C1	Whigsborough Stream	No fish recorded				
L1	Lake/wetland	Fisheries appraisal only				
L2	Lake wetland	Fisheries appraisal only – three-spined stickleback recorded during sweep sampling				
P1	Pond	Fisheries appraisal only – three-spined stickleback recorded during sweep sampling				
P2	Pond	Fisheries appraisal only – three-spined stickleback recorded during sweep sampling				

Table 4.4 Summary of aquatic species and habitats of higher conservation value recorded in the vicinity of the proposed Cush wind farm, August 2025

Site	Watercourse	White-clawed crayfish	Otter signs within 150m	Annex I aquatic habitats	Rare or protected macrophytes/aquatic bryophytes	Rare or protected macro-invertebrates	Other species/habitats of high conservation value
A1	Rapemills River	None recorded	Regular spraint site with prints & slide	Not present	None recorded	None recorded	Lamprey (<i>Lampetra</i> sp.)
A2	Eglish Stream	None recorded	No signs	Not present	None recorded	None recorded	None recorded
A3	Eglish Stream	None recorded	Spraint site on boulders c.60m downstream	Not present	None recorded	None recorded	None recorded
A4	Rapemills River	None recorded; negative eDNA result at site	Old spraint	Not present	None recorded	None recorded	Lamprey (<i>Lampetra</i> sp.); European eel (eDNA only)
A5	West Galros Stream	None recorded	No signs	Not present	None recorded	None recorded	None recorded
A6	West Galros Stream	None recorded; negative eDNA result at site	No signs	Not present	None recorded	None recorded	None recorded
A7	Rapemills River	None recorded	Regular spraint site	Not present	None recorded	None recorded	None recorded
A8	Rapemills River	None recorded; negative eDNA result at site	No signs	Not present	None recorded	None recorded	Atlantic salmon, lamprey (<i>Lampetra</i> sp.) & European eel (all eDNA only)
B1	Drainage channel	None recorded	No signs	Not present	None recorded	None recorded	None recorded
C1	Whigsborough Stream	None recorded	No signs	Not present	None recorded	None recorded	None recorded
L1	Lake/wetland	None recorded	No signs	Not present	None recorded	None recorded	None recorded
L2	Lake wetland	None recorded	No signs	Not present	None recorded	None recorded	None recorded
P1	Pond	None recorded	No signs	Not present	None recorded	None recorded	None recorded
P2	Pond	None recorded	No signs	Not present	None recorded	None recorded	None recorded

Conservation value: Brook lamprey (*Lampetra planeri*), river lamprey (*Lampetra fluviatilis*), otter (*Lutra lutra*) and white-clawed crayfish (*Austropotamobius pallipes*) are listed under Annex II of the Directive on the Conservation of Natural Habitats of Wild Fauna and Flora (92/43/EEC) ('EU Habitats Directive'). Otters and white-clawed crayfish are also protected under the Irish Wildlife Acts 1976-2023. White-clawed crayfish (Füreder et al., 2010) are listed as 'Endangered' according to the IUCN Red List. European eel are 'critically endangered' according to most recent ICUN red list (Pike et al., 2020) and listed as 'critically engendered' in Ireland (King et al., 20

5. Discussion

The watercourses in the vicinity of the proposed Cush wind farm were lowland and peatland channels which had typically been extensively straightened and deepened historically (land drainage) and suffered from evident water quality pressures (primarily siltation). Over half of the survey sites were of low aquatic value and did not support aquatic species or habitats of high conservation value during the survey period.

However, in keeping with the previous 2022 surveys (Triturus, 2022), a number of high conservation value aquatic species were recorded. Annex II otter signs were identified at several locations on the Rapemills River, with Annex II lamprey (*Lampetra* sp.) again recorded from the Rapemills River (as per previous surveys). Annex II Atlantic salmon were detected through eDNA sampling of the Rapemills River at site A8, with Red-listed European eel eDNA detected from the Rapemills River and West Galros Stream. Whilst none of these species were recorded at lake site L2 - a large wetland/lake complex situated in cutover bog adjacent to the proposed site boundary - the site was considered of high overall biodiversity and aquatic value in a local context.

In support of previous surveys no rare or protected macrophytes/aquatic bryophytes, rare or protected macro-invertebrates, Annex I aquatic habitats or otter breeding/resting areas were recorded during the current survey. The only aquatic invasive species recorded was the macrophyte Canadian pondweed (*Elodea canadensis*)¹ at site A8 on the Rapemills River. Whilst no white-clawed crayfish were recorded in the current survey, the species is known from the survey area and the presence of a small population is considered likely (see **section 5.3** below).

5.1 Fisheries

A typical diversity of fish species for the surveyed sub-catchments were recorded via electro-fishing during the current survey, with brown trout, lamprey (*Lampetra* sp.), gudgeon, minnow, stone loach, pike and three-spined stickleback captured in August 2025 (**Table 3.1, 3.2**). Atlantic salmon and European eel were detected through eDNA sampling only (**Table 4.1; Appendix B**). With the exception of Atlantic salmon (eDNA only), the same species assemblage was recorded during the previous survey in August 2022 (Triturus, 2022). Four of the riverine sites did not support resident fish at the time of survey.

Salmonid populations were restricted in vicinity of the proposed development, with brown trout being recorded throughout the Rapemills River at sites A1, A4, A7 and A8 and via eDNA sampling of the West Galros Stream (A6). Atlantic salmon were also detected through eDNA sampling at site A8 (Lusmagh Bridge). Lamprey ammocoetes (*Lampetra* sp.) were recorded in low densities from sites A1 and A4 on the Rapemills River, with eDNA sampling detecting the species at site A8. Suitability for the species was typically poor or absent in the survey area. Hydromorphological modifications, siltation and bed calcification significantly reduced the quality and availability of salmonid and lamprey spawning and nursery habitats in the survey area (**Appendix A**). Although no Red-listed European eel were recorded

¹ listed on the on the Third Schedule of the European Communities (Birds and Natural Habitats) Regulations 2011-2021 (S.I. 477/2011) but a very widespread, established species in Ireland now considered as a low risk (Torsney et al., 2025)

via electro-fishing, eDNA sampling did detect the species in the Rapemills River (A4, A8) and West Galros Stream (A6) in August 2025, indicating low numbers of eel are present in the survey area.

5.2 Otter

Otter signs (typically spraints) were identified at a total of 4 no. sites on the Rapemills River (A1, A4, A7 and near site A3). Several signs were identified at the same locations as the previous 2022 surveys (i.e. inter-annual marking sites, **Plate 4.16**). Although many smaller watercourses and waterbodies were of low value for otter (poor prey resources etc.), the low number of otter signs identified was mostly due to a paucity of suitable instream/riparian marking features such as boulders and large woody debris - features typically removed through historical drainage. This can result in sign detection difficulties (Wang et al., 2021; Reuther et al., 2000) even when areas are utilised by foraging and commuting otter (e.g. West Galros Stream and connected peat settlement ponds).

No breeding (holt) or couch (resting) areas were identified in the vicinity of the survey sites in August 2025 or August 2022.

5.3 White-clawed crayfish (likely presence)

No live white-clawed crayfish were recorded during the current targeted surveys and environmental DNA sampling of the Rapemills River (2 sites) and West Galros Stream failed to detect the species. However, white-clawed crayfish remains were recorded in otter spraint on both these watercourses during the previous survey (Triturus, 2022). Crayfish burrows were frequent in the steep clay banks of the West Galros Stream (sites A5 & A6) as well as connected former peat settlement ponds (sites P1 & P2) and suitability was high overall.

The failure to detect eDNA signatures of crayfish in these watercourses may be an artefact of hydrological conditions at the time of sampling, especially in the West Galros Stream which did not support flowing water in August 2025. Whilst highly sensitive and often detectable over long distances instream (including in crayfish; Chucholl et al., 2021), the detection of eDNA from an upstream (riverine) population depends on downstream transport of genetic material, and mixing of same in lacustrine habitats. The low summer flows present on the West Galros Stream and connected ponds (very suitable crayfish habitat) at the time of survey may have limited the flow/mixing of eDNA and thus influenced detection rates of crayfish (i.e. DNA may have temporarily settled out of suspension; Buxton et al., 2018). The patchy distribution and often low abundances of white-clawed crayfish in a given river system may also strongly influence eDNA detection probability (Sint et al., 2022). Whilst further survey effort would be required to confirm, it is considered likely that a small fragmented crayfish population still exists in the Rapemills River/West Galros Stream system.

5.4 Water quality & macro-invertebrates

No rare or protected macro-invertebrate species (according to national red lists) were recorded in the biological water quality samples taken from 10 no. riverine or composite sweep samples collected at 2 no. lake sites (**Appendix C**). However, whilst not protected, the nationally uncommon backswimmer *Notonecta obliqua* was recorded from the impounded peat channel at site B1. This species occupies a restricted and mostly coastal distribution in Ireland but is known to inhabit small pools in heathland and peatlands (Nelson, 2022).

The non-native amphipod crustacean *Crangonyx* sp. was recorded in low numbers from lake site L2 (**Appendix B**). Whilst *Crangonyx pseudogracilis* has been known in Ireland since 1969, its Irish range has expanded in recent years (Minchin et al., 2013) and it is now well established (Baars et al., 2021). Furthermore, *Crangonyx floridanus* has recently been confirmed in the Liffey and Barrow catchments (Baars et al., 2021). Speciation within the *Crangonyx* genus has proven difficult (Mauvisseau et al. 2018) and could not be determined in the current survey. Although the ecological impacts of either *Crangonyx* species in Ireland remains uncertain (Baars et al., 2021) the species has been shown to be an important dietary component in brown trout in the River Liffey (Delanty et al., 2022).

As per previous surveys (**Table 4.2**), all sampling sites failed to meet the target good status ($\geq$ Q4) requirements of the European Union Environmental Objectives (Surface Waters) (Amendment) Regulations 2019 and the Water Framework Directive (2000/60/EC) (**Figure 4.1**). Whilst Rapemills River at site A1 and A4 was of Q3-4 (moderate status) in August 2022 (EPA group A *Rhithrogena semicolorata* or *Ephemera danica* present), this had decreased to Q3 (poor status) in August 2025. All other sampling sites ranged from Q2-3 to Q3 (poor status) with several ratings tentative due to poor flows and an absence of suitable riffle areas for sampling. Alongside eutrophication, hydromorphological modifications (land/peatland drainage) and peat harvesting (leading to siltation) have been identified as the major pressures impacting water quality in the Brosna_SC_080 and the Shannon (Lower)_SC_040 river sub-catchments (EPA data) and this was supported by observations made during the current and previous surveys.

6. References

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7. Appendix A – fisheries report

Please see accompanying fisheries assessment report

8. Appendix B – eDNA lab report



eDNA Report

Technical Report



SureScreen Scientifics

Policy No: -0087-2025
 Purchase Order: eDNA_Cush
 Contact: Triturus Environmental Ltd
 Issue Date: 23.09.2025
 Received Date: 06.09.2025



eDNA Analysis

Summary

When aquatic organisms inhabit a waterbody such as a pond, lake or river they continuously release small amounts of their DNA into the environment. By collecting and analysing water samples, we can detect these small traces of environmental DNA (eDNA) to confirm the presence or absence of the target species within the waterbody.

Results

Lab ID	Site Name	OS Reference	Target Species	Sample Integrity Check	Result	Positive Replicates
FK259B	A4 - Roodmill's River		White-clawed crayfish (Austropotamobius pallipes)	Pass	Negative	0
			Atlantic salmon (Salmo salar)	Pass	Negative	0
			European eel (Anguilla anguilla)	Pass	Positive	12
			Brook/River lamprey (Lampetra planeri / Lampetra fluviatilis)	Pass	Positive	2
FK2901	A6 - West Gains Stream		White-clawed crayfish (Austropotamobius pallipes)	Pass	Negative	0
			Brown (sea) trout (Salmo trutta)	Pass	Positive	12

SureScreen Scientifics Ltd, Morley Retreat, Church Lane, Morley, Derbyshire, DE7 8DE, UK
 +44 (0)1332 390003 | info@surecreen.co.uk | www.surecreen.co.uk



Policy No: 4087-2025
 Purchase Order: eOHA_Cush
 Contact: Triturus Environmental Ltd
 Issue Date: 23.07.2025
 Received Date: 06.08.2025



		European eel (<i>Anguilla anguilla</i>)	Pass	Positive	0
		Brook/River lamprey (<i>Lampetra planeri</i> / <i>Lampetra fluviatilis</i>)	Pass	Negative	0
FK3496	ASH, Rapemills Road	White-clawed crayfish (<i>Austropotamobius pallipes</i>)	Pass	Negative	0
		Atlantic salmon (<i>Salmo salar</i>)	Pass	Positive	1
		European eel (<i>Anguilla anguilla</i>)	Pass	Positive	11
		Brook/River lamprey (<i>Lampetra planeri</i> / <i>Lampetra fluviatilis</i>)	Pass	Positive	2

Matters affecting result: none

Reported by: Vanessa Hind

Approved by: Consuela Sopronyi



Policy No: -/087/2025
 Purchase Order: eDNA_Cush
 Contact: Triturus Environmental Ltd
 Issue Date: 03/07/2025
 Received Date: 06/08/2025



Methodology

Samples have been analyzed for the presence of target species eDNA following readily available and scientifically published eDNA assays and protocols.

The analysis is conducted in two phases. The sample first goes through an extraction process where the filter is incubated in order to obtain any DNA within the sample. The extracted sample is then tested via real-time PCR (also called q-PCR) for each of the selected target species. This process uses species-specific molecular markers (known as primers) to amplify a select part of the DNA, allowing it to be detected and measured in 'real time' as the analytical process develops. qPCR combines amplification and detection of target DNA into a single step. With qPCR, fluorescent dyes specific to the target sequence are used to label targeted PCR products during thermal cycling. The accumulation of fluorescent signals during this reaction is measured for fast and objective data analysis. The primers used in this process are specific to a part of mitochondrial DNA, only found in each individual species. Separate primers are used for each of the species, ensuring no DNA from any other species present in the water is amplified. If target species DNA is present, the DNA is amplified up to a detectable level, resulting in positive species detection. If target DNA is not present then amplification does not occur and a negative result is recorded.

Analysis of eDNA requires scrupulous attention to detail to prevent the risk of false positive and false negative results. True positive controls, negative controls, and spiked synthetic DNA are included in every analysis and these have to be correct before any result is declared. Stages of the analysis are also conducted in different buildings at our premises for added security. SureScreen Scientifics Ltd is ISO9001 accredited and participates in Natural England's proficiency testing scheme for GCN eDNA testing.

Interpretation of Results

Sample Integrity Check: Laboratory Arrival

When samples are received in the laboratory, they are inspected for any tube leakage, suitability of sample (not too much mud or weed etc.) and absence of any factors that could potentially lead to inconclusive results. Any samples which fail this test are rejected and eliminated before analysis.

Degradation and Inhibition check:

Analysis of the spiked DNA marker to see if there has been degradation or inhibition of the kit or sample, between the date it was made to the date of analysis. Degradation of the spiked DNA marker may indicate a risk of false negative results. If inhibition is detected, samples are purified and re-analyzed. Inhibitors cannot always be removed, if the inhibition check fails, the sample should be re-collected.

Result: Presence of eDNA (Positive/Negative/Inconclusive)

Positive: DNA was identified within the sample, indicative of species presence within the sampling location at the time the sample was taken or within the recent past.

Positive Replicate: Number of positive qPCR replicates out of a series of 12. If one or more of these are found to be positive the pond is declared positive for species presence. It may be assumed that small fractions of positive analysis suggest low level presence, but this cannot currently be used for population studies. Even a score as low as 1/12 is declared positive. 0/12 indicates negative species presence.

Negative: eDNA was not detected or is below the threshold detection level and the test result should be considered as evidence of species absence, however, does not exclude the potential for species presence below the limit of detection.

Inconclusive: Controls indicate inhibition or degradation of the sample, resulting in the inability to provide conclusive evidence for species presence or absence.



9. Appendix C – biological water quality & lacustrine macro-invertebrate communities

Table 9.1 Macro-invertebrate Q-sampling results for riverine sites, August 2025

Group	Family	Species	A1	A3	A4	A5	A6	A7	A8	B1	C1	EPA group
Ephemeroptera	Baetidae	<i>Alainites muticus</i>	2	5	6			4				B
Plecoptera	Leuctridae	<i>Leuctra fusca</i>			3							B
Trichoptera	Glossosomatidae	<i>Agapetus fuscipes</i>										B
Trichoptera	Hydroptilidae	<i>Hydroptila</i> sp.							1			B
Trichoptera	Limnephilidae	<i>Limnephilus lunatus</i>				11						B
Trichoptera	Limnephilidae	<i>Potamophylax cingulatus</i>						23				B
Trichoptera	Phryganeidae	<i>Agrypnia obsoleta</i>							1			B
Trichoptera	Sericostomatidae	<i>Sericostoma personatum</i>	11		6							B
Odonata	Aeshnidae	sp. indet.								1		B
Odonata	Coenagrionidae	sp. indet.				7	4			15		B
Odonata	Libellulidae	<i>Sympetrum</i> sp.								12		B
Ephemeroptera	Baetidae	<i>Baetis rhodani</i>	5	3	8			45	13			C
Ephemeroptera	Ephemerellidae	<i>Serratella ignita</i>	36		6			3	2			C
Trichoptera	Hydropsychidae	<i>Hydropsyche instabilis</i>			10							C
Trichoptera	Hydropsychidae	<i>Hydropsyche siltalai</i>			26			1				C
Trichoptera	Polycentropodidae	<i>Plectrocnemia conspersa</i>								6		C
Trichoptera	Polycentropodidae	<i>Polycentropus kingi</i>							1			C
Arachnida	Hydrachnidae	sp. indet.					6		1		1	C
Coleoptera	Dytiscidae	<i>Graptodytes pictus</i>				4						C
Coleoptera	Dytiscidae	<i>Nebrioporus depressus</i>							2			C
Coleoptera	Dytiscidae	<i>Oreodytes sanmarkii</i>	1		1							C
Coleoptera	Elmidae	<i>Elmis aenea</i>	6		29			25	4			C
Coleoptera	Elmidae	<i>Limnius volckmari</i>	42		3							C
Coleoptera	Gyrinidae	Gyrinidae larva							1			C
Coleoptera	Gyrinidae	<i>Gyrinus substriatus</i>				6					4	C

Group	Family	Species	A1	A3	A4	A5	A6	A7	A8	B1	C1	EPA group
Coleoptera	Haliphiidae	<i>Brychius elevatus</i>	1		8			1				C
Coleoptera	Haliphiidae	<i>Haliphus ruficollis</i> group				3						C
Coleoptera	Notonectidae	<i>Notonecta obliqua</i>								6		C
Crustacea	Gammaridae	<i>Gammarus duebeni</i>	55	11	38			5	4		3	C
Diptera	Chironomidae	Non- <i>Chironomus</i> spp.	21							3	7	C
Diptera	Simuliidae	sp. indet.	3	4	22			6				C
Gastropoda	Lymnaeidae	<i>Lymnaea stagnalis</i>		1		2	12		2		3	C
Gastropoda	Planorbidae	<i>Bathymphalus contortus</i>		1								C
Gastropoda	Planorbidae	<i>Gyraulus albus</i>					1					C
Gastropoda	Planorbidae	<i>Planorbis planorbis</i>	1	15								C
Gastropoda	Tateidae	<i>Potamopyrgus antipodarum</i>			11	1	8	12				C
Hirudinea	Piscicolidae	<i>Piscicola</i> sp.				2						C
Hemiptera	Corixidae	Corixidae nymph							1	2	2	C
Hemiptera	Corixidae	<i>Hesperocorixa castanea</i>								9		C
Hemiptera	Corixidae	<i>Hesperocorixa linnaei</i>							1			C
Hemiptera	Corixidae	<i>Hesperocorixa sahlbergi</i>				12						C
Hemiptera	Gerridae	<i>Gerris</i> sp.				22	18					C
Crustacea	Asellidae	<i>Asellus aquaticus</i>	4			26			1		4	D
Gastropoda	Lymnaeidae	<i>Ampullacaena balthica</i>	1	21		6	1					D
Gastropoda	Physidae	<i>Physa fontinalis</i>							1			D
Megaloptera	Sialidae	<i>Sialis lutaria</i>					1		1		1	D
Diptera	Chironomidae	<i>Chironomus</i> spp.		10					3	1	3	E
Oligochaeta		sp. indet.			5						6	n/a
Abundance			189	71	182	102	51	125	40	55	34	
Q-rating			Q3	Q2-3*	Q3	Q3*	Q3*	Q3	Q3*	Q3	Q2-3	
WFD class			Poor	Poor	Poor	Poor	Poor	Poor	Poor	Poor	Poor	

* tentative Q-rating given poor flows or absence of suitable riffle areas for sampling (Toner et al., 2005)

Table 9.2 Macro-invertebrate communities recorded at lacustrine sites, August 2025

Group	Family	Species	L1	L2	P1	P2
Mollusca	Sphaeriidae	sp. indet.				86
Odonata	Coenagrionidae	sp. indet.	13	33	28	2
Ephemeroptera	Baetidae	<i>Cloeon simile</i>	17	11	21	10
Crustacea	Asellidae	<i>Asellus aquaticus</i>			36	16
Gastropoda	Lymnaeidae	<i>Lymnaea stagnalis</i>			44	1
Diptera	Chironomidae	<i>Chironomus</i> spp.	4		12	21
Trichoptera	Limnephilidae	<i>Halesus radiatus</i>			10	21
Diptera	Chironomidae	Non- <i>Chironomus</i> spp.	12		1	
Hemiptera	Corixidae	Corixidae nymph		11		2
Trichoptera	Phryganeidae	<i>Agrypnia obsoleta</i>			5	6
Crustacea	Ostracoda	sp. indet.				11
Odonata	Aeshnidae	sp. indet.	6		1	
Coleoptera	Gyrinidae	<i>Gyrinus substriatus</i>	7			
Megaloptera	Sialidae	<i>Sialis lutaria</i>			1	5
Crustacea	Crangonyctidae	<i>Crangonyx</i> sp.		6		
Coleoptera	Noteridae	<i>Noterus crassicornis</i>	5			
Diptera	Culicidae	sp. indet.		5		
Coleoptera	Dytiscidae	<i>Graptodytes pictus</i>			4	
Gastropoda	Tateidae	<i>Potamopyrgus antipodarum</i>			4	
Coleoptera	Hydrophilidae	<i>Helophorus brevipalpis</i>	4			
Gastropoda	Lymnaeidae	<i>Ampullacaena balthica</i>	1		2	
Trichoptera	Leptoceridae	<i>Mystacides longicornis</i>				3
Coleoptera	Halpliidae	<i>Haliphus ruficollis</i> group			2	
Crustacea	Gammaridae	<i>Gammarus duebeni</i>			2	
Arachnida	Hydrachnidiae	sp. indet.			1	1
Coleoptera	Dytiscidae	<i>Nebrioporus depressus</i>			1	1
Ephemeroptera	Baetidae	<i>Baetis rhodani</i>	1		1	
Diptera	Tabanidae	sp. indet.	1			1
Ephemeroptera	Caenidae	<i>Caenis luctuosa</i>				2
Trichoptera	Polycentropodidae	<i>Plectrocnemia conspersa</i>		2		
Coleoptera	Dytiscidae	<i>Hyphydrus ovatus</i>			1	
Ephemeroptera	Heptageniidae	<i>Heptagenia sulphurea</i>			1	
Gastropoda	Planorbidae	<i>Gyraulus albus</i>			1	
Hemiptera	Corixidae	<i>Hesperocorixa linnaei</i>			1	
Annelidae	Oligochaeta	sp. indet.				1
Coleoptera	Halpliidae	<i>Haliphus ruficollis</i>	1			
Coleoptera	Halpliidae	<i>Haliphus</i> sp.	1			
Abundance			73	68	180	190
Taxon richness			13	6	22	17



Triturus Environmental Ltd.,
Unit 5 Anchor Business Park,
Little Island,
Co. Cork,
T45 XN59.

Fisheries assessment for the proposed Cush wind farm, Co. Offaly (2025)



Prepared by Triturus Environmental Ltd. for SLR Consulting Ireland

January 2026

Please cite as:

Triturus (2026). Fisheries assessment for the proposed Cush wind farm, Co. Offaly (2025). Report prepared by Triturus Environmental Ltd. for SLR Consulting Ireland. January 2026.

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1. Introduction

1.1 Background

Triturus Environmental Ltd. were commissioned by SLR Consulting Ireland to undertake a baseline fisheries assessment of numerous watercourses in the vicinity of the proposed Cush wind farm development located near Birr, Co. Offaly.

The survey was undertaken to establish baseline fisheries data used in the preparation of the EIAR for the proposed development, inclusive of the proposed internal cable route. In order to gain an accurate overview of the existing and potential fisheries value of the watercourses within the vicinity of the proposed development a catchment-wide electro-fishing survey across 10 no. riverine sites was undertaken (**Table 2.1; Figure 2.1**). A fisheries appraisal of 4 no. lacustrine sites was also undertaken. Electro-fishing helped to identify the importance of the watercourses as nurseries and habitats for salmonids, lamprey (*Lampetra* sp.) and European eel (*Anguilla anguilla*). Other species of lower conservation value were also recorded. The presence and or absence of fish populations and or associated supporting habitat would help inform impact assessment and any subsequent mitigation for the development.

Triturus Environmental Ltd. made an application under Section 14 of the Fisheries (Consolidation) Act, 1959 as substituted by Section 4 of the Fisheries (Amendment) Act, 1962, to undertake a catchment-wide electro-fishing survey in the vicinity of the proposed Cush wind farm. The current surveys were undertaken in August 2025 and would update those previously completed by Triturus in August 2022.

1.2 Fisheries (desktop review)

Previous surveys for the development recorded a low diversity of fish species. The Rapemills River, a tributary of the River Shannon, is known to support brown trout (*Salmo trutta*), lamprey (*Lampetra* sp.), pike (*Esox lucius*), minnow (*Phoxinus phoxinus*), stone loach (*Barbatula barbatula*) and three-spined stickleback (*Gasterosteus aculeatus*) (Triturus 2022 data).

The West Galros Stream, a heavily modified tributary of the Rapemills River, was found to support three-spined stickleback only in the August 2022 survey (Triturus 2022 data). No fish were recorded from the heavily modified Eglish Stream at proposed survey site A2 or the heavily modified Whigsborough Stream at survey site C1 in August 2022 (Triturus data).

2. Methodology

2.1 Fisheries assessment (electro-fishing)

A single anode Smith-Root LR24 backpack (12V DC input; 300V, 100W DC output) was used to electro-fish riverine sites on Thursday 14th, Friday 15th and Saturday 16th August 2025 following notification to Inland Fisheries Ireland and under the conditions of a Department of Climate, Energy and the Environment (DCEE) licence. To collate a more accurate baseline of the proposed receiving watercourses, the electro-fishing survey was undertaken across 10 no. riverine sites (see **Table 2.1**, **Figure 2.1**).

Both river and holding tank water temperature was monitored continually throughout the survey to ensure temperatures of 20°C were not exceeded, thus minimising stress to the captured fish due to low dissolved oxygen levels. A portable battery-powered aerator was also used to further reduce stress to any captured fish contained in the holding tank. Salmonids, European eel and other captured fish species were transferred to a holding container with oxygenated fresh river water following capture. To reduce fish stress levels, anaesthesia was not applied to captured fish. All fish were measured to the nearest millimetre and released in-situ following a suitable recovery period.

As three primary species groups were targeted during the survey, i.e., salmonids, lamprey, and eel, the electro-fishing settings were tailored for each species. By undertaking electro-fishing using the rapid electro-fishing technique (see methodology below), the broad characterisation of the fish community at each sampling reach could be determined as a longer representative length of channel was surveyed. Electro-fishing methodology followed accepted European standards (CEN, 2003) and adhered to best practice (e.g., CFB, 2008).

2.1.1 Salmonids and European eel

For salmonid species and European eel, as well as all other incidental species, electro-fishing was carried out in an upstream direction for a 10-minute CPUE, an increasingly common standard approach for wadable streams (Matson et al., 2018). A total of approximately 30-75m channel length was surveyed at each site, where feasible, in order to gain a better representation of fish stock assemblages.

Relative conductivity of the water at each site was checked in-situ with a conductivity meter and the electro-fishing backpack was energised with the appropriate voltage and frequency to provide enough draw to attract salmonids and European eel to the anode without harm. For the relatively high conductivity waters of the sites a voltage of 200-220v, frequency of 35-40Hz and pulse duration of 3.5-4ms was utilised to draw fish to the anode without causing physical damage.

2.1.2 Lamprey

Electro-fishing for lamprey ammocoetes was conducted using targeted quadrat-based electro-fishing (as per Harvey & Cowx, 2003) in objectively suitable areas of sand/silt, where encountered. As lamprey take longer to emerge from silts and require a more persistent approach, they were targeted at a lower frequency (30Hz) burst DC pulse setting which also allowed detection of European eel in sediment, if present. Settings for lamprey followed those recommended and used by Harvey & Cowx

(2003), APEM (2004) and Niven & McAuley (2013). Using this approach, the anode was placed under the water's surface, approximately 10-15cm above the sediment, to prevent immobilising lamprey ammocoetes within the sediment. The anode was energised with 100V of pulsed DC for 15-20 seconds and then turned off for approximately five seconds to allow ammocoetes to emerge from their burrows. The anode was switched on and off in this way for approximately two minutes. Immobilised ammocoetes were collected by a second operator using a fine-mesh hand net as they emerged.

Lamprey species were identified to species level, where possible, with the assistance of a hand lens, through external pigmentation patterns and trunk myomere counts as described by Potter & Osborne (1975) and Gardiner (2003).

2.2 Fisheries habitat

A fisheries habitat appraisal of 14 no. riverine and lacustrine sites was undertaken to establish their importance for salmonid, lamprey, European eel and other fish species. The appraisals of salmonids and lamprey were cognisant of species-specific habitat requirements and preferences as outlined in O'Grady (2006), Hendry et al. (2003), Armstrong et al. (2003), Harvey & Cowx (2003), Maitland (2003) and Hendry & Cragg-Hine (1997). River habitat surveys and fisheries assessments were also carried out utilising elements of the approaches in the River Habitat Survey Methodology (EA, 2003) and Fishery Assessment Methodology (O'Grady, 2006) to broadly characterise the riverine sites (i.e. channel profile, substrata etc.).

2.3 Biosecurity

A strict biosecurity protocol following IFI (2010) and the Check-Clean-Dry approach was adhered to during surveys for all equipment and PPE used. Disinfection of all equipment and PPE before and after use with Virkon™ was conducted to prevent the transfer of pathogens or invasive propagules between survey sites. Surveys were undertaken at sites in a downstream order to minimise the risk of upstream propagule mobilisation. Particular cognisance was given towards preventing the spread or introduction of highly virulent crayfish plague (*Aphanomyces astaci*). Any aquatic invasive species or pathogens recorded within or adjoining the survey areas were geo-referenced. All Triturus staff are certified in 'Good fieldwork practice: slowing the spread of invasive non-native species' by the University of Leeds.

Table 2.1 Location of 14 no. electro-fishing & fisheries appraisal survey sites in the vicinity of the proposed Cush wind farm, Co. Offaly

Site no.	Watercourse	EPA code	Location	X (ITM)	Y (ITM)
A1	Rapemills River	25R01	Eglish	608544	709345
A2	Eglish Stream	25E18	Eglish	608194	709857
A3	Eglish Stream	25E18	Eglish	607766	709311
A4	Rapemills River	25R01	Boolinarig Bridge	607478	709372
A5	West Galros Stream	25W44	Eglish	608084	710542
A6	West Galros Stream	25W44	N62 road crossing	607627	710485
A7	Rapemills River	25R01	R439 road crossing	604773	710211
A8	Rapemills River	25R01	Lusmagh Bridge	600128	714644
B1	Drainage channel	n/a	Clooneen	607887	712615
C1	Whigsborough Stream	25W43	Clooneen	608671	712865
L1*	Lake/wetland	n/a	Eglish	608291	710532
L2*	Lake/wetland	n/a	Clooneen	607832	713182
P1*	Pond	n/a	Galros East	607783	710585
P2*	Pond	n/a	Galros East	607982	710624

* fisheries appraisal only

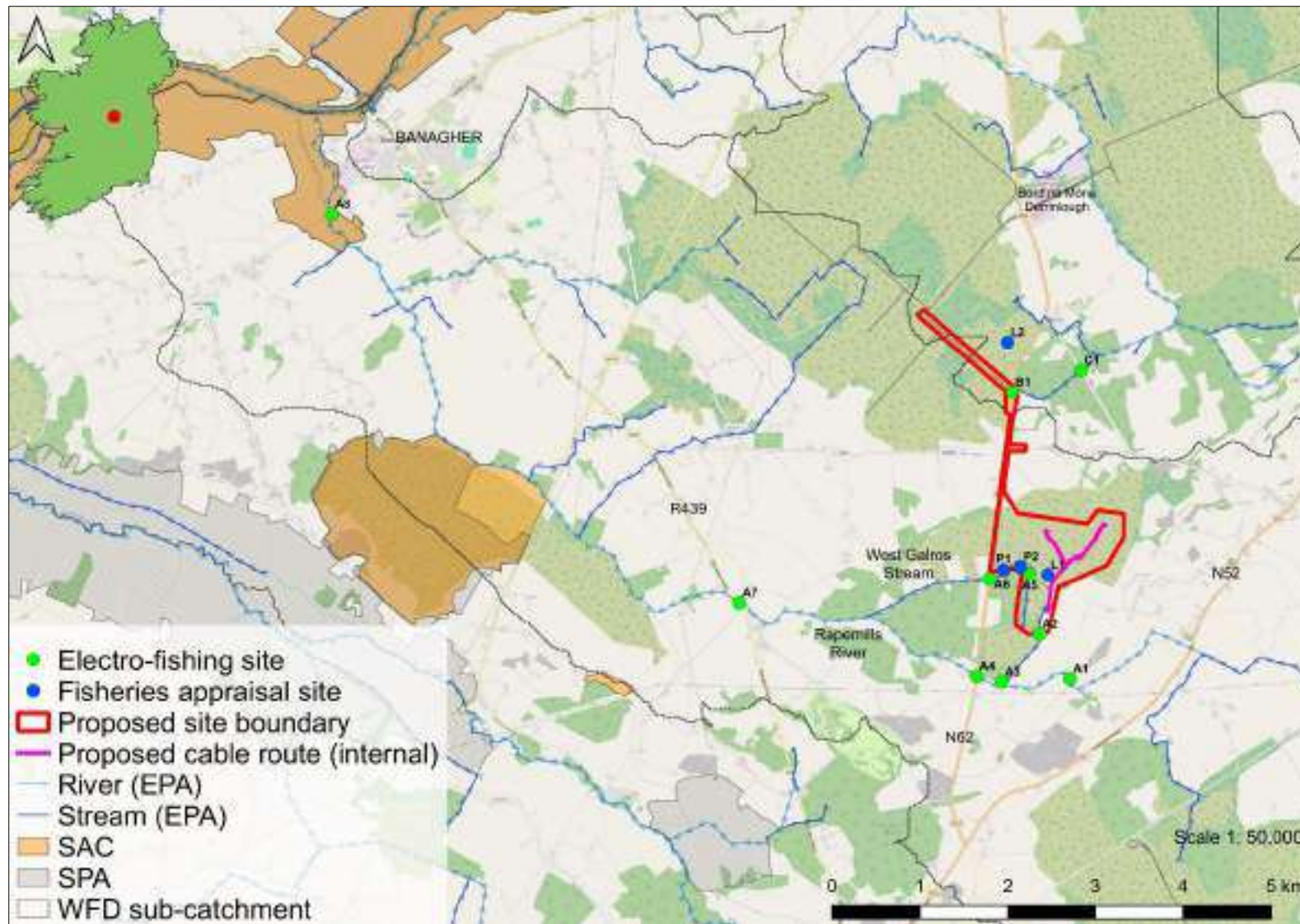


Figure 2.1 Overview of the electro-fishing & fisheries appraisal survey site locations, August 2025

3. Results

A catchment-wide fisheries survey of 10 no. riverine and 4 no. lacustrine sites in the vicinity of the proposed Cush wind farm was conducted on Thursday 14th, Friday 15th and Saturday 16th August 2025 following notification to Inland Fisheries Ireland. The results of the survey are discussed below in terms of fish population structure, population size and the suitability and value of the surveyed areas as nursery and spawning habitat for salmonids, European eel and lamprey species. Scientific names are provided at first mention only.

3.1 Fisheries assessment & appraisal

3.1.1 Site A1 – Rapemills River, Eglish

Brown trout (*Salmo trutta*) ($n=16$), lamprey (*Lampetra* sp.) ($n=14$) and three-spined stickleback (*Gasterosteus aculeatus*) ($n=6$) were recorded via electro-fishing at site A1 on the Rapemills River (EPA code: 25R01) at quarry access bridge upstream of the proposed development (i.e. an upstream control site). (**Figure 3.1**).

The site was of good value for salmonids although primarily suited adults rather than juveniles given the predominance of deep pool, glide and bank scours/undercuts with high vegetation cover. Nonetheless, a mixed cohort trout population was present. Spawning habitat was widespread for both salmonids and lamprey. Organic rich soft sediment accumulations were frequent throughout but *Lampetra* sp. ammocoetes were highly localised, with most being confined to accumulations under the bridge (as per 2022 survey). Despite good suitability for European eel none were recorded.

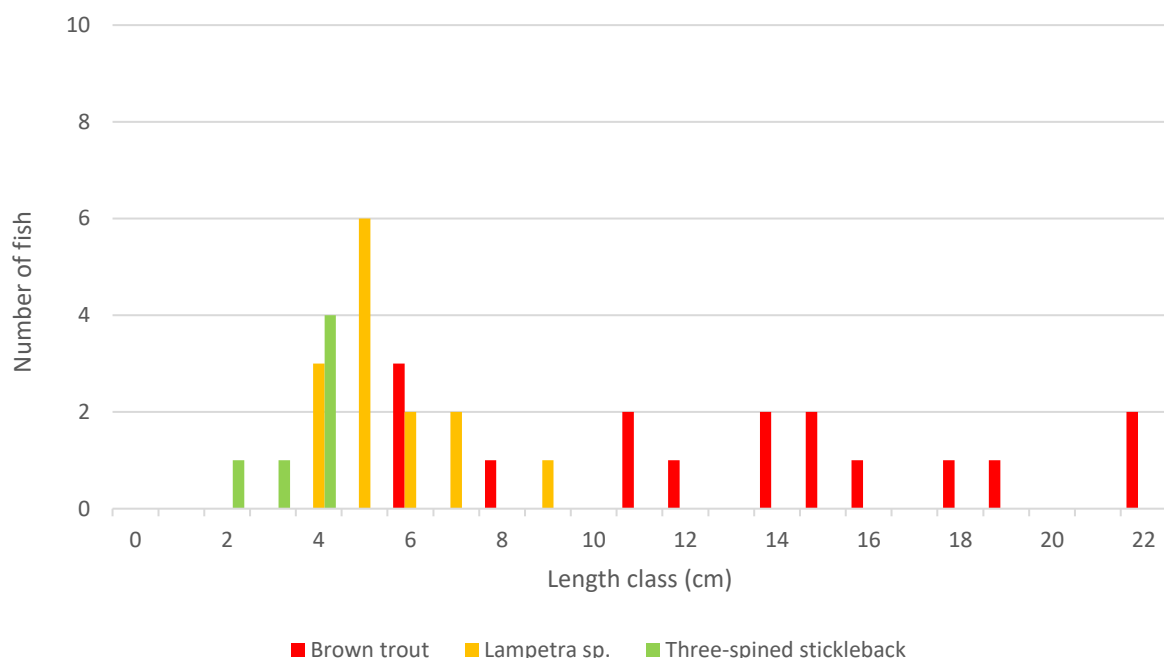


Figure 3.1 Length frequency distribution recorded via electro-fishing at site A1, August 2025



Plate 3.1 Mixed cohort brown trout recorded at site A1 on the Rapemills River upstream of the proposed development, August 2025



Plate 3.2 *Lampetra* sp. ammocoetes recorded at site A1 on the Rapemills River, August 2025

3.1.2 Site A2 – Eglis Stream, Eglis

Site A2 on the upper reaches of the Eglis Stream (25E18) was not of fisheries value given its dry, ephemeral nature and absence of aquatic habitats at the time of survey. The stream was also dry at this location during the previous August 2022 survey.



Plate 3.3 Representative image of site A2 on the Eglish Stream, August 2025 (dry, ephemeral channel)

3.1.3 Site A3 – Eglish Stream, Eglish

No fish were recorded via electro-fishing at site A3 on the lower reaches of the Eglish Stream (25E18). With the exception of low suitability for ubiquitous species such as three-spined stickleback (not recorded), the stream was not of fisheries value given its heavily modified, silted and shallow nature with an absence of flows.



Plate 3.4 Representative image of site A3 on the lower reaches of the Eglish Stream, August 2025

3.1.4 Site A4 – Rapemills River, Boolinarig Bridge

Brown trout ($n=15$) and lamprey (*Lampetra* sp.) ($n=7$) were the only fish species recorded via electro-fishing at site A4 on the Rapemills River (25R01) at Boolinarig Bridge (N62 road crossing) (**Figure 3.2**).

The site was of good value for salmonids despite evident siltation and hydromorphological pressures, with a mixed cohort population present (as per 2022). Spawning habitat for salmonids and lamprey was limited given the general paucity of gravels/cobbles in addition to natural bed calcification (colmation). Nursery habitat was also limited due to the highly localised nature of riffle and faster flowing glide areas. Deep pool and glide with bank scours and occasional macrophyte stands were of value as holding areas for adult salmonids. Abundant soft sediment deposits supported only a low density (3.5 per m²) of *Lampetra* sp. ammocoetes. Despite good suitability for European eel, none were recorded, primarily reflecting downstream barriers in the Shannon catchment – however, the species was detected via eDNA sampling, indicating their presence at and or upstream of the sampling location (**Appendix B**).

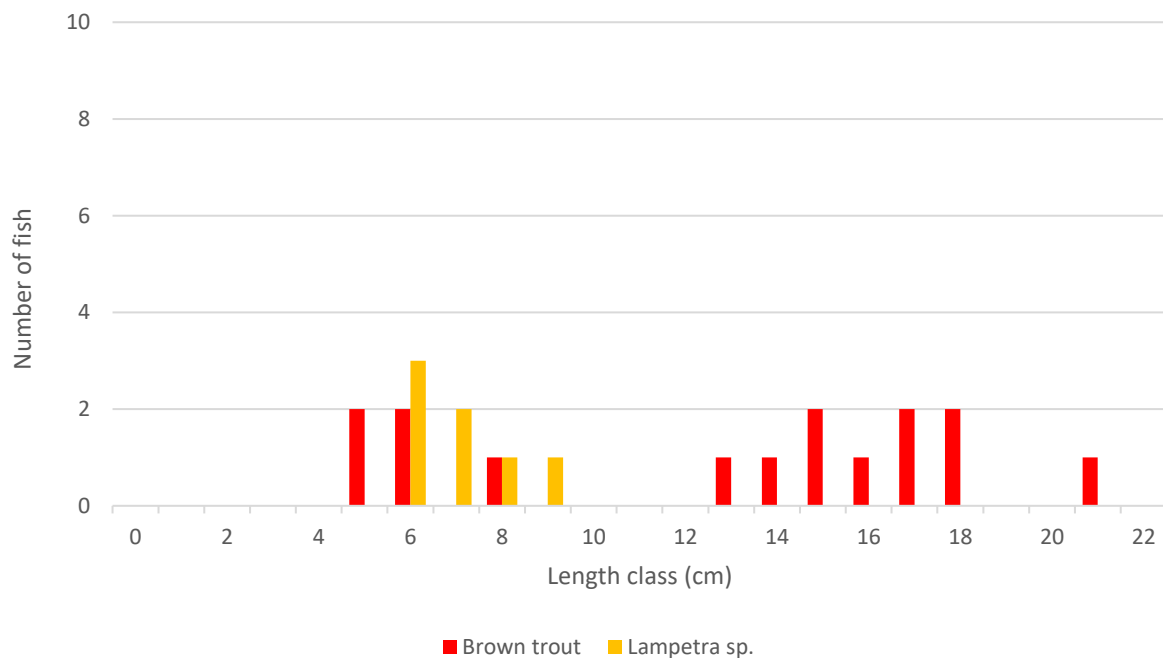


Figure 3.2 Length frequency distribution recorded via electro-fishing at site A4, August 2025



Plate 3.5 Mixed cohort brown trout recorded at site A4 on the Rapemills River at Boolinarig Bridge, August 2025

3.1.5 Site A5 – West Galros Stream, Eglish

Electro-fishing was not undertaken at site B5 on the upper reaches of the West Galros Stream (25W44) given prohibitive depths of >1.5m and a deep silt base. With the exception of three-spined stickleback (recorded in sweep samples), site A5 was of poor fisheries value given poor hydromorphology, low flows and poor fluvial connectivity. However, there was some suitability for European eel (eDNA detected downstream at site A6).



Plate 3.6 Representative image of site A5 on the West Galros Stream, August 2025

3.1.6 Site A6 – West Galros Stream, N62 road crossing

Electro-fishing was not undertaken at site A6 on the West Galros Stream (25W44) at the N62 road crossing given prohibitive depths of >1.5-2m. With the exception of three-spined stickleback (recorded via sweep sampling), site A6 was of poor fisheries value given poor hydromorphology, low/absent flows and heavy siltation. However, whilst salmonid spawning and nursery habitat was absent, the site had some low value as a holding habitat for adult trout given the high average depth. Argillaceous sediment deposits were unsuitable for lamprey ammocoete burial (no lamprey eDNA detected). Suitability for European eel was high and indeed the species was detected via eDNA sampling (**Table 4.1**).



Plate 3.7 Representative image of site A6 on the West Galros Stream, August 2025

3.1.7 Site A7 – Rapemills River, R439 road crossing

Brown trout ($n=28$) was the only species recorded via electro-fishing at site A7 on the Rapemills River (25R01) at the R439 road c.3km downstream of site A4 (**Figure 3.3**).

The site was of high value for salmonids, supporting a moderate density of mixed-cohort brown trout. Whilst bed calcification reduced the spawning capacity of the site (colmation of gravels), some limited spawning habitat for both salmonids and lamprey was present in pool tailings. Abundant bryophyte rich boulder and cobble provided some good quality salmonid nursery refugia with frequent small shaded pools of value as holding areas for adults. Lamprey ammocoete habitat was absent. Despite some good suitability for European eel, none were recorded, with bed calcification reducing the availability of instream refugia.

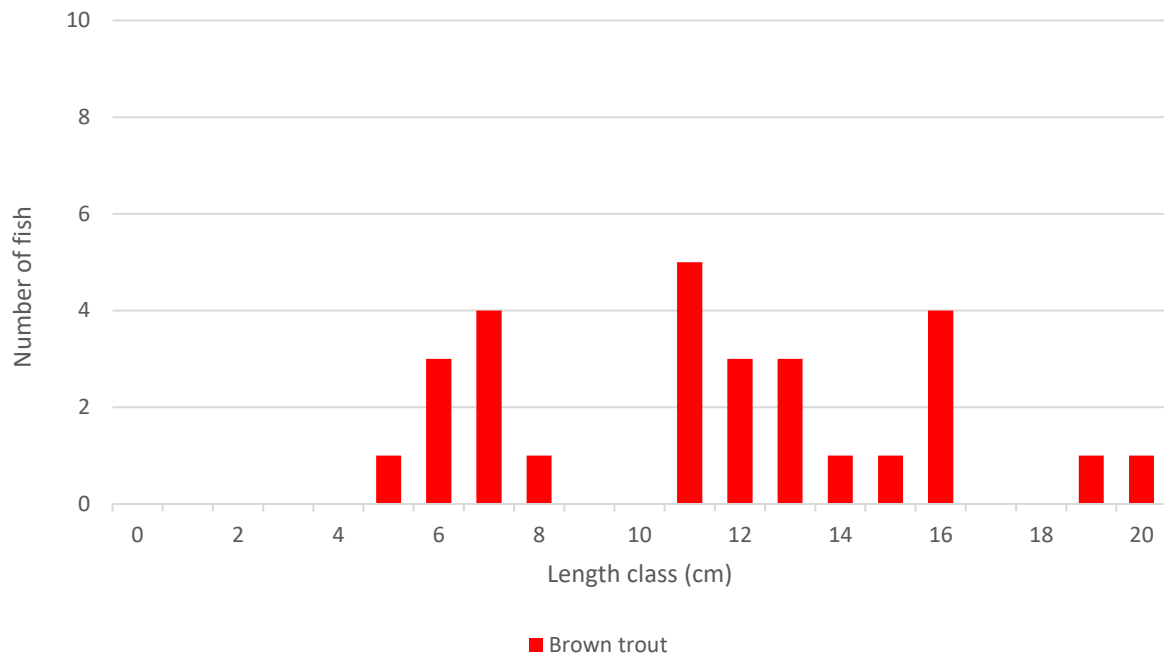


Figure 3.3 Length frequency distribution recorded via electro-fishing at site A7, August 2025



Plate 3.8 Brown trout recorded at site A7 on the Rapemills River, August 2025

3.1.8 Site A8 – Rapemills River, Lusmagh Bridge

minnow (*Phoxinus phoxinus*) ($n=35$), three-spined stickleback ($n=11$), gudgeon (*Gobio gobio*) ($n=10$), stone loach ($n=6$), brown trout ($n=2$) and pike (*Esox lucius*) ($n=1$) were recorded via electro-fishing at site A8 on the lower reaches of the Rapemills River (25R01) at Lusmagh Bridge (**Figure 3.4**).

A short section near the bridge was shallow enough to undertake backpack electro-fishing (too deep elsewhere). The site was of relatively poor value for salmonids given a paucity of suitable spawning and nursery habitat although deep glide and pool were valuable holding areas for adult salmonids (albeit none recorded). These areas were also of high value for a range of coarse fish species. Soft sediment accumulations did not support lamprey ammocoetes and the site was not of value for spawning lamprey given siltation pressures. Despite some good physical suitability, no European eel were recorded. However, European eel, Atlantic salmon and *Lampetra* sp. were detected via eDNA sampling, indicating their presence at and or upstream of the sampling location (**Appendix B**).

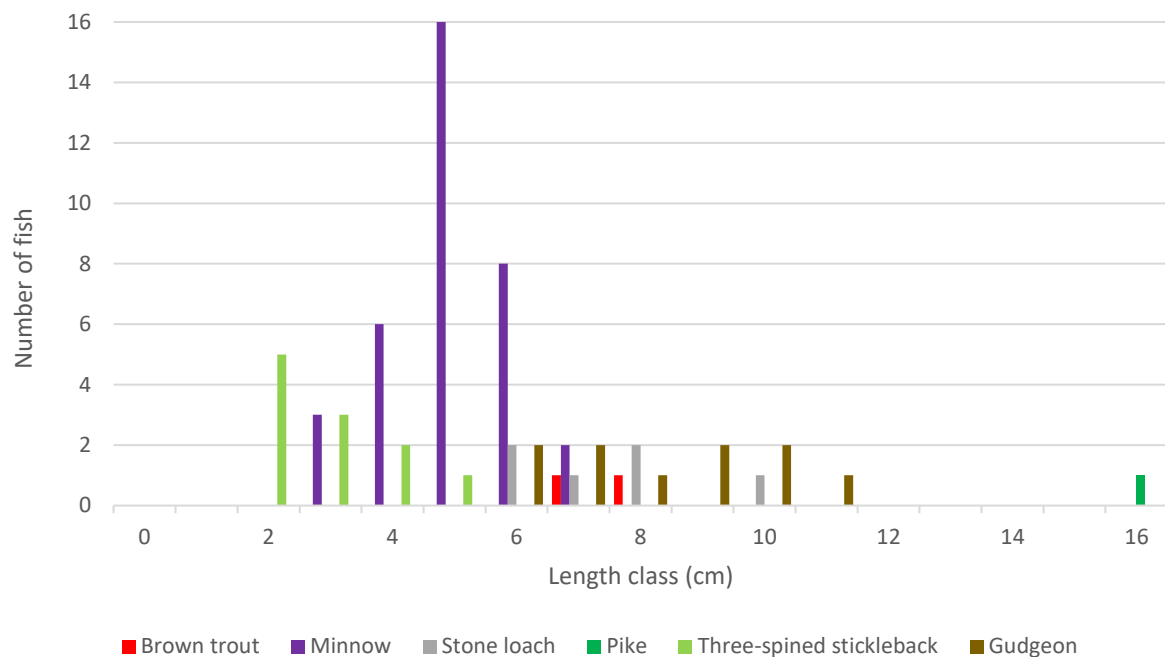


Figure 3.4 Length frequency distribution recorded via electro-fishing at site A8, August 2025



Plate 3.9 Juvenile pike recorded at site A8 on the Rapemills River at Lusmagh Bridge, August 2025



Plate 3.10 Gudgeon recorded at site A8 on the Rapemills River at Lusmagh Bridge, August 2025

3.1.9 Site B1 – Drainage channel, Clooneen

No fish were recorded via electro-fishing at site B1 on a drainage channel perpendicular to a dry roadside drain within the proposed site boundary. The intermittent drainage channel was unsuitable for fish given its shallow heavily silted nature and isolation from other habitats.



Plate 3.11 Representative image of site B1 on an impounded peat drainage channel, August 2025

3.1.10 Site C1 – Whigsborough Stream, Clooneen

No fish were recorded via electro-fishing at site C1 on the Whigsborough Stream (25W43) at a local road crossing downstream (east) of the proposed site boundary. The site was not of fisheries value given gross siltation, poor hydromorphology and absent flows, in addition to poor connectivity with downstream habitats (frequent peat blockages instream).



Plate 3.12 Representative image of site C1 on the Whigsborough Stream, August 2025

3.1.11 Site L1 – Lake/wetland, Eglish

Site L1 was located at a small wetland within the proposed site boundary. Electro-fishing was not undertaken at site L1 given the lacustrine conditions and deep silt bed. The wetland was of poor fisheries value given very shallow depths, siltation and isolation from other habitats.



Plate 3.13 Representative image of site L1, August 2025

3.1.12 Site L2 – Lake/wetland, Clooneen

Site L2 was located at a large 20ha lake/wetland complex adjacent to Derrinlough wind farm and the proposed site boundary. Electro-fishing was not undertaken at site L2 given the lacustrine conditions and deep silt bed. The wetland was of some fisheries value despite its generally shallow depths, siltation and isolation from other habitats. Three-spined stickleback were visibly plentiful and recorded in sweep samples.



Plate 3.14 Three-spined stickleback recorded via sweep netting at site L2, August 2025



Plate 3.15 Representative image of site L2, August 2025

3.1.13 Site P1 – Pond, Galros East

Site P1 was located at a former peat settlement pond of 0.2ha adjacent to the West Galros Stream. Electro-fishing was not undertaken at site P1 given the deep lacustrine conditions. However, three-spined stickleback were recorded via sweep sampling and were present in high numbers. The alkaline pond was of good suitability for European eel and had some suitability for brown trout although the absence of suitable spawning habitat likely precluded the species.



Plate 3.16 Three-spined stickleback were abundant in sweep samples taken at site P1, August 2025



Plate 3.17 Representative image of site P1, August 2025

3.1.14 Site P2 – Pond, Galros East

Site P2 was located at a former peat settlement pond of 0.3ha adjacent to site P1 and the West Galros Stream. Electro-fishing was not undertaken at site P2 given the deep lacustrine conditions. However, three-spined stickleback were recorded via sweep sampling and were present in moderate numbers. The alkaline pond was of good suitability for European eel and had some suitability for brown trout although the absence of suitable spawning habitat likely precluded the species.



Plate 3.18 Representative image of site P2, August 2025

Table 3.1 Fish species densities per m² recorded at sites in the vicinity of the proposed development via electro-fishing in August 2025 (values in **bold** represent the highest densities recorded for each species, respectively)

Site	Watercourse	CPUE (elapsed time)	Approx. area fished (m ²)	Fish density per m ²						
				Brown trout	<i>Lampetra</i> sp.	Minnow	Stone loach	Gudgeon	Pike	Three-spined stickleback
A1	Rapemills River	10	200	0.080	3.5 per m²	0.000	0.000	0.000	0.000	0.030
A2	Eglish Stream	n/a	Dry channel	n/a	n/a	n/a	n/a	n/a	n/a	n/a
A3	Eglish Stream	5	105	0.000	0.000	0.000	0.000	0.000	0.000	0.000
A4	Rapemills River	10	280	0.054	2.3 per m ²	0.000	0.000	0.000	0.000	0.000
A5	West Galros Stream	n/a	Fisheries appraisal only	n/a	n/a	n/a	n/a	n/a	n/a	n/a
A6	West Galros Stream	n/a	Fisheries appraisal only	n/a	n/a	n/a	n/a	n/a	n/a	n/a
A7	Rapemills River	10	250	0.112	0.000	0.000	0.000	0.000	0.000	0.000
A8	Rapemills River	10	225	0.009	0.000	0.156	0.027	0.044	0.004	0.049
B1	Drainage channel	5	90	0.000	0.000	0.000	0.000	0.000	0.000	0.000
C1	Whigsborough Stream	5	50	0.000	0.000	0.000	0.000	0.000	0.000	0.000
L1	Lake/wetland	n/a	Fisheries appraisal only	n/a	n/a	n/a	n/a	n/a	n/a	n/a
L2	Lake/wetland	n/a	Fisheries appraisal only	n/a	n/a	n/a	n/a	n/a	n/a	n/a
P1	Pond	n/a	Fisheries appraisal only	n/a	n/a	n/a	n/a	n/a	n/a	n/a
P2	Pond	n/a	Fisheries appraisal only	n/a	n/a	n/a	n/a	n/a	n/a	n/a

Table 3.2 Relative abundance of fish species of higher conservation value recorded via **electro-fishing** in the vicinity of the proposed development, August 2025

Site	Watercourse	Atlantic salmon	Brown trout	<i>Lampetra</i> sp.	European eel	Other species
A1	Rapemills River		Medium	Low		Three-spined stickleback
A2	Eglish Stream	No fish recorded – dry, ephemeral channel				
A3	Eglish Stream	No fish recorded				
A4	Rapemills River	Negative eDNA	Medium	Low	Positive eDNA	
A5	West Galros Stream	Fisheries appraisal only				
A6	West Galros Stream	Fisheries appraisal only – negative brown trout, <i>Lampetra</i> sp. eDNA but positive European eel eDNA				
A7	Rapemills River		High			
A8	Rapemills River	Positive eDNA	Low	Positive eDNA	Positive eDNA	Minnow, stone loach, pike, three-spined stickleback, gudgeon
B1	Drainage channel	No fish recorded				
C1	Whigsborough Stream	No fish recorded				
L1	Lake/wetland	Fisheries appraisal only				
L2	Lake/wetland	Fisheries appraisal only – three-spined stickleback recorded during sweep sampling				
P1	Pond	Fisheries appraisal only – three-spined stickleback recorded during sweep sampling				
P2	Pond	Fisheries appraisal only – three-spined stickleback recorded during sweep sampling				

Table 3.3 Comparison of fish recorded via electro-fishing in 2022 and 2025 at sites in vicinity of the proposed Cush wind farm

Site no.	Watercourse	EPA code	Fish species recorded	
			August 2022	August 2025
A1	Rapemills River	25R01	Brown trout, <i>Lampetra</i> sp., three-spined stickleback	Brown trout, <i>Lampetra</i> sp., three-spined stickleback
A2	Eglish Stream	25E18	No fish recorded – dry channel	No fish recorded – dry channel
A3	Eglish Stream	25E18	Not surveyed	No fish recorded
A4	Rapemills River	25R01	Brown trout, <i>Lampetra</i> sp.	Brown trout, <i>Lampetra</i> sp.; European eel (eDNA only)
A5	West Galros Stream	25W44	Fisheries appraisal only	Fisheries appraisal only
A6	West Galros Stream	25W44	Fisheries appraisal only	Fisheries appraisal only
A7	Rapemills River	25R01	Brown trout	Brown trout
A8	Rapemills River	25R01	Brown trout, European eel, pike, minnow, stone loach, three-spined stickleback	Brown trout, minnow, stone loach, pike, three-spined stickleback, gudgeon; Atlantic salmon, <i>Lampetra</i> sp. & European eel (eDNA only)
B1	Drainage channel	n/a	Not surveyed	No fish recorded
C1	Whigsborough Stream	25W43	No fish recorded	No fish recorded
L1	Lake/wetland	n/a	Not surveyed	Fisheries appraisal only
L2	Lake/wetland	n/a	Not surveyed	Fisheries appraisal only – three-spined stickleback recorded
P1	Pond	n/a	Not surveyed	Fisheries appraisal only – three-spined stickleback recorded
P2	Pond	n/a	Not surveyed	Fisheries appraisal only – three-spined stickleback recorded

4. Discussion

The surveyed watercourses in the vicinity of the proposed Cush wind farm development were typically small lowland channels draining areas of peatland that had been extensively straightened and deepened historically. In addition to hydromorphological impacts, siltation, eutrophication and low summer flows had significantly impacted fisheries habitat. Historical straightening and deepening of watercourses damages habitat and hydromorphological heterogeneity, encourages sediment deposition and invariably results in an irreparable reduction in fisheries potential, particularly for salmonids and lamprey (O’Grady et al., 2017; Blann et al., 2009; O’Grady, 2006) but also European eel. Four of the riverine sites did not support resident fish at the time of survey, with a further 6 no. sites unsuitable for electro-fishing (fisheries appraisals undertaken).

Nevertheless, several fish species of high conservation value were recorded. A typical diversity of fish species for the surveyed sub-catchments were recorded via electro-fishing during the current survey, with brown trout, lamprey (*Lampetra* sp.), gudgeon, minnow, stone loach, pike and three-spined stickleback captured in August 2025 (**Table 3.1, 3.2**). Atlantic salmon and European eel were detected through eDNA sampling only (**Appendix B**). With the exception of Atlantic salmon (detected via eDNA sampling at site A8 on the Rapemills River), the same species assemblage was recorded during the previous survey in August 2022 (**Table 3.3**). Fish abundances and distributions were also broadly similar to 2022.

Salmonids were restricted in the survey area, primarily given poor habitat suitability. Brown trout were recorded throughout the Rapemills River at sites A1, A4, A7 and A8, with site A7 offering particularly valuable spawning and nursery habitat. Much of the river had been heavily modified and suffered from considerable siltation pressures, reducing the quality of salmonid habitat. Bed calcification (colmation) in this alkaline river further limited the availability of salmonid spawning habitat but it was still the most valuable salmonid watercourse in the survey area. Salmonid suitability elsewhere was low, although brown trout eDNA was detected in the West Galros Stream (site A6). Notably, Atlantic salmon was detected at site A8 on the Rapemills River (Lusmagh Bridge), indicating their presence at or (likely) upstream of the sampling point. Given significant downstream barriers in the Shannon catchment (e.g. Ardnacrusha hydro-electric dam)¹ the occurrence of salmon this far up the Shannon catchment is very limited and highly sporadic.

Lamprey (*Lampetra* sp.) also occupied a limited distribution in the survey area, with organic rich soft sediment accumulations at sites A1 and A4 on the Rapemills River supporting low densities of ammocoetes, respectively (3.5 & 2.3 per m²). These sites were also found to support low numbers of ammocoetes during the previous 2022 survey (Triturus, 2022). Environmental DNA sampling also detected *Lampetra* sp. at site A8 in the lower reaches and the species is likely distributed throughout the watercourse. Nevertheless, the quality of lamprey habitat was generally poor across the survey area. Owing to their relatively small morphologies, *Lampetra* species such as brook lamprey require clean, fine gravels in which to dig their redds (Dawson et al., 2015; Rooney et al., 2013; Lasne et al., 2010) although areas may also include fractions of sand, larger gravels, and cobble (Kelly & King, 2011; Nika & Virbickas, 2010). Spawning habitat in the vicinity of the proposed development was sparse and

¹ Due to downstream migration barriers (such as hydroelectric dams and weirs), Atlantic salmon distribution is highly restricted in the upper Shannon catchment and the river is only achieving 5% of its conservation limit above Parteen weir in recent years (e.g. TEGOS, 2025a)

of poor quality due to significant siltation, bed calcification and hydromorphological pressures (as outlined above for salmonids). Furthermore, lamprey ammocoetes require the deposition of fine, organic-rich sediment $\geq 5\text{cm}$ in depth in which to burrow and mature (Aronsoo & Virkkala, 2014; Goodwin et al., 2008; Gardiner, 2003) – many accumulations observed were either dominated by peat or argillaceous particles, both of which are sub-optimal for larval burial.

European eel are ‘critically endangered’ in Ireland (King et al., 2011) and on a global scale (Pike et al., 2020). Despite habitat suitability across much of the survey area, no European eel were recorded in the electro-fishing survey. As with salmonids, European eel habitat is also degraded by river drainage by virtue of a reduction or removal of instream refugia required by the species (Laffaille et al., 2003) and more optimal, heterogeneous areas of channel (e.g. boulder zones) were highly localised in vicinity of the proposed development. As eel occurrence decreases significantly with increasing distance from the sea (Harwood et al., 2022; Degerman et al., 2019), the paucity of eel observed can be further explained by the large distances between the survey area and marine habitats (Matondo et al., 2021; Chadwick et al., 2007) in addition to significant instream barriers in the Shannon catchment. Nevertheless, European eel were detected through eDNA sampling on the Rapemills River (sites A4, A8) and the West Galros Stream (A6) in August 2025 signifying there is at least a low number of eels within the survey area. This is supported by the capture of low numbers of eel (electro-fishing) from the Rapemills River at Lusmagh Bridge in August 2022 (Triturus, 2022).

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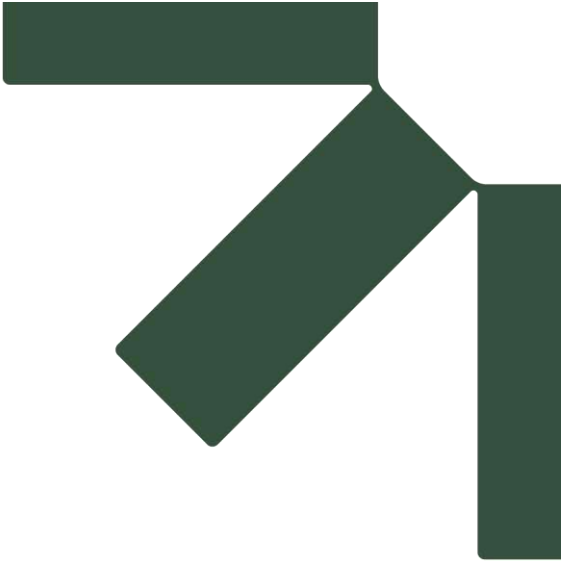
Triturus Environmental Ltd.,

Unit 5 Anchor Business Park,

Little Island,

Co. Cork,

T45 XN59.



Appendix H Baseline Bat Survey Report

Appropriate Assessment Screening Report and Natura Impact Statement

Cush Wind Farm Phase II

Cush Wind Limited

SLR Project No.: 501.065723.00001

23 October 2026





Baseline Bat Survey Report

Cush Wind Farm Phase II

Cush Wind Limited

Galros West Co. Offaly

Prepared by:

SLR Environmental Consulting (Ireland) Ltd

Suite 212, Acorn Business Centre, Blackrock, Cork,
T12 K7CV

SLR Project No.: 501.065723.00001

21 October 2026

Revision: 1

Revision Record

Revision	Date	Prepared By	Checked By	Authorised By
1	21 October 2026	Sinead Clifford	Andrew Torsney	Andrew Torsney
	Click to enter a date.			
	Click to enter a date.			
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	Click to enter a date.			

Basis of Report

This document has been prepared by SLR Environmental Consulting (Ireland) Ltd (SLR) with reasonable skill, care and diligence, and taking account of the timescales and resources devoted to it by agreement with Cush Wind Limited (the Client) as part or all of the services it has been appointed by the Client to carry out. It is subject to the terms and conditions of that appointment.

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Executive Summary

SLR Environmental Consulting (Ireland) Ltd was commissioned by Cush Wind Limited to undertake a baseline bat survey to inform the Environmental Impact Assessment Report (EIAR) for the proposed Cush Wind Farm Phase II in County Offaly. The survey programme comprised a desk study, habitat and roost suitability assessment, and seasonal static bat detector surveys undertaken between spring and autumn 2025. Three automated full-spectrum bat detectors were deployed at the proposed turbine locations to quantify bat activity and species composition across the site. Existing records from the National Biodiversity Data Centre (NBDC), Bat Conservation Ireland (BCI), designated site databases and published distribution datasets were also reviewed.

The purpose of the surveys was to establish a robust baseline of bat populations and their use of the site, identify any roosting, commuting or foraging habitats that may be affected by the proposed development, and assess the relative level of bat activity within the project area. The results will be used to inform the ecological impact assessment, refine project design where necessary, and support the development of appropriate mitigation measures for bats in accordance with Irish and European wildlife legislation and current industry guidance.

Eight bat species were recorded during the surveys: common pipistrelle, soprano pipistrelle, Nathusius' pipistrelle, Leisler's bat, brown long-eared bat, Daubenton's bat, Natterer's bat and whiskered bat. Common pipistrelle was the most frequently recorded species, followed by Leisler's bat and soprano pipistrelle. Activity levels were highest during the spring survey period and lowest during summer.

No buildings, structures or significant tree roosts were identified within the turbine study area, and no evidence of bat roosts was recorded during field surveys. The wider site is dominated by open PB4 cut bog habitat with limited ecological connectivity and relatively few features likely to support regular commuting or concentrated foraging by bats. A single tree with limited roosting potential was recorded adjacent to the proposed underground electricity line route.

The species considered to be at greatest risk of collision with wind turbines in Ireland, namely common pipistrelle, soprano pipistrelle, Nathusius' pipistrelle and Leisler's bat, were all recorded.

The proposed development is located within a landscape that generally offers limited habitat suitability for bats, with low levels of connectivity and an absence of important roosting features within the turbine area. However, surveys confirmed regular use of the site by several bat species, including all four species considered to be at higher risk of turbine collision.

Based on the NatureScot assessment framework, the project is considered to represent a medium-risk site for bats, reflecting the combination of a medium-sized wind farm development and moderate habitat risk. Although overall bat activity is concentrated in a small number of locations and periods, the presence of high collision-risk species means that bats must be considered carefully during the impact assessment process. Appropriate mitigation and operational measures will therefore be required to ensure that potential effects on bats are avoided, reduced or managed in accordance with best practice and relevant legislation.

Overall, the surveys indicate that the site supports a typical assemblage of Irish bat species, with no significant roost resource identified within the turbine development area, but with sufficient activity by high-risk species to warrant further consideration during the EIAR and mitigation design process.



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Appendix B Criteria for Assessing Habitat Risk for Bats

B.1 Criteria for Assessing Habitat Risk for Bats

Appendix C Collision Risk, Relative Abundance and Overall Population Vulnerability of Bat Species in Ireland

C.1 Population Vulnerability of Irish Bat Species

Appendix D Confidential Appendix: Confidential Roost Data

Appendix E Confidential Appendix: Bat Conservation Ireland Data

Appendix F Ecobat Reports

Appendix G Weather Data



Acronyms and Abbreviations

BCI	Bat Conservation Ireland
BCT	Bat Conservation Trust
CIEEM	Chartered Institute of Ecology and Environmental Management
CSZ	Core Sustenance Zone
EIA	Environmental Impact Assessment
EIAR	Environmental Impact Assessment Report
EPA	Environmental Protection Agency
EU	European Union
UGL	Underground Electricity Line
ITM	Irish Transverse Mercator
NBDC	National Biodiversity Data Centre
NHA	Natural Heritage Area
NPWS	National Parks and Wildlife Service
NS	NatureScot
OD	Ordnance Datum
pNHA	proposed Natural Heritage Area
PRF	Potential Roost Feature
PRF-I	Potential Roost Feature suitable for individual bats only
PRF-M	Potential Roost Feature suitable for multiple bats and potentially a maternity roost
QI	Qualifying Interest
SAC	Special Area of Conservation
SLR	SLR Environmental Consulting (Ireland) Ltd
SM4-FS	Wildlife Acoustics Song Meter 4 Full Spectrum Bat Detector
THR	Turbine Haul Route
T9, T10, T11	Turbine/Detector Locations 9, 10 and 11



1.0 Introduction

1.1 Background

SLR Consulting Ireland Ltd (hereafter 'SLR') was commissioned by Cush Wind Limited in July 2024 to undertake baseline bat surveys necessary to inform the Environmental Impact Assessment (EIA) for the proposed Cush Wind Farm Phase II (hereafter 'the project'). The project will be situated in west County Offaly, ca. 4km north of Birr and ca. 28km west of Tullamore (hereafter "the project site"). This baseline report provides the results of surveys for bats, carried out between May to September 2025.

1.2 Project Overview

The project assessed within this EIAR comprises a 3 no. wind turbine extension to the permitted Cush Wind Farm Phase I¹, together with all associated and ancillary infrastructure and works.

The proposed turbines will be selected from within the turbine dimension range assessed in the EIAR, comprising:

- an overall tip height of 199.1m to 200m;
- a hub height of 111.6m to 120.9m; and
- a rotor diameter of 158m to 175m.

The project also includes turbine foundations and crane hardstanding areas; new and upgraded access tracks; internal underground electrical and communications cabling; site drainage and rehabilitation works; peat and spoil management measures; a proposed electrical switch room building and associated compound; and a c.5km underground electricity line extending from the proposed electrical switch room to facilitate connection of the proposed wind farm to the national electricity network².

Temporary and permanent accommodation works will also be required at locations along the turbine component haul route to facilitate the delivery of abnormal loads.

The proposed wind farm site is located in rural County Offaly, approximately 4km north of Birr and c.28km south-west of Tullamore. The proposed turbines are located within the townlands of Galros East, Whigsborough, Ballycollin, and Eglishe,

For the purposes of the bat surveys and assessment, the relevant project components comprise the proposed turbine locations and associated wind farm infrastructure, together with the underground electricity line route. References within this report to individual components of the project are made to assist in describing the survey areas and potential ecological interactions and do not alter the overall definition of the project assessed within the EIAR.

A full description of the project is provided at **Chapter 3** of the EIAR.

For clarity, where individual components of the project are referred to separately within this report, such references are used only to assist the reader in understanding the particular

¹ An Coimisiún Pleanála Reference: ABP-318816-24

² The proposed Mullanafawnia 110kV substation is being promoted separately by a third party developer and does not form part of the project for which planning permission is sought. However, having regard to the functional relationship between the project and the proposed substation, the proposed Mullanafawnia 110kV substation is assessed cumulatively throughout this EIAR, where relevant.



element under assessment. They do not alter the overall definition of the project assessed in this EIAR. These include:

- Wind Farm or Main Project Site – Refers to that within the red line boundary only;
- Underground electricity line (UGL) – Refers to the proposed underground electricity cable;
- Substation – Refers to the proposed substation;
- Haul route – Refers to the turbine delivery route.

1.3 Site Description

The project is located in rural County Offaly, approximately 4km north of the town of Birr and c.28km south-west of Tullamore, County Offaly.

For the purposes of this report, the project is described by reference to the proposed wind farm site and the underground electricity line route. These references are used to assist in describing the bat survey areas and ecological characteristics of individual elements of the project and do not alter the overall definition of the project assessed within the EIAR.

The proposed wind farm site is located in the townlands of Galros East, Whigsborough, Ballycollin, and Eglish. The 3 no. proposed turbine locations are situated on Galros Bog, an area historically subject to industrial peat production which is now predominantly characterised by cutaway raised bog. The bog is generally flat to gently sloping and is extensively drained by a network of open drains. Ground elevations across Galros Bog range from approximately 47m to 56m OD.

The N62 national road extends along the western side of Galros Bog. Areas of conifer plantation occur adjacent to the southern part of the bog and the West Galros Stream, a tributary of the Rapemills River, flows along the south-western side of the bog. The wider landscape comprises a mixture of former industrial peatland, agricultural grassland, hedgerows, drainage channels, forestry and dispersed rural residential development.

The c.5km underground electricity line route extends from the proposed electrical switch room through predominantly private agricultural grassland. The route crosses the N52 national road and L7006 local road and runs adjacent to the Rapemills River for approximately 2.5km, crossing the river at 2 no. locations. Ground elevations along the route generally range from approximately 50m to 65m OD.

A full description of the project and its geographical context is provided in Chapter 3 of the EIAR.

1.4 Scope of Study

The main aim of the surveys is to provide baseline data to inform the wind farm design process and inform the Environmental Impact Assessment (EIA) Report. More specifically, this report aims to:

- Identify the locations of any bat roosts, swarming sites, and key commuting or foraging habitat features that could be affected by the project;
- Determine the bat assemblage using the project site for foraging or commuting purposes;
- Compare levels of bat activity between recording locations both within the project site and between seasons, to identify locations that may be of most importance to commuting or foraging bats, or indicate the nearby presence of a roost; and



- Undertake analysis to determine, if possible, relative levels of activity compared with other sites, using the online Ecobat tool³.

The survey methodology was designed in accordance with current NatureScot wind farm-specific guidance⁴ (hereafter 'NS'; while this guidance is Scottish, the guidance has been adopted in Ireland as industry-standard) and CIEEM-recommended bat survey methodology⁵ (see Section 2.2.6 for specific limitations). In addition, Bat Conservation Ireland guidance published in 2012⁶ was also used where NS guidance was considered inappropriate in an Irish context e.g. defining the appropriate weather conditions for bat activity.

This report presents the findings of the bat surveys only. The assessment of impacts resulting from the project and the subsequent application of the mitigation hierarchy is beyond the scope of this report but will be addressed in the EIAR.

NS guidance⁴ suggests a standardised format for presenting bat data and specifically, quantifying activity and species vulnerability, which relies on use of the Ecobat tool.

1.5 Relevant Legislation

1.5.1 Irish Legislation

Under Schedule 5 of the Wildlife Acts 1976 to 2021⁷ (and as strengthened by the Wildlife Amendment Act, 2000⁸), all bat species and their roosts are protected by law. It is an offence to disturb bats or their roosts without an appropriate licence from the National Parks and Wildlife Service (NPWS).

The Wildlife Amendment Act (2000) is also the legal instrument through which Natural Heritage Areas (NHAs) are protected. These are areas containing habitats or species that require legal protection from damage, which can include bats. Not all NHAs have received statutory designation, and these are termed proposed Natural Heritage Areas (pNHAs). While lacking the same level of legal protection as NHAs, pNHAs are subject to limited protection via agri-environmental planning schemes and the recognition of the ecological value of pNHAs by planning and licencing authorities.

1.5.2 EU Legislation

Under the Habitats Directive 1992 (92/43/EEC)⁹, member states of the European Union must designate Special Areas of Conservation (SACs), which form part of the EU-wide Natura 2000 protected area network. The aim of this network is to safeguard biodiversity against potentially damaging developments. SACs are designated based on the presence of habitats or species (known as 'qualifying interests' or QIs) listed under Annex I or Annex II of

³ The Mammal Society. EcoBat. An EcoStat tool. Available online: <http://www.mammal.org.uk/science-research/ecostat/> [Last accessed 23/10/2026].

⁴ NatureScot (formerly 'Scottish Natural Heritage' or SNH), Natural England, Natural Resources Wales, RenewableUK, Scottish Power Renewables, Ecotricity Ltd, University of Exeter & Bat Conservation Trust (2021) Bats and Onshore Wind Turbines: Survey, Assessment and Mitigation. Available online at: <https://www.nature.scot/doc/bats-and-onshore-wind-turbines-survey-assessment-and-mitigation> [Last accessed 23/10/2026]

⁵ Collins, J. (ed.) (2023, updated 2024) Bat Surveys for Professional Ecologists: Good Practice Guidance (4th dn). The Bat Conservation Trust, London.

⁶ Bat Conservation Ireland (2012) Wind Turbine/Wind Farm Development Bat Survey Guidance, Version 2.8, December 2012. Bat Conservation Ireland, www.batconservationireland.org.

⁷ <https://www.irishstatutebook.ie/eli/1976/act/39/enacted/en/html#zza39y1976> [Last accessed 23/10/2026]

⁸ <https://www.irishstatutebook.ie/eli/2000/act/38/enacted/en/print.html> [Last accessed 23/10/2026]

⁹ <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:31992L0043> [Last accessed 23/10/2026]



the Habitats Directives, respectively. The only species of bat in Ireland that is listed under Annex II of the Habitats Directives is the lesser horseshoe bat *Rhinolophus hipposideros*.

While strict protection is afforded SACs, all species of bat in Ireland also receive additional protection under Annex IV of the Habitats Directive. This prohibits the deliberate disturbance of bat species (particularly during the periods of breeding, nursing, and hibernation), as well as the deterioration and/or destruction of roosts across their entire natural range within the EU, both within and outside Natura 2000 sites.

1.5.3 Other International Legislation

Ireland has ratified two international wildlife laws pertaining to bats:

- The Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention, 1982)¹⁰. Part of this convention stipulates that all bat species and their habitats are conserved; and
- The Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention, 1979)¹¹. The aim of this convention was to protect migratory species (which includes some species of bats) across all European borders.

2.0 Methodology

2.1 Desk Study

A desk-based study has been undertaken to identify sources of pre-existing ecological data of relevance that could inform the EIA.

This included examination of:

- Recent satellite maps to identify features of potential value to bats at the Project Site:
 - o Obtained via satellite images available on <https://earth.google.com/web/> [Last accessed 23/10/2026]. This was used to conduct an Initial Site Risk Assessment, assigning the habitats within the Project Site to a risk category (low, moderate or high) using criteria provided within NatureScot guidance and reproduced in **Appendix B**. Habitat suitability was assigned to individual features with the exception of areas of conifer plantation that were described as a block. Satellite images were also searched for any potential roost features (e.g. buildings/structures, caves or trees) within 200 m of the planning application red line boundary plus rotor radius.

The final turbine model has not yet been selected and will be chosen from within the turbine dimension range assessed for the project. For the purposes of defining the bat survey area, the maximum and minimum rotor diameter permutations within that range were considered, as these represent the outer limits of the potential rotor-swept area. These survey extents ensure that the full turbine dimension range has been taken into account for the purposes of the bat survey. The corresponding survey radii were calculated as follows:

- o i. Maximum rotor diameter permutation – 175m rotor diameter (87.5m rotor radius): 287.5m, comprising the 200m survey buffer plus the 87.5m rotor radius; and

¹⁰ https://www.coe.int/en/web/bern-convention?_sm_aui=VVtWnJSVsMSFDZ5 [Last accessed 23/10/2026]

¹¹ <https://www.cms.int/> [Last accessed 23/10/2026]



- o ii. Minimum rotor diameter permutation – 158m rotor diameter (79m rotor radius): 279m, comprising the 200m survey buffer plus the 79m rotor radius.

The bat landscapes suitability index for the Project Site¹²:

- o The index ranks landscapes from least (0) to most favourable (100) using records held by Bat Conservation Ireland (BCI) and landscape features to train a predictive model that identifies geographical areas suitable for individual bat species;
- Bat species and roost records within 10 km from the Project Site¹³;
- Maps of nationally and internationally designated sites for bats within 10 km from the Project Site¹⁴;
- The location of the Project Site in relation to the edge of bat species' known Irish ranges¹⁵;
- The location of wind energy developments and other projects within 10 km from the Project Site that could contribute to cumulative effects on local bat populations¹⁶; and
- The Environmental Statements (ES) of wind energy developments or other projects within 10 km of the Project Site containing information relating to bats¹⁶.

2.2 Field Survey Methodology and Rationale

The field survey methodology was designed with reference to current wind farm specific guidance⁴. It comprises deployment of a suite of automated full spectrum detectors at three turbine locations at ground level and habitat appraisal for winter and summer roosts.

Similarly, the guidance states that the use of walked transects should be discretionary and site-specific⁴. The choice of methods must be appropriate to identify connections between nearby roosts, linear features and potential key foraging areas across the development footprint. Due to absence of bat roosting habitat at the project site identified during the habitat appraisal and desk-search, transect surveys were not judged as necessary.

Full details of each survey type are provided below; where the methodology deviates from the guidance, a rationale has been provided.

2.2.1 Bat Survey Study Areas

The spatial extent of the bat surveys varied according to the survey type and the component of the Proposed Project being assessed. The survey areas are shown in **Figure 2**.

¹² Obtained via Biodiversity Ireland <https://maps.biodiversityireland.ie/Map> [Last accessed 23/10/2026].

¹³ Obtained via data request from Bat Conservation Ireland (BCI) received 25/11/2022 and a search of the records contained in 10 km grid squares N00, N01, N10, N11 by the National Biodiversity Data Centre (NBDC) <https://maps.biodiversityireland.ie/Map> [Last accessed 23/10/2026].

¹⁴ Obtained via EPA map viewer <https://gis.epa.ie/EPAMaps/> [Last accessed 23/10/2026].

¹⁵ Obtained via maps contained under Article 17 reporting <https://www.npws.ie/publications/article-17-reports/article-17-reports-2019> [Last accessed 23/10/2026].

¹⁶ Obtained via the EIA portal [https://housinggov.ie/maps.arcgis.com/apps/webappviewer/index.html?id=d7d5a3d48f104ecbb206e7e5f84b71f1,myplan: https://myplan.ie/national-planning-application-map-viewer/](https://housinggov.ie/maps.arcgis.com/apps/webappviewer/index.html?id=d7d5a3d48f104ecbb206e7e5f84b71f1,myplan:https://myplan.ie/national-planning-application-map-viewer/)

Wind Energy Ireland: <https://windenergyireland.com/about-wind/interactive-map>

Offaly County Council <https://www.eplanning.ie/OffalyCC/searchexact> [all last accessed 23/10/2026].



2.2.1.1 Preliminary Ecological Appraisal – Daytime Bat Walkover (DBW)

Wind Farm Site

NatureScot (2021) guidance states that key features that could support maternity roosts (i.e. summer) and significant hibernation (i.e. winter) and / or swarming sites within 200 m plus rotor radius of the proposed turbines and of the site boundary should be subject to further investigation. For the purpose of the DBW, the study areas for the wind farm site followed NS guidance of 200m plus rotor radius of the proposed development red line boundary. For the two turbine parameter range permutations being considered these were:

- 287m survey area – Based on the maximum rotor diameter permutation of 175m rotor diameter (i.e. 87.5m rotor radius); and
- 279m survey area – Based on the minimum rotor diameter permutation of 158m rotor diameter (i.e. 79m rotor radius).

Underground Electricity Line

The study areas for the underground electricity line route was 50m radius of the proposed route where permissible.

Turbine Haul Route (THR)

The study areas for the THR was the footprint of works at nodes.

2.2.1.2 Preliminary Roost Assessment (PRA)

Wind Farm Site

The study areas for PRA of the wind farm site were the same as those outlined in Section 2.2.1.1. This focussed on any features identified during the DBW.

2.2.1.3 Activity Survey – Static Detector Surveys (Ground-Level)

NS guidance states that survey effort should be focused in areas of the development site where turbines are likely to be located. Detectors should be placed at or close to all known turbine locations at wind farms containing less than ten proposed turbines. Where there are more than ten proposed turbines, detectors should be placed at ten turbine locations plus a third of additional potential turbine sites for up to a maximum of 40 detectors for the largest developments. As the proposed project comprises three turbines, a detector was placed at each of the proposed turbines.

2.2.2 Preliminary Ecological Appraisal – Daytime Bat Walkover

A Daytime Bat Walkover (DBW) was undertaken on 04th April 2025. The study area, as identified in Section 2.2.1.1, was walked during daylight hours to characterise the habitats present and assess their suitability for bats. Consideration was given to the availability and distribution of potential foraging habitat, linear features that could facilitate commuting, and connectivity between the Project site and the wider landscape. This data informed an initial site risk assessment following NS guidance, assigning the habitat within the survey area to a risk category (low, moderate or high) as reproduced in Appendix B-1.

Table 1 Categories of suitability⁵ – Potential flight-paths and foraging habitats

Suitability	Description
None	No habitat features on site likely to be used by any commuting or foraging bats at any time of the year (i.e. no habitat that provides continuous lines of



Suitability	Description
	shade/protection for flight-lines, or generates/shelters insect populations available to foraging bats).
Negligible	No obvious habitat features on site likely to be used as flight-paths or by foraging bats; however, a small element of uncertainty remains in order to account for non-standard bat behaviour.
Low	Habitat that could be used by small numbers of bats as flight-paths such as a gappy hedgerow or unvegetated stream, but isolated, i.e. not very well connected to the surrounding landscape by other habitat. Suitable, but isolated habitat that could be used by small numbers of foraging bats such as a lone tree (not in a parkland situation) or a patch of scrub.
Moderate	Continuous habitat connected to the wider landscape that could be used by bats for flight-paths such as lines of trees and scrub or linked back gardens. Habitat that is connected to the wider landscape that could be used by bats for foraging such as trees, scrub, grassland or water.
High	Continuous, high-quality habitat that is well connected to the wider landscape that is likely to be used regularly by bats for flight-paths such as river valleys, streams, hedgerows, lines of trees and woodland edge. High-quality habitat that is well connected to the wider landscape that is likely to be used regularly by foraging bats such as broadleaved woodland, tree-lined watercourses and grazed parkland. Site is close to and connected to known roosts

Potential roosting features (PRFs) were also identified. These were categories as per Table 2 - Table 3 below.

Table 2 Categories of bat roost suitability⁵ - Structures

Suitability	Description
None	No habitat features on site likely to be used by any roosting bats at any time of the year (i.e. a complete absence of crevices/suitable shelter at all ground/underground levels).
Negligible	No obvious habitat features on site likely to be used by roosting bats; however, a small element of uncertainty remains as bats can use small and apparently unsuitable features on occasion. Negligible is defined as 'so small or unimportant as to be not worth considering, insignificant'. This category may be used where there are places that a bat could roost or forage (due to one attribute) but it is unlikely that they actually would (due to another attribute).
Low	A structure with one or more potential roost sites that could be used by individual bats opportunistically at any time of the year. However, these potential roost sites do not provide enough space, shelter, protection, appropriate conditions^ and/or suitable surrounding habitat to be used on a regular basis or by larger numbers of bats (i.e. unlikely to be suitable for maternity and not a classic cool/stable hibernation site but could be used by individual hibernating bats).
Moderate	A structure with one or more potential roost sites that could be used by bats due to their size, shelter, protection, conditions^ and surrounding habitat but unlikely to support large numbers due to conservation status (with respect to roost type only such as maternity or hibernation – categorisation described in table made irrespective of precise conservation status which is established after presence is confirmed).



Suitability	Description
High	A structure with one or more potential roost sites that are obviously suitable for use by larger numbers of bats on a more regular basis and potentially for longer periods of time due to their size, shelter, protection, conditions and surrounding habitat. These structures have the potential to support high conservation status roosts, e.g. maternity or classic cool/stable hibernation site.

Table 3 Categories of describing suitability of PRFs - Trees⁵

Suitability	Description
None	Either no PRFs in the tree or highly unlikely to be any.
FAR	Further Assessment Required to establish if PRFs are present in the tree.
PRF	A tree with at least one PRF present.

2.2.3 Preliminary Roost Assessment

Trees, structures and other features identified during the DBW as having potential to support roosting bats were subject to a Preliminary Roost Assessment (PRA) to assess the characteristics of identified Potential Roost Features (PRFs), determine their suitability to support roosting bats and identify any requirement for further survey.

PRFs were inspected externally from ground level, where accessible and visible, using binoculars and a high-powered torch as appropriate. The assessment considered the type and characteristics of each PRF, its accessibility and suitability for bats, and any evidence indicative of bat use, including droppings, staining, feeding remains or other field signs.

Trees were classified according to their suitability to support roosting bats using the categories set out in the BCT Guidelines (Collins, 2023), as reproduced in Table 4.

Table 4 Categories of bat roost suitability - Trees⁵

Suitability	Description
PRF-I	PRF is only suitable for individual bats or very small numbers of bats either due to size or lack of suitable surrounding habitats.
PRF-M	PRF is suitable for multiple bats and may therefore be used by a maternity colony.

If structures were present, an external bat survey was undertaken. This involved a thorough and systematic inspection of the outside of a structure to identify potential or existing bat access points, roosting locations, and any signs of bat activity. Surveyors looked for evidence such as live or dead bats, droppings, urine staining, fur-oil marks, and audible squeaking, with bat specimens and droppings providing the most reliable confirmation of presence. The inspection covered all accessible external features, including the ground beneath likely entry points, windowsills, walls, peeling paint, damaged render, hanging tiles, weatherboarding, eaves, fascias, soffits, flashing around chimneys, roof felt, tiles, slates, bat boxes, and any gaps in brickwork or stonework that could have provided access to cavities.

2.2.4 Activity Survey

2.2.4.1 Static Detector Survey (Ground Level)

Detectors were deployed at the specified locations in Section 2.2.1.3.

Table 5 presents the deployment dates for the static detector (ground level) survey.



Table 5 Static Bat Detector Deployment

Season	Sampling Location(s)	Dates of Deployment	Length of Recording Period
Spring 2025	T9, T10, T11	06th May 2025 – 15th May 2025	10 nights
Summer 2025	T9, T10, T11	04 th June 2025 – 15 th June 2025	12 nights
Autumn 2025	T9, T10, T11	16 th September 2025 – 26 th September 2025	10 nights

Detectors (Wildlife Acoustics SM4-FS) were deployed with microphones attached to wooden stakes or trees approximately 1-2m above ground level, with detectors programmed to record from 30 minutes before sunset until 30 minutes after sunrise.

The locations of each static detector are shown in Figure 2 and Table 6.

Table 6 Static Bat Detector Locations – Description

Sample Point	Co-ordinates (ITM)		Description	Distance from Nearest Turbine Location
	Easting	Northing		
T9	608636	710729	Open, PB4 cutover bog habitat with no linear features adjacent	At proposed location
T10	608275	711034	Open, PB4 cutover bog habitat with no linear features adjacent	At proposed location
T11	608944	711100	Open, PB4 cutover bog habitat with no linear features adjacent	At proposed location

Weather Data and Survey Dates

The NS guidance states that 10 nights of data per season should be collected, within appropriate weather conditions, specifically with a sunset temperature of 10°C or above, ground level wind speed of 5m/s or lower, and no rain or very light rain. This guidance is for Scotland, and for Ireland Bat Conservation Ireland guidance⁴ state that sunset temperatures should be 7°C or above.

The NS guidance also states that while surveys should aim for 10 consecutive nights, in practice weather conditions may preclude this, particularly early or late in the year and in more northerly latitudes. The guidance also goes on to say that in more northerly latitudes, there will be limitations on the number of suitable nights and some surveys may need to take place over longer periods which sample a range of conditions. In such cases, the survey period should be planned and justified by the ecologist and the effect on bat behaviours considered taking account of weather forecasts.

The reading closest to sunset for each night was used to assess the suitability of temperature following the methodology outlined in NS and CIEEM-recommended guidance.



For wind, an average per night was determined based on the period between sunset and sunrise. This period was then used to work out the average nightly wind speed. If the average was less than 5m/s the night was considered suitable for bat surveys. Weather data was sourced from a combination of online sources.

For the purposes of this assessment, light rain has been classified as total nightly rainfall less than 2 mm and/or less than 1 mm of rainfall in any one-hour period throughout the night. The same protocol for determining night length across deployments was used as described above.

The details of the weather conditions are provided in Table G-1 in Appendix G.

2.2.5 Bat Sonogram Analysis

Bat calls were analysed in full spectrum format using Kaleidoscope Pro (version 5.6.3) software. An auto identification filter within Kaleidoscope Pro was used initially to assign calls to likely species, using a Bats of Europe filter (version 5.4.0) for Ireland. This software allows data to be classified automatically with bat species which fit the same call characteristics that each call file provides.

While the auto identification is efficient, it is not totally infallible, therefore the following manual checks by an experienced ecologist skilled in bat call identification were also undertaken with reference to key identification as follows:

- All files classified as 'no ID' were manually checked and assigned to a species, using call parameters within Russ (2021)¹⁷;
- A randomly selected 10% subset of files assigned by the filter as being noise were also checked manually, to ensure no faint calls were missed;
- *Myotis* calls were identified to species level and putative *Nathusius*' pipistrelle *Pipistrellus nathusii* calls were manually checked, all using the parameters¹⁸ contained within Russ (2021); and
- Social calls were identified to species level using Middleton et al. (2014).

This report refers to "bat passes"; a bat pass has been defined as a single file captured by the bat detector, which contains two or more bat calls (likely attributed to the same bat). The number of bat passes does not relate to the number of bats present in one location (as one bat may make several passes); rather, it gives an indication of the level of bat activity in that location over each recording period. Note that where more than one species was identified within the same bat pass, the pass was manually split into two so an accurate number of bat passes split by species was obtained. The presentation and statistical analysis of all bat call results was completed in Excel.

2.2.6 Limitations

In all the deployment sessions, it was not possible to collect 10 consecutive nights of static bat data in suitable weather conditions. However, there were 10, 9, and 7 suitable nights for the spring, summer and autumn sessions, respectively. All 10 nights of the spring season met the optimal weather conditions. In summer, 9 nights met these criteria. However, there was one additional night that exceeded the threshold for appropriate weather conditions by 0.1m/s where average nightly wind speed was 5.1m/s rather than the recommended 5m/s.

¹⁷ Russ, J. (2021) British Bat Calls. A Guide to Species Identification. Pelagic Publishing, Exeter.

¹⁸ Calls with a peak frequency of 41kHz or less were considered to be *Nathusius*' pipistrelle, which was further confirmed by detailed interrogation to check the absence of common pipistrelle calls immediately before or after the putative *Nathusius*' pipistrelle calls



However, the BCT (2023) guidelines also allow for up to 5.4 m/s. In the autumn deployment session, there were seven nights that met these criteria. However, there was one additional night that exceeded the threshold for appropriate weather conditions by 0.3m/s where average nightly wind speed was 5.3m/s rather than the recommended 5m/s. However, the BCT (2023) guidelines also allow for up to 5.4 m/s.

However, all survey dates were retained for analysis, as bat calls were still recorded in sub-optimal weather conditions, suggesting that the conditions recorded did not significantly reduce bat activity. Furthermore, nights with suitable weather conditions sometimes had lower levels of bat activity than those with unsuitable weather conditions.

2.3 Evidence of Technical Competence and Experience

2.3.1 Habitat Appraisal for Potential Bat Roost Features and Assessment of Habitat Risk

Sinéad Clifford carried out searches for potential bat roosts, and habitat mapping.

2.3.2 Activity Survey – Static Bat Detector Survey (Ground-Level)

Static detectors were deployed and collected each season. This was carried out by Lorcan Kelly and Kieran Moynihan.

2.3.3 Analysis and Reporting

Bat call analysis and reporting was undertaken by Sinéad Clifford. This report was reviewed by Dr Andrew Torsney.

2.3.4 Personnel

2.3.4.1 Sinéad Clifford

Sinéad is Energy Sector Lead (Ireland) and an Associate Ecologist with SLR. Sinéad holds a BSc (Hons) Wildlife Biology from Institute of Technology Tralee, and a Certificate in Ecological Consultancy (Distinction) from Ecology Training UK (formerly Acorn Ecology). Sinéad has worked in ecological consultancy since 2018. She has designed and implemented numerous bat surveys for a wide range of diverse projects during her career. Sinéad is highly experienced in the analysis of bat call data, has written multiple baseline bat reports and undertaken impact analysis for bats for many wind farm projects.

2.3.4.2 Kieran Moynihan

Kieran is a Senior Field Ecologist with SLR and has worked in consultancy since 2022. He has a BSc (Hons) in Biological, Earth and Environmental Sciences (Ecology) from University College Cork. Kieran has experience of carrying out bat transects, roost surveys, emergence and re-entry surveys and deployment of static detectors.

2.3.4.3 Michael James

Michael James (MJ) – Michael is a Graduate Ecologist with SLR. Michael holds a BA (Hons) in Zoology from Trinity College Dublin and is a qualifying member of CIEEM. Since starting at SLR, Michael has been involved in various surveys. These include bat surveys for wind farms. He has also conducted bat emergence surveys and habitat surveys for other projects.



2.3.4.4 Andrew Torsney

Dr Andrew Torsney – This report was reviewed by Andrew. He is the Regional Lead for Ecology in Ireland and a seasoned environmental consultant with over 14 years of experience, having spearheaded a diverse range of projects spanning local to national scales. His expertise includes the successful management of high-impact national initiatives, such as the National Grid Implementation Plan for EirGrid and Fáilte Ireland's National Tourism Monitoring Programme. Andrew's proficiency extends beyond project management, showcasing his ability to deliver complex technical reports and provide strategic environmental guidance that aligns with both regulatory frameworks and stakeholder expectations. Andrew is a recognised bat specialist with extensive experience in bat ecology, survey design, impact assessment and mitigation. He authored the bat identification guide for the National Biodiversity Data Centre and has undertaken research developing habitat suitability models for six bat species within the Yorkshire Dales National Park. His research also includes investigations into swarming behaviour and migratory bat movements in Poland, alongside population genetic cluster analyses in Devon. Andrew holds a national bat derogation licence and has acted as Technical Associate and technical lead on numerous complex bat projects, including the offshore bat assessment for the Dublin Array Offshore Wind Farm. His expertise spans roost assessment, activity survey design, collision risk assessment, habitat connectivity, mitigation strategy development and the application of emerging evidence to inform planning and appropriate assessment.

2.4 Assessment of Relative Bat Activity Levels

In accordance with NS guidance², the relative level of bat activity recorded during the static detector surveys should be analysed through the use of the secure online tool Ecobat¹⁹, initially designed by the University of Exeter and now hosted and developed by the Mammal Society (Lintott et al. (2018))²⁰. Ecobat compares data entered by the user with bat survey information collected from similar areas at the same time of year and (where possible) in comparable weather conditions. Ecobat generates a percentile rank for each night of activity and provides a numerical way of interpreting the relative levels of bat activity recorded at a site with other sites across the same regions or across Ireland as a whole.

3.0 Results

3.1 Desk Study

3.1.1 Habitat Assessment

Online satellite images identified no structures/buildings or trees that could be used by roosting bats within 287.5m or 279m of the proposed turbines during the desk study. Similarly, there were no trees identified from satellite imagery within these two search areas.

There was a lack of linear habitats that could be used by foraging and/or commuting bats within 200m plus rotor radii of T10 and T11. There was limited suitability of habitats within the study area of T9, with a linear section of disconnected scrub noted on the southern extent of the search area. This habitat is poorly connected to the wider landscape.

¹⁹ <http://www.mammal.org.uk/science-research/ecostat/>

²⁰ Lintott, P. R., Davison, S., Breda, J., Kubasiewicz, L., Dowse, D., Daisley, J. & Mathews, F. (2018). Ecobat: An online resource to facilitate transparent, evidence-based interpretation of bat activity data. *Ecology and Evolution* 8(2): 935- 941.



3.1.1.1 Bat Landscapes

For the proposed wind farm site and the third of the proposed underground electricity line closest to the wind farm, the score is 26.56 (out of a maximum score of 100). For the remainder of the proposed UGL the score is 33.78 (out of a maximum score of 100). A full breakdown is provided in Table 7 with an explanation provided below.

The area within which T9, T10, T11 are located has a high bat landscapes suitability index for soprano pipistrelle, brown long-eared bat, common pipistrelle, and Leisler's bat. There is moderate suitability for whiskered bat, Daubenton's bat, and Natterer's bat. The bat landscapes suitability index is classified as low for lesser horseshoe bat, and Nathusius' pipistrelle.

The area within which the remainder of the UGL is located has a high bat landscapes suitability index for soprano pipistrelle, brown long-eared bat, common pipistrelle, Leisler's bat, and Natterer's bat. There is moderate suitability for Daubenton's bat, and whiskered bat. The bat landscapes suitability index is classified as low for lesser horseshoe bat, and Nathusius' pipistrelle.

Table 7 Bat Landscape Suitability Index at Project Site

Location and Species	Landscape Suitability Index (out of maximum 100)
T9, T10, T11, part of UGL	
All Bats	26.56
Pipistrellus pygmaeus	36
Plecotus auritus	36
Pipistrellus pipistrellus	39
Rhinolophus hipposideros	1
Nyctalus leisleri	36
Myotis mystacinus	29
Myotis daubentonii	26
Pipistrellus nathusii	1
Myotis nattereri	35
Part of UGL	
All Bats	33.78
Pipistrellus pygmaeus	45
Plecotus auritus	44
Pipistrellus pipistrellus	52
Rhinolophus hipposideros	2
Nyctalus leisleri	48
Myotis mystacinus	29
Myotis daubentonii	36
Pipistrellus nathusii	1
Myotis nattereri	47



3.1.2 Bat / Roost Records

3.1.2.1 NBDC Data

NBDC has records for five bat species recorded within the 10 km grid squares (N01, N10, N11) that overlaps the project site as shown in Table 8. The type of record (i.e. roost, flying, call) is not stated.

Table 8 Records of Bat Species within 10km of Project Site

10km Grid Square	Bat Species	Records	Last Record
N01	Common Pipistrelle (<i>Pipistrellus pipistrellus</i> s.s.)	5	12/09/2018
N01	Daubenton's Bat (<i>Myotis daubentonii</i>)	193	04/09/2021
N01	Leisler's Bat (<i>Nyctalus leisleri</i>)	2	18/05/2012
N01	Pipistrelle (<i>P. pipistrellus</i> s.l.)	1	18/05/2012
N01	Soprano Pipistrelle (<i>Pipistrellus pygmaeus</i>)	5	12/09/2018
N10	Brown Long-eared Bat (<i>Plecotus auritus</i>)	3	01/07/2018
N10	Common Pipistrelle (<i>Pipistrellus pipistrellus</i> s.s.)	29	22/05/2019
N10	Daubenton's Bat (<i>Myotis daubentonii</i>)	4	11/07/2018
N10	Leisler's Bat (<i>Nyctalus leisleri</i>)	7	11/07/2018
N10	Soprano Pipistrelle (<i>Pipistrellus pygmaeus</i>)	14	22/05/2019
N11	Common Pipistrelle (<i>Pipistrellus pipistrellus</i> s.s.)	12	22/05/2019
N11	Daubenton's Bat (<i>Myotis daubentonii</i>)	6	02/07/2018
N11	Leisler's Bat (<i>Nyctalus leisleri</i>)	1	02/07/2018
N11	Soprano Pipistrelle (<i>Pipistrellus pygmaeus</i>)	6	22/05/2019
N11	Pipistrelle (<i>P. pipistrellus</i> s.l.)	1	18/05/2012

3.1.2.2 Bat Conservation Ireland Data

Bat Conservation Ireland data (confidential **Appendix D** and **Appendix E**) show that 12 recorded bat roosts are located within 10km from the project site. The closest roost (ca. 4.43km north-east of the nearest turbine (T11)) is a brown long-eared bat roost. The remaining roosts are for soprano pipistrelle (two separate roosts), Leisler's bat (five separate roosts), Daubenton's bat (two separate roosts), whiskered bat (one separate roost), common pipistrelle (one separate roost), and a mixed roost for brown long-eared bat and whiskered bat.

None of the recorded roosts have ecological connectivity to the project site i.e., the core sustenance zones (CSZ)²¹ as measured from the roost, do not overlap with the project site.

The BCI data showed there were no roosts adjacent to the underground electricity line.

²¹ A CSZ as applied to bats, refers to the area surrounding a communal bat roost within which habitat availability and quality will have a significant influence on the resilience and conservation status of the colony using the roosts. If bat commuting and foraging habitats within the CSZ are affected by the project, then this could affect bats using the roost. Core_Sustenance_Zones_Explained_04.02.16.pdf (bats.org.uk) [Last accessed October 2023]



Seven species were recorded by transects or as ad-hoc observations: *Myotis daubentonii*, *Myotis nattereri*, *Plecotus auritus*, *Nyctalus leisleri*, *Pipistrellus nathusii*, *Pipistrellus pipistrellus*, *Pipistrellus pygmaeus*, and additionally *Myotis* spp., and *Pipistrellus* spp.

3.1.3 National and International Designated Sites

Designated sites within 20 km of the Project Site are shown in **Table 9** and **Figure 3**.

There are 19 pNHAs and two NHAs within 10 km of the Project Site. None of the NHAs are designated for bats; however, there are five pNHAs designated for bats.

There are 6 SACs within 10 km of the Project Site, but none are designated for bats.

Table 9 Designated Sites within 10km of Project Site

Site Name	Site Code	Distance from Project Site (km)	Designated for Bats?	Within the CSZ for species?
Internationally Designated Sites				
Ridge Road, SW of Rapemills SAC	000919	4.67	No	N/A
All Saints Bog and Esker SAC	000566	5.53	No	N/A
Island Fen SAC	002236	7.08	No	N/A
River Shannon Callows SAC	000216	7.80	No	N/A
Lisduff Fen SAC	002147	8.79	No	N/A
Ballyduff/Clonfinane Bog SAC	000641	9.42	No	N/A
Nationally Designated Sites				
NHA				
River Little Brosna Callows NHA	000564	6.37	No	N/A
Killeen Bog NHA	000648	7.73	No	N/A
pNHA				
Lough Coura	000909	0.90	No	N/A
Woodville Woods	000927	2.11	No	N/A
Ross And Glenns Eskers	000920	3.25	No	N/A
Dovegrove Callows	000010	4.04	No	N/A
Ridge Road, SW Of Rapemills	000919	4.68	No	N/A
Derrykeel Meadows	000897	5.06	No	N/A
All Saints Bog And Esker	000566	5.52	No	N/A
Birr (Domestic Dwelling No. 2, Occupied)	000568	5.74	Yes. A nursery roost for Leisler's bat.	No. While the pNHA is 2.97km from the application boundary at it's closest point, this relates to the junction



Site Name	Site Code	Distance from Project Site (km)	Designated for Bats?	Within the CSZ for species?
				works. The pNHA is actually 4.29km from the main project site. As such, it is outside the CSZ for this species (i.e. 3km).
Birr (Domestic Dwelling No.1, Occupied)	000569	5.77	Yes. A nursery roost for Leisler's bat.	No. While the pNHA is 3.02km from the application boundary at it's closest point, this relates to the junction works. The pNHA is actually 4.17km from the main project site. As such, it is outside the CSZ for this species (i.e. 3km).
Banagher (Domestic Dwelling, Occupied)	000567	6.19	Yes. Summer and possible winter roost of brown long-eared bat.	No. This is outside the CSZ for this species (i.e. 3km).
Bracken's Dwelling, Near Whiteford	002058	6.54	Yes. A nursery roost for Leisler's bat.	No. This is outside the CSZ for this species (i.e. 3km).
Kinnitty (Domestic Dwelling, Occupied)	000579	6.64	Yes. A summer roost for Leisler's bat.	No. This is outside the CSZ for this species (i.e. 3km).
River Shannon Callows	000216	7.80	No	N/A
Lough Boora	001365	9.02	No	N/A
Grand Canal	002104	9.08	No	N/A
Ballyduff/Clonfinane Bog	000641	9.43	No	N/A

3.1.4 Location of Project Site Relative to Bat Range Edges

The location of the project site is at the range edge (the definition of range used here is the Extent of Occurrence²²) for *Nathusius' pipistrelle*, *Natterer's bat*, and *whiskered bat*. The 10km square (N01) that contains the proposed wind farm site is within the range of these species, but the next 10km square to the east (N11) which contains the UGL is immediately outside the range of *Nathusius' pipistrelle* and *whiskered bat*. According to NS guidance², the potential for negative impact is likely to increase where there are high risk bat species on the edge of their range. This applies to *Nathusius' pipistrelle* (high risk) but not for *whiskered bat* or *Natterer's bat* (both low risk). However, the range data comes from the latest Article 17 report¹⁵. That report acknowledged that there is much uncertainty surrounding its range and could be reflective of survey effort rather than true presence.

²² The area contained within the shortest continuous imaginary boundary that can be drawn to encompass all the known, inferred, or project sites of present occurrence excluding cases of vagrancy.



3.1.5 Other Wind Energy Developments or Projects

Table 10 outlines wind farms have been granted planning consent located within 10km of the project site:

Table 10 Other Wind Energy Developments

Development	Planning Register Reference	Development Description	Status	Distance (km)
Cush Wind Farm (Phase I), Co. Offaly	An Coimisiún Pleanála Reference ABP-318816-24	8 no. wind turbines and all associated infrastructure.	Permitted	0
Cush Wind Farm Phase I Section 146B Alteration Request, Co. Offaly.	An Coimisiún Pleanála Reference ACP-324405-26	Request to alter the permitted Cush Wind Farm Phase I development to provide for design flexibility in respect of the permitted turbine dimensions.	Proposed	0
Derrinlough Wind Farm Co. Offaly	An Coimisiún Pleanála Reference ABP-306706-20	21 no. wind turbines and all associated infrastructure.	Existing	2
Meenwaun Wind Farm Co. Offaly	15/44 (An Coimisiún Pleanála Reference PL19.244903)	4 no. wind turbines and all associated infrastructure	Existing	3.0
Carrig Renewables Wind Farm Grid Connection, Co. Tipperary & Co. Offaly.	23/60140	The development will consist of: (i) The provision of underground electrical cabling (38kV) from the townland of Townparks to the existing Dallow 110kV substation in the townland of Clondallow to facilitate the connection of the proposed Carrig Renewables Wind Farm.	Permitted	3.5
Cloghan Wind Farm Co. Offaly	14/188 (An Coimisiún Pleanála Reference PL19.244053), and 19/404	9 no. wind turbines and all associated infrastructure.	Existing	4.0
Cloghan Wind Farm Grid Connection Co. Offaly	19/555	Approximately 8km of underground electricity cables.	Existing	4.0
Derrinlough Wind Farm Co. Offaly	FMR 26/01 (Design Flexibility Request)	Proposed Battery Energy Storage System, consisting of battery container units, transformers, inverters, underground cabling, associated control	Proposed	7.5



Development	Planning Register Reference	Development Description	Status	Distance (km)
		rooms, access routes, lighting, CCTV, lightning masts, fencing and grid connection to the existing Derrinlough 110kV substation.		

There are six operational wind farms within 10km of the project site. Apart from the consented wind farms named above, there are no other operational or consented projects located within 10km from the project site boundary that could give rise to cumulative effects on bat populations located within the project site.

3.2 Field Survey

3.2.1 Preliminary Ecological Appraisal – Daytime Bat Walkover (DBW) Survey

3.2.1.1 Potential Commuting/Foraging Habitat

There was a lack of habitats that could be used by foraging and/or commuting bats within 200m plus rotor radii of T10 and T11. There was limited suitability of habitats within 200m plus rotor radii of T9, with a linear section of disconnected scrub noted on the southern extent of the search area. This habitat is poorly connected to the wider landscape.

Approximately 2.5km of the Rapemills river runs along the underground electricity line route. There were also hedgerows and treelines noted which were classified as FAR, as per Table 3.

3.2.1.2 Potential Roosting Habitat

The DBW identified no structures/buildings or trees that could be used by roosting bats within 287.5m or 279m of the proposed turbines.

There were no structures with roosting potential identified along the underground electricity line route. There were treelines and watercourses along the underground electricity line route that could provide potential commuting and/or foraging habitat.

3.2.1.3 Potential Roost Feature Survey

A map showing the locations of potential roost features is shown in Figure 4 in Confidential **Appendix D** **Appendix E** along with a full description of each potential roost feature. What follows is a summary of the potential roost feature survey.

Structures

The DBW identified no structures with roosting suitability within the 287.5m or 279m search radii or along the proposed UGL search radius. Thus, no further investigation was required.

Trees

The DBW identified no tree with roosting suitability within the 287.5m or 279m search radii of the proposed turbines. Thus, no further investigation was required.

The majority of the trees along the underground electricity line route were assessed as having no roosting potential above 'low potential', consisting predominantly of scrub, conifer or broadleaved species lacking potential roosting features. One PRF-I tree was recorded ca.



11m from the proposed UGL. This was a mature, ash with light ivy cover and some minor areas of peeling bark. However, it lacked sufficient shelter and the appropriate conditions to support larger numbers or for maternity and/or winter roosts. The majority of the hedgerows along the proposed UGL are quite low, having been regularly cut back or consisting of low-growing disconnected scrub. As a result, there is limited potential roosting features present along the route.

3.2.1.4 Habitat Risk Assessment

The majority of the proposed wind farm site comprises PB4 cutover bog habitat (proposed wind farm site) and agricultural grassland habitats (proposed UGL), which are generally considered to be of lower value for foraging bats. The PB4 cutover bog has been subject to industrial peat harvesting historically. The absence of prominent linear features mean there is a lack of connectivity to the wider landscape, which further reduces roosting opportunities for roosting bats.

The habitats at the project site are therefore considered to be of **moderate** risk for bats according to table 3a of NS guidance² and reproduced below (the risk assessment category is provided for each point and the overall category is the mean of these categories):

- No potential roost features of low quality present within the proposed wind farm site (low).
- Low quality foraging habitat that could be used by small numbers of foraging bats (low);
- Isolated site not connected to the wider landscape by prominent linear features (low); and
- Project Site is located the edge of the ranges for Nathusius' pipistrelle, Natterer's bat, and whiskered bat (high).

The Project is judged as being of **medium** size according to table 3a of NS guidance² and reproduced below (the size assessment category is provided for each point and the overall category is the mean of these categories):

- Small scale development (3 turbines) (small);
- Six other consented wind developments are located within 5 km of Project Site (medium); and
- Project comprises turbines >100 m in height (large).

Overall, the Project Site is judged to pose a **medium (3)** risk to bats.

3.2.2 Activity Survey – Static Detector Survey (Ground-Level) – All Species

Eight species were recorded during the static bat detector surveys:

- Daubenton's bat;
- Whiskered bat;
- Natterer's bat;
- Leisler's bat;
- Nathusius' pipistrelle
- Common pipistrelle;
- Soprano pipistrelle; and



- Brown long-eared bat;

3.2.2.1 Temporal Distribution

A summary of the results per survey season is provided in Table 11 to illustrate any seasonal variation. Note that while there are differences in detectability between species, raw data have been presented for all species. Between-species comparisons should not be made without adjustments to the raw data to account for these differences in detectability.

Table 11 reports the maximum, mean and median bat passes per night at all locations, for all species combined, for each survey season. The table shows that:

- The highest maximum and median activity level per night was recorded in spring;
- The highest mean activity level per night was recorded in spring;
- The lowest maximum and mean activity level per night was recorded in summer; and
- The lowest median activity level per night was recorded in Autumn.

Table 11 Summary of Results per Season Across All Sample Locations

Season	Maximum Bat Passes per Night	Mean Bat Passes per Night	Median Bat Passes per Night
Spring	1185	381	282
Summer	94	35	28
Autumn	414	48	26

Notwithstanding differences in species detectability, Chart 1 shows that the most frequently recorded species across all survey locations in spring was consistently common pipistrelle, with peak activity recorded on the 13th May 2025. The next most frequently recorded species were Leisler's bat and soprano pipistrelle. Eight species of bat were recorded in spring.

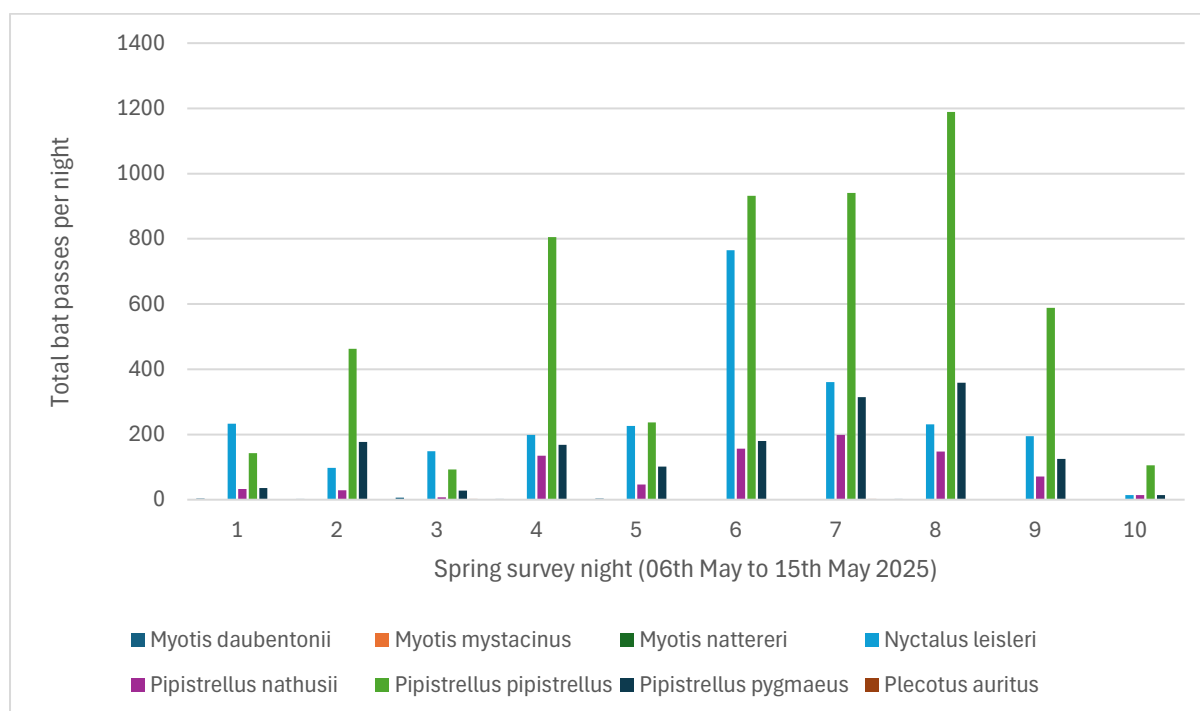


Chart 1 Total Bat Passes Per Night in Spring Across All Detector Locations

Notwithstanding differences in species detectability, Chart 2 shows that the most frequently recorded species across all survey locations in summer was consistently common pipistrelle, with peak activity recorded on the 08th June 2025. The next most frequently recorded species was common pipistrelle. Eight species of bat were recorded in summer.

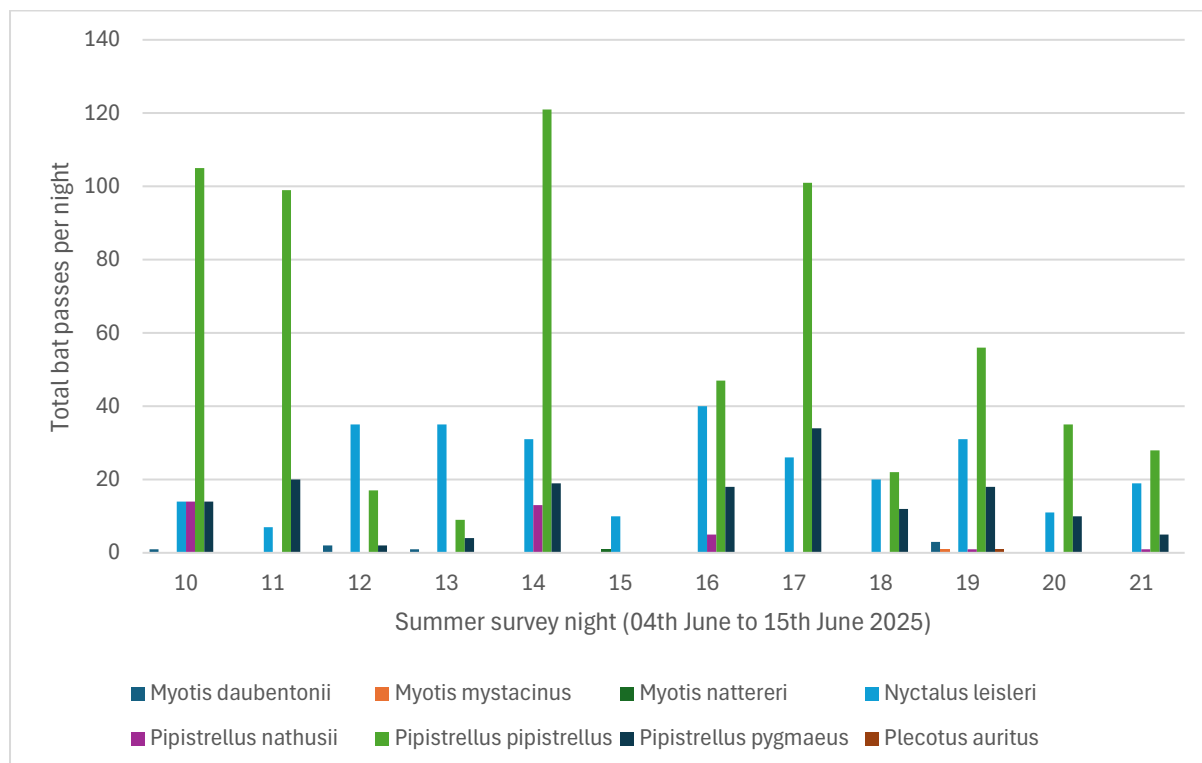


Chart 2 Total Bat Passes Per Night in Summer Across All Detector Locations

Notwithstanding differences in species detectability, Chart 3 shows that the most frequently recorded species across all survey locations in autumn was consistently Leisler's bat, with peak activity recorded on the 20th September 2025. Eight species of bat were recorded in autumn.



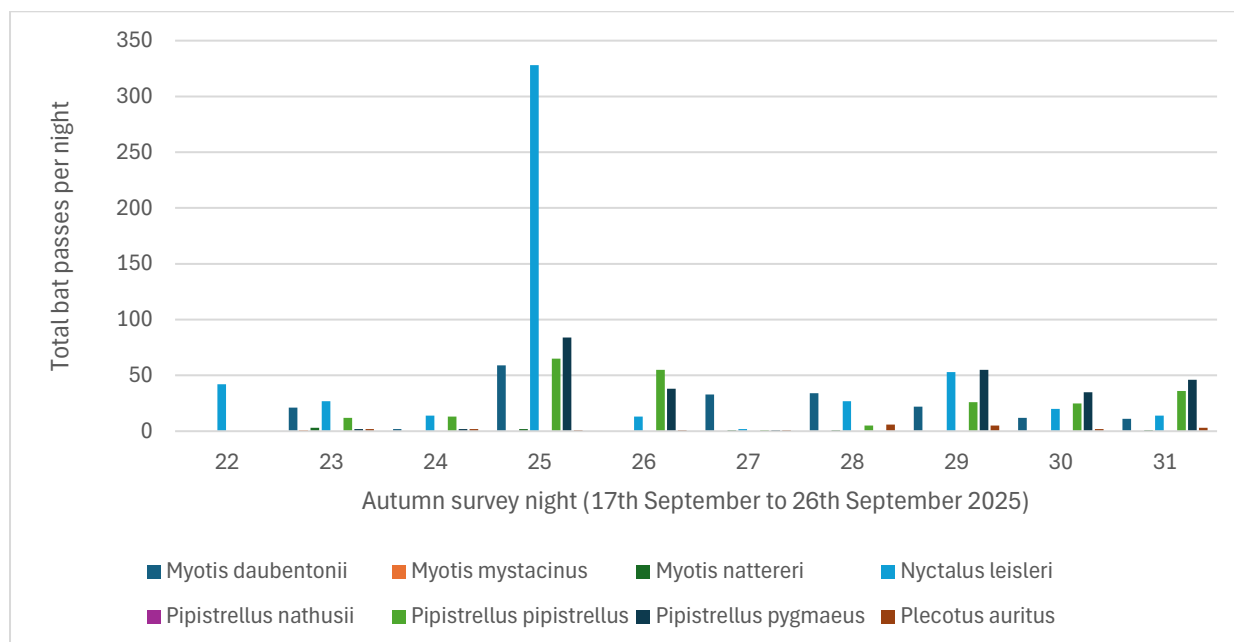


Chart 3 Total Bat Passes Per Night in Autumn Across All Detector Locations

3.2.2.2 Spatial Distribution

Table 12 reports the maximum, mean and median bat passes per night and total bat passes across all nights at each location, for all species combined, across all seasons combined. The total number of bat passes recorded at each location is also provided. The table shows that:

- The highest mean and median activity level per night was recorded at sample location T10;
- The lowest mean and median activity level per night was recorded at sample location T11;
- The greatest amount of activity in any one night (maximum bat passes per night) was recorded at sample location T10, while the lowest was sample location T11.

Table 12 Summary of Results per Sample Location Across All Seasons

Sample Location	Maximum Bat Passes per Night	Mean Bat Passes per Night	Median Bat Passes per Night
T9	780	161	37
T10	1185	198	71
T11	506	59	28

Chart 4 displays the mean number of bat passes per night for all locations split by bat species. Notwithstanding differences in species detectability, it shows that:

- For all locations, common pipistrelle was the most frequently recorded bat species across all seasons combined; and
- The only location where any other bat species was even half as common as common pipistrelle was at sample location T9, where Leisler's bat was the second most frequently recorded bat species.



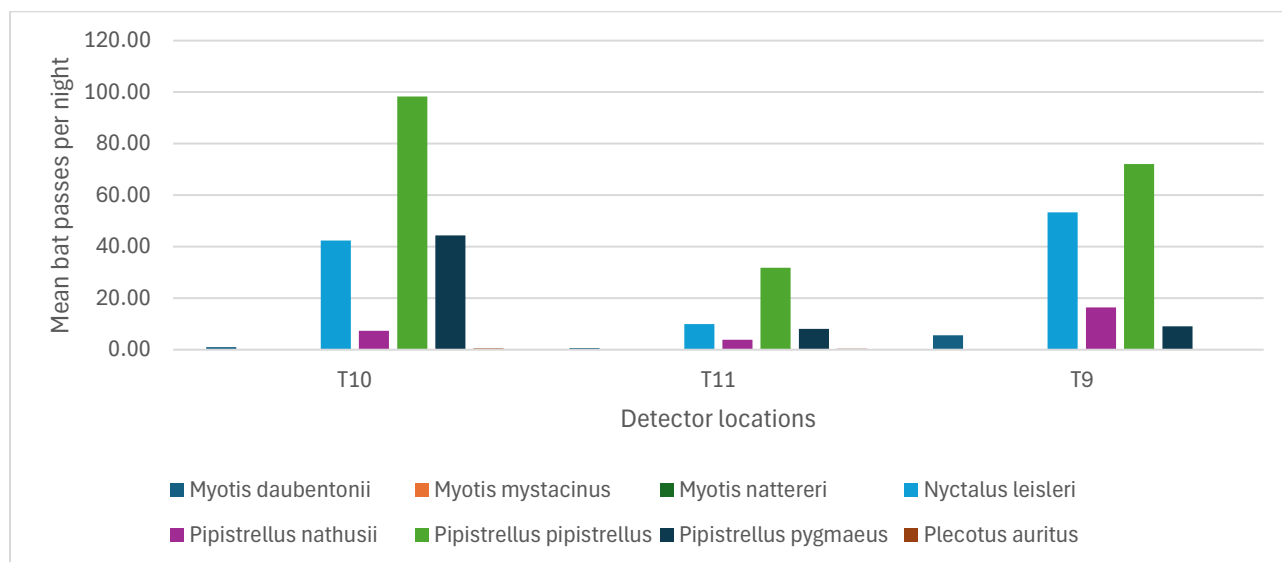


Chart 4 Bat passes at each detector location for each species recorded.

3.2.3 Activity Surveys – Static Bat Detector Survey – High Collision Risk Species

Species considered to be at a higher risk of collision in Ireland, as adapted from current NS guidance², include:

- Common pipistrelle;
- Soprano pipistrelle;
- Nathusius' pipistrelle; and
- Leisler's bat.

All four species were recorded at the project site.

Below each species recorded by the automated bat activity survey has been further analysed with reference to their spatial and temporal distributions.

3.2.3.1 Common Pipistrelle

Temporal Distribution

A summary of the common pipistrelle activity results per survey season is provided in **Table 13**, to illustrate any seasonal variation. **Table 13** reports the maximum, mean and median bat passes per night at all locations, for common pipistrelles, for each survey season. The table shows that:

- Common pipistrelle was recorded across all seasons.
- The highest mean and median activity level per night was recorded in spring;
- The lowest mean and median activity level per night was recorded in autumn; and
- The greatest amount of activity in any one night (maximum bat passes per night) was recorded in spring.



Table 13 Summary of Common Pipistrelle Activity Results Per Season Across All Sample Locations

Season	Maximum Bat Passes per Night	Mean Bat Passes per Night	Median Bat Passes per Night
Spring	1189	599	588
Summer	121	49.54	35
Autumn	65	24.60	19.5

Spatial Distribution

A summary of the common pipistrelle activity results per sample location is provided in **Table 14** and Chart 5 to illustrate any spatial variation within the project site.

Table 14 reports the maximum, mean and median bat passes per night at each location, for common pipistrelles, across all seasons combined. The table shows that:

- Common pipistrelle were recorded across all locations.
- The highest mean and median activity level per night was recorded at location T10;
- The lowest mean and median activity level per night was recorded at location T11; and
- The greatest amount of activity in any one night (maximum bat passes per night) was recorded at location T10.

Table 14 Summary of Common Pipistrelle Results per Sample Location Across All Seasons

Sample Location	Maximum Bat Passes per Night	Mean Bat Passes per Night	Median Passes per Night
T9	527	72	10
T10	620	98	29
T11	270	32	14



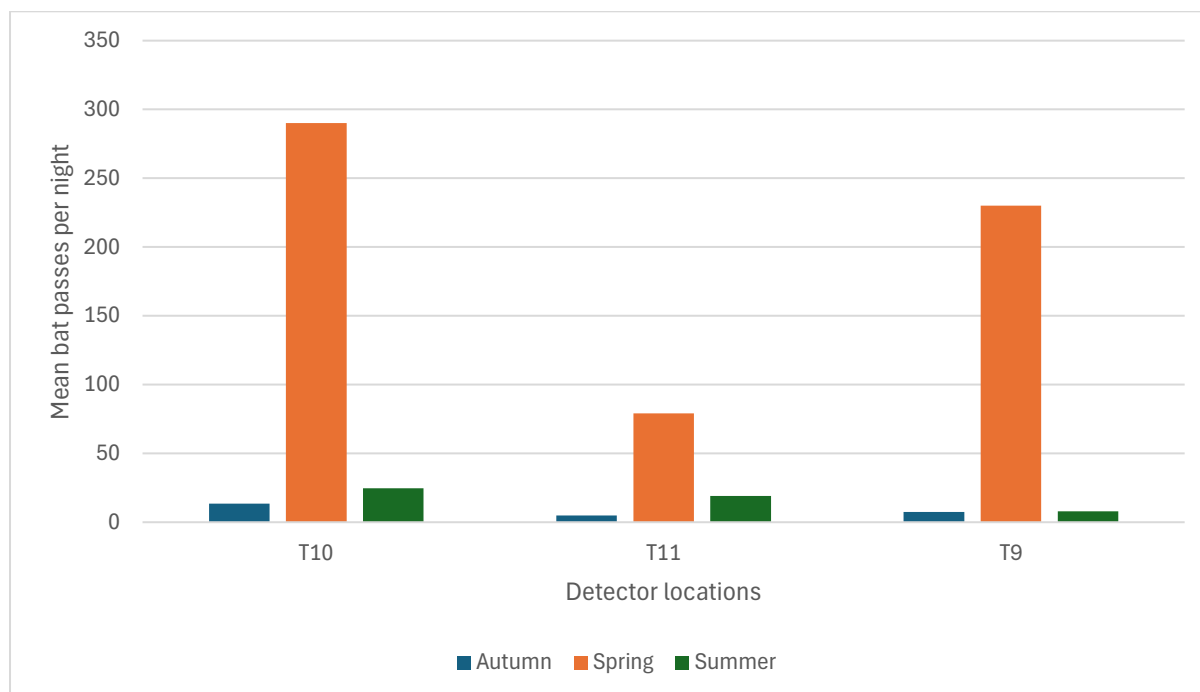


Chart 5 Average Common Pipistrelle Activity Per Sample Location and Season

It is evident from Chart 5 that common pipistrelle was scarcely recorded at locations T9, T10, and T11 in summer and autumn. Activity was highest at location T9, T10, and T11 in spring. Common pipistrelle was recorded across all locations and all seasons.

3.2.3.2 Soprano Pipistrelle

Temporal Distribution

A summary of the Soprano pipistrelle activity results per survey season is provided in **Table 15** to illustrate any seasonal variation. **Table 15** reports the maximum, mean and median bat passes per night at all locations, for soprano pipistrelle, for each survey season. The table shows that:

- Soprano pipistrelle was recorded across all seasons;
- The highest mean and median activity level per night was recorded in spring;
- The lowest mean and median activity level per night was recorded in summer; and
- The greatest amount of activity in any one night (maximum bat passes per night) was recorded in spring.

Table 15 Summary of Soprano Pipistrelle Activity Results Per Season Across All Sample Locations

Season	Maximum Bat Passes per Night	Mean Bat Passes per Night	Median Bat Passes per Night
Spring	359	165	168
Summer	34	13	12
Autumn	84	27	20



Spatial Distribution

A summary of the soprano pipistrelle activity results per sample location is provided in **Table 16** and Chart 6 to illustrate any spatial variation within the project site.

Table 16 reports the maximum, mean and median bat passes per night at each location, for soprano pipistrelles, across all seasons combined. The table shows that:

- Soprano pipistrelle were recorded across all locations;
- The highest mean and median activity level per night was recorded at locations T10;
- The lowest mean and median activity level per night was recorded at location T11 and T9 respectively; and
- The greatest amount of activity in any one night (maximum bat passes per night) was recorded at location T10.

Table 16 Summary of Soprano Pipistrelle Results per Sample Location Across All Seasons

Sample Location	Maximum Bat Passes per Night	Mean Bat Passes per Night	Median Passes per Night
T9	40	9	3
T10	325	45	9
T11	37	8	5

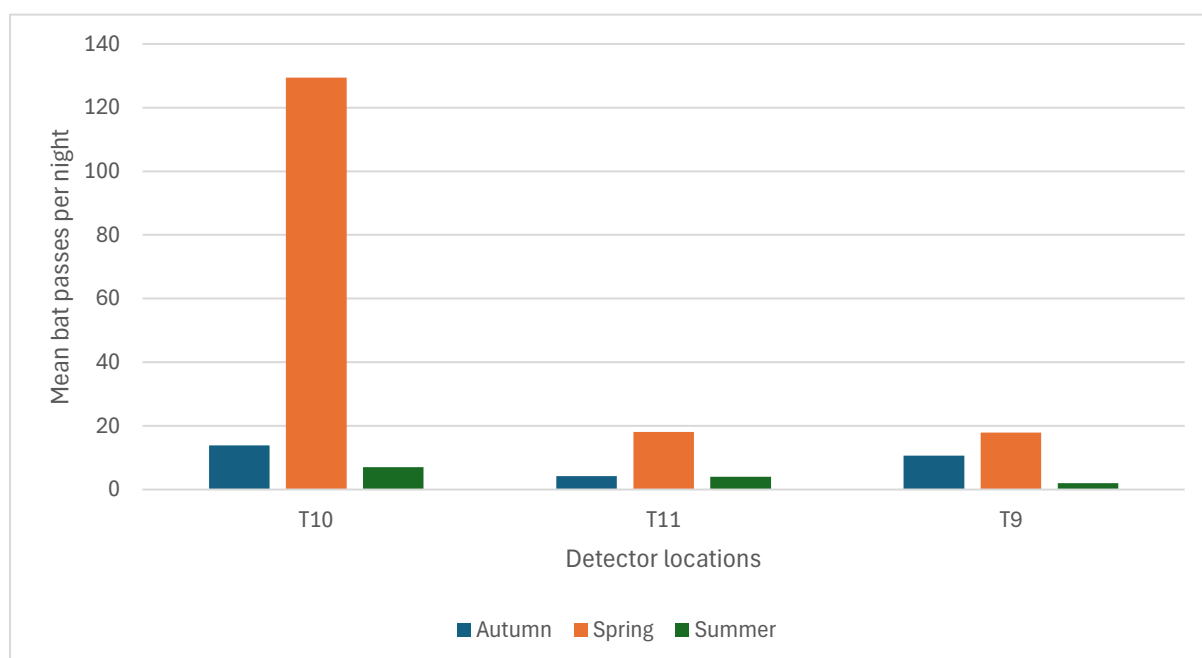


Chart 6 Average Soprano Pipistrelle Activity Per Sample Location and Season

It is evident from Chart 6 that soprano pipistrelle was scarcely recorded at locations T9 and T11 across all seasons. Activity was highest at location T10 in spring. Soprano pipistrelle was recorded at very low levels at all locations in summer and autumn. However soprano pipistrelle was recorded across all locations and all seasons.



3.2.3.3 Nathusius' Pipistrelle

Temporal Distribution

A summary of the Nathusius' pipistrelle activity results per survey season is provided in **Table 17** to illustrate any seasonal variation. **Table 17** reports the maximum, mean and median bat passes per night at all locations, for Nathusius' pipistrelle, for each survey season. The table shows that:

- Nathusius' pipistrelle was recorded across all seasons;
- The highest mean and median activity level per night was recorded in spring;
- The lowest mean and median activity level per night was recorded in summer and autumn; and
- The greatest amount of activity in any one night was recorded in spring.

Table 17 Summary of Nathusius' Pipistrelle Activity Results Per Season Across All Sample Locations

Season	Maximum Bat Passes per Night	Mean Bat Passes per Night	Median Bat Passes per Night
Spring	199	92	71
Summer	15	5	3
Autumn	3	3	3

Spatial Distribution

A summary of the Nathusius' pipistrelle activity results per sample location is provided in **Table 18** and Chart 7, to illustrate any spatial variation within project site.

Table 18 reports the maximum, mean and median bat passes per night at each location, for Nathusius' pipistrelle, across all seasons combined. The table shows that:

- Nathusius' pipistrelle were recorded across all locations;
- The highest mean and median activity level per night was recorded at locations T9 (peatland)
- The lowest mean and median activity level per night was recorded at locations T11, (peatland); and
- The greatest amount of activity in any one night (maximum bat passes per night) was recorded at location T9 (peatland).

Table 18 Summary of Nathusius' Pipistrelle Results per Sample Location Across All Seasons

Sample Location	Maximum Bat Passes per Night	Mean Bat Passes per Night	Median Passes per Night
T9	138	17	1
T10	57	8	1
T11	47	5	1



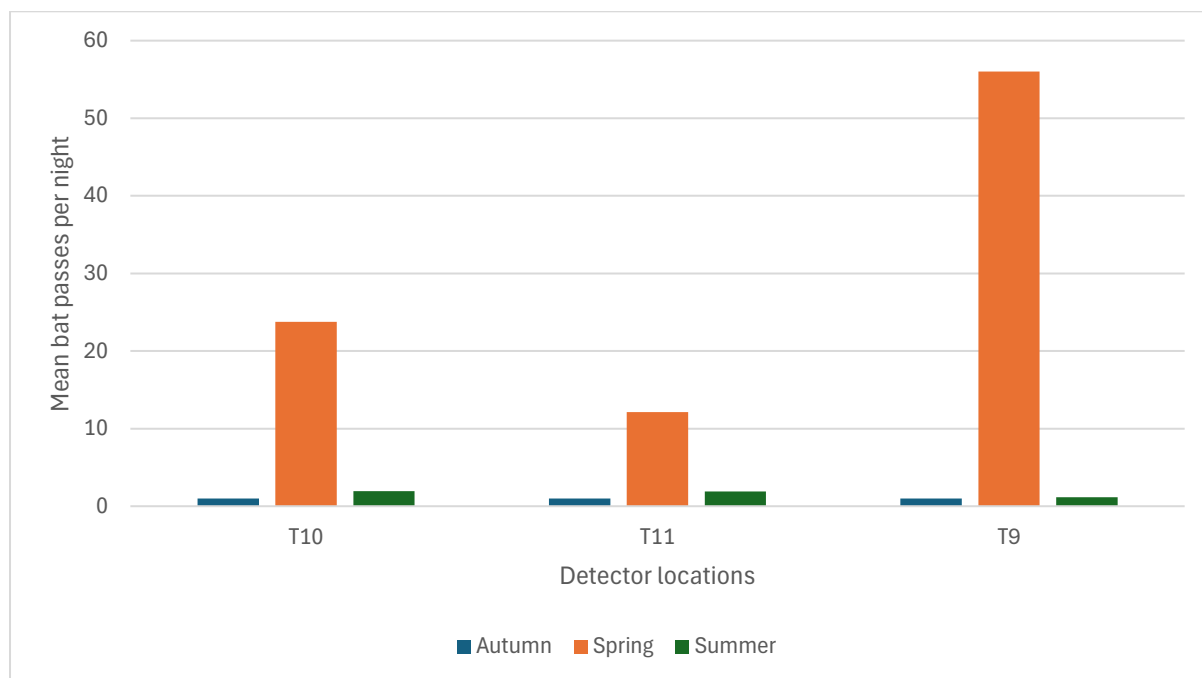


Chart 7 Average Nathusius' Pipistrelle Activity Per Sample Location and Season

It is evident from Chart 7 that Nathusius' pipistrelle was scarcely recorded at all locations in summer and autumn. Activity was highest at all locations in spring, although was still very low overall (i.e. mean of <60 bat passes per night).

3.2.3.1 Leisler's Bat

Temporal Distribution

A summary of the Leisler's bat activity results per survey season is provided in **Table 19** to illustrate any seasonal variation. **Table 19** reports the maximum, mean and median bat passes per night at all locations, for Leisler's bat, for each survey season. The table shows that:

- Leisler's bat was recorded across all seasons.
- The highest mean and median activity level per night was recorded in spring;
- The lowest mean and median activity level per night was recorded in summer; and
- The greatest amount of activity (maximum bat passes per night) in any one night was recorded in spring.

Table 19 Summary of Leisler's bat Activity Results Per Season Across All Sample Locations

Season	Maximum Bat Passes per Night	Mean Bat Passes per Night	Median Bat Passes per Night
Spring	765	273	226
Summer	40	22	20
Autumn	328	54	24



Spatial Distribution

A summary of the Leisler's bat activity results per sample location is provided in **Table 20** and Chart 8, to illustrate any spatial variation within project site.

Table 20 reports the maximum, mean and median bat passes per night at each location, for Leisler's bat, across all seasons combined. The table shows that:

- Leisler's bat were recorded across all locations;
- The highest mean and median activity level per night was recorded at locations T9 and T10 respectively;
- The lowest mean and median activity level per night was recorded at location T11; and
- The greatest amount of activity in any one night (maximum bat passes per night) was recorded at location T9.

Table 20 Summary of Leisler's bat Results per Sample Location Across All Seasons

Sample Location	Maximum Bat Passes per Night	Mean Bat Passes per Night	Median Passes per Night
T9	374	53	10
T10	241	42	15
T11	150	10	4

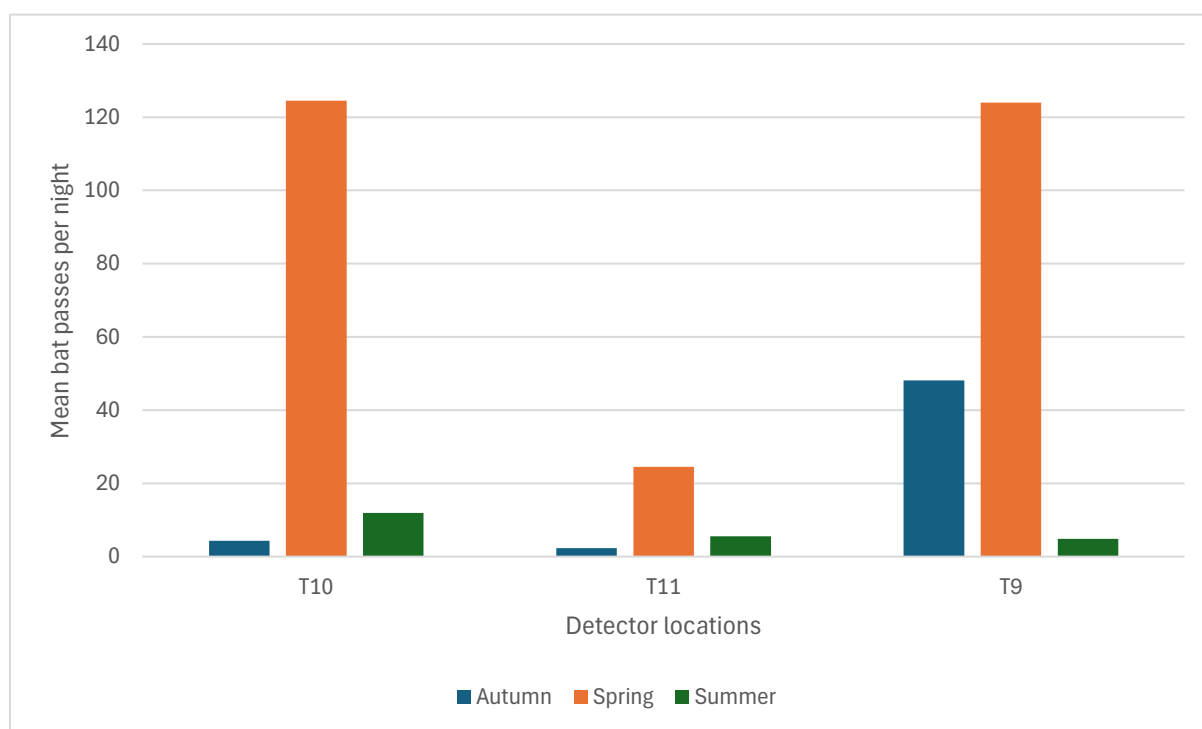


Chart 8 Average Leisler's Bat Activity Per Sample Location and Season

It is evident from Chart 8 that Leisler's bat was scarcely recorded at locations T11 across all seasons.



Activity was highest at locations T10 and T9 in spring. Activity across all locations was low in summer and autumn.

3.2.4 Activity Surveys – Static Bat Detector Survey – Lower Collision Risk Species

A summary of brown long-eared, Daubenton's bat, Natterer's bat and whiskered bat activity results per sample location is provided in Chart 9 to Chart 12, to illustrate any spatial variation within project site. In general, the mean number of bat calls per night across all seasons and turbine locations is very low (mostly <5 calls per night) for all four species.

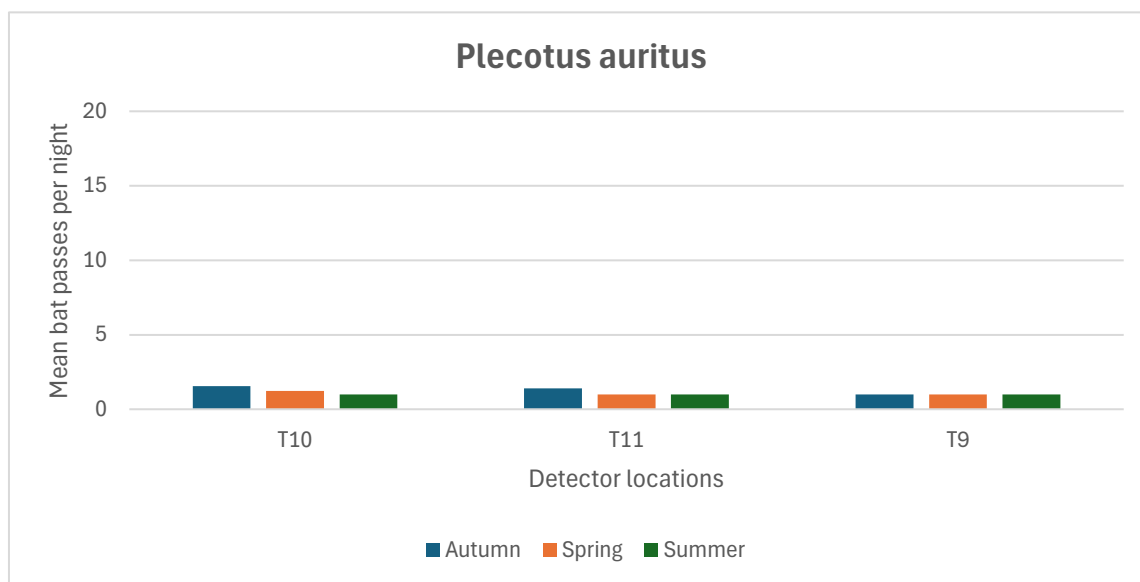


Chart 9 Mean Brown Long-Eared Bat Activity Per Sample Location and Season

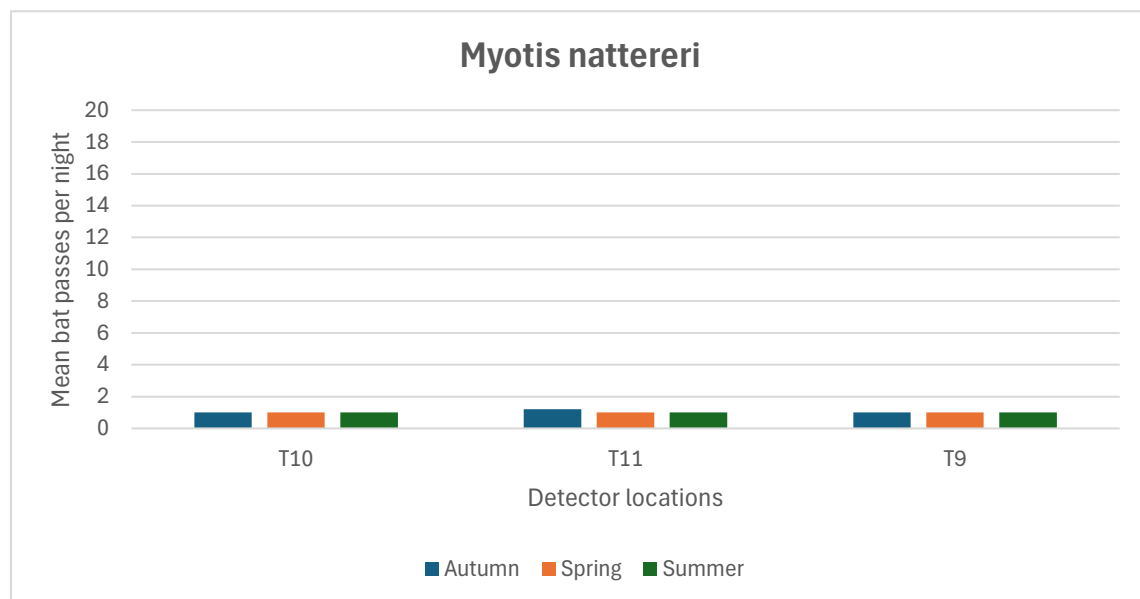


Chart 10 Mean Natterer's Bat Activity Per Sample Location and Season



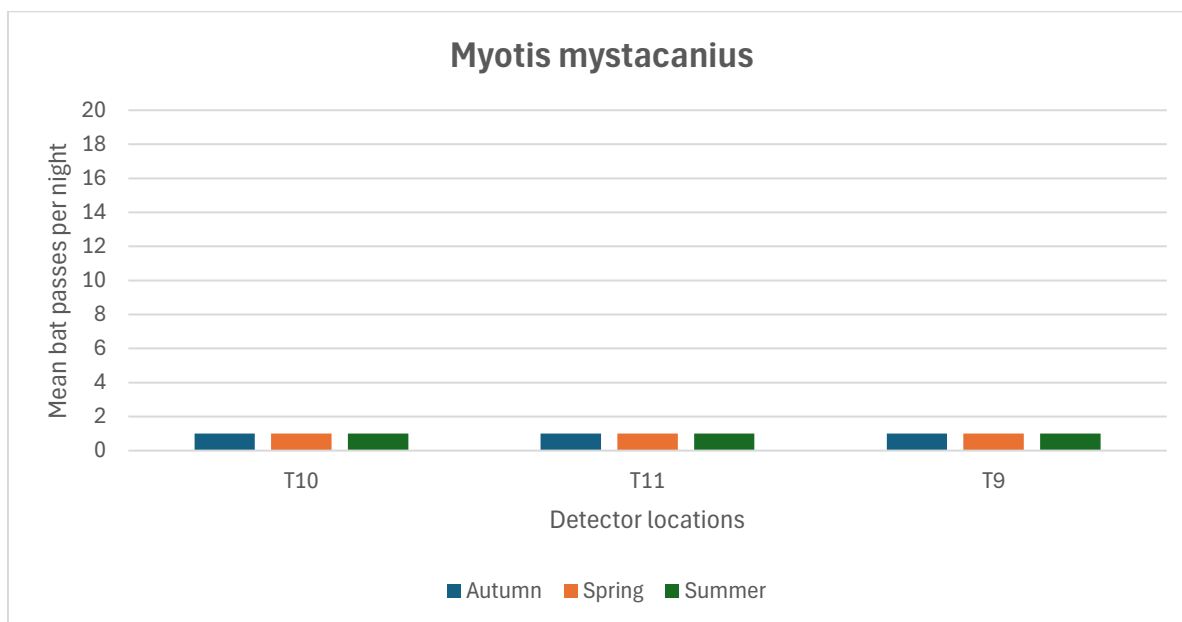


Chart 11 Mean Whiskered Bat Activity Per Sample Location and Season

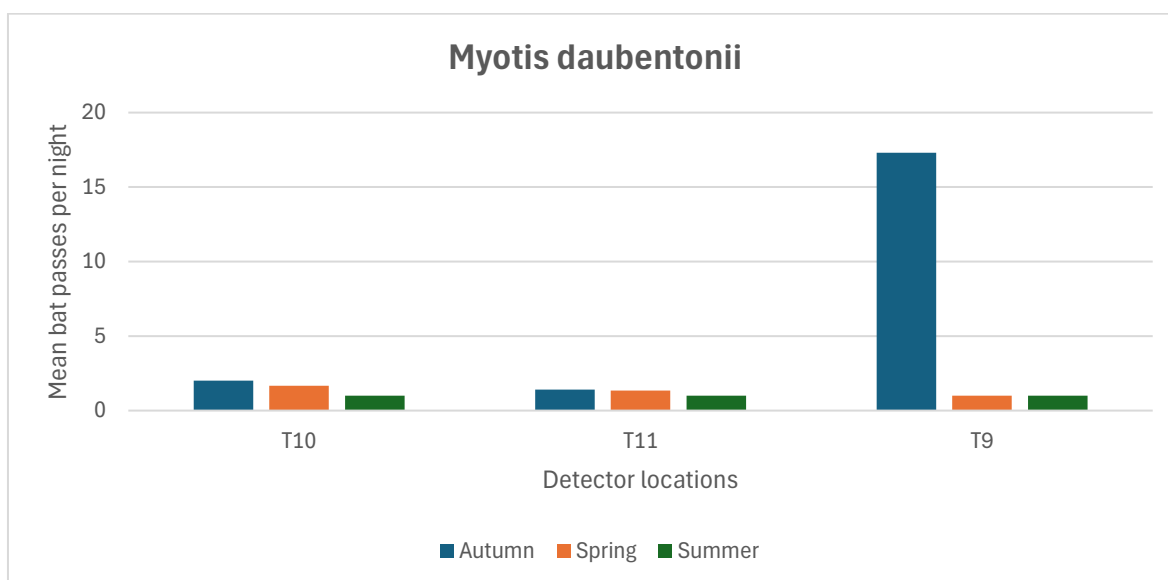


Chart 12 Mean Daubenton's Bat Activity Per Sample Location and Season

4.0 Discussion and Conclusions

4.1 Designated Sites for Bats

There are five pNHAs within 10km of the Site, which are of interest for their populations of Leisler's bat and brown long-eared bat. The distance between these pNHAs and the project site is outside the CSZ for these species. Therefore, the populations for which these pNHAs are designated are not considered to use the Site.



4.2 Habitat and Roost Assessment

The Project Site is dominated by PB4 cutover bog with conifer plantation and agricultural grassland to the south. The Project Site is largely void of linear features except for hedgerows to the south. As such, connectivity to the wider landscape is low. The bog drains may offer some foraging opportunities for bats.

A desktop study showed that 12 recorded bat roosts are located within 10km from the project site. However, none of the recorded roosts have ecological connectivity to the project site i.e., the core sustenance zones (CSZ)²³ as measured from the roost, do not overlap with the project site. The BCI data showed there were no roosts adjacent to the proposed underground electricity line.

Seven species were recorded by transects or as ad-hoc observations: *Myotis daubentonii*, *Myotis nattereri*, *Plecotus auritus*, *Nyctalus leisleri*, *Pipistrellus nathusii*, *Pipistrellus pipistrellus*, *Pipistrellus pygmaeus*, and additionally *Myotis* spp., and *Pipistrellus* spp.

Field surveys also identified no structures with suitability for roosting bats, and no evidence of bats was recorded at any of these.

One PRF-I tree was recorded c. 11m from the proposed UGL. This was a mature, ash with light ivy cover and some minor areas of peeling bark. However, it lacked sufficient shelter and the appropriate conditions to support larger numbers or for maternity and/or winter roosts.

Overall, the project itself was judged to be of 'medium size', which combined with 'moderate risk' habitats within project site, means the Project itself is of 'medium risk' to bat species.

4.3 Overview of Bat Activity

Eight bat species were recorded during the ground-level automated activity surveys conducted in 2025: brown long-eared bat, common pipistrelle, Daubenton's bat, Leisler's bat, Nathusius' pipistrelle, Natterer's bat, soprano pipistrelle and whiskered bat.

4.4 Temporal Distribution of Bat Activity

Bat activity was highest in spring (a mean of 381 bat passes per night) and lowest in summer (a mean of 35 bat passes per night). The difference in activity between the highest and lowest season was 346 bat passes per night on average.

4.5 Spatial Distribution of Bat Activity

Bats were recorded at all detector locations, but generally location T9 and T10 had the greatest number of bat passes per night, across all seasons (161 and 198 mean bat passes per night, respectively). Location T11 had the lowest number of bat passes per night across all seasons (mean of 59 bat passes per night).

²³ A CSZ as applied to bats, refers to the area surrounding a communal bat roost within which habitat availability and quality will have a significant influence on the resilience and conservation status of the colony using the roosts. If bat commuting and foraging habitats within the CSZ are affected by the project, then this could affect bats using the roost. Core_Sustenance_Zones_Explained_04.02.16.pdf (bats.org.uk) [Last accessed October 2023]



4.6 'High Collision Risk' Bat Species

4.6.1 Activity Survey – Static Detector (Ground-Level)

All four Irish 'high collision risk' species were recorded during surveys: common pipistrelle, Leisler's bat, Nathusius' pipistrelle and soprano pipistrelle.

Common pipistrelle was the most frequently recorded species, with a peak activity (largest number of calls per night) of 620 calls recorded at location T10 in the spring season, and the greatest mean was 98 calls per night at T10 across all seasons.

Soprano pipistrelle was the next most frequently recorded species, with a peak activity (largest number of calls per night) recorded at location T10 in the spring season and the greatest mean of 165 calls per night in spring.

Leisler's bat was the third most frequently recorded species, with a peak activity (largest number of calls per night) recorded at location T9 in the spring season and the greatest mean of 273 calls per night in spring.

Nathusius' pipistrelle was the most infrequently recorded 'high collision risk' species, with a peak activity (largest number of calls per night) recorded at location T9 in the spring season (199 calls). However, the mean number of calls was relatively low with the greatest mean of 17 calls per night at location T9). Only 3 calls were recorded in the autumn season.

4.6.2 Assessment of Relative Bat Activity Levels

To inform any resulting impact assessment, information on bat activity levels and site risk are presented below.

4.6.2.1 Bat Activity Categories

Relative bat activity levels have been assessed following NS guidance². Full Ecobat reports are included in Appendix F.

Below in Table 21 is a summary of key results for high collision risk species, showing all sampling locations with high median and maximum levels of bat activity per season. While both metrics provide useful information on bat activity, the median should be used to determine whether activity is consistently high or not.

Table 21 Sample Locations with High Bat Activity Levels

Sample Location	Season	Species with Moderate-High or High Maximum Activity Levels (* denotes those where the confidence level is <200)	Species with Moderate-High or High Median Activity Levels (* denotes those where the confidence level is <200)
T9	Spring	Myotis mystacinus* Nyctalus leisleri Pipistrellus nathusii Pipistrellus pipistrellus	Myotis mystacinus* Pipistrellus nathusii
	Summer	Plecotus auritus*	Plecotus auritus*
	Autumn	Myotis daubentonii* Nyctalus leisleri Pipistrellus pygmaeus	Myotis daubentonii*
T10	Spring	Myotis daubentonii* Nyctalus leisleri	Myotis daubentonii* Plecotus auritus*



Sample Location	Season	Species with Moderate-High or High Maximum Activity Levels (* denotes those where the confidence level is <200)	Species with Moderate-High or High Median Activity Levels (* denotes those where the confidence level is <200)
		Pipistrellus pipistrellus Pipistrellus pygmaeus Plecotus auritus*	
	Summer	Myotis daubentonii* Myotis mystacinus* Myotis nattereri* Nyctalus leisleri Pipistrellus nathusii* Pipistrellus pipistrellus Pipistrellus pygmaeus*	Myotis daubentonii* Myotis mystacinus* Myotis nattereri* Nyctalus leisleri Pipistrellus nathusii* Pipistrellus pygmaeus*
	Autumn	Pipistrellus pipistrellus Pipistrellus pygmaeus Plecotus auritus*	Pipistrellus pipistrellus Pipistrellus pygmaeus Plecotus auritus*
T11	Spring	Myotis daubentonii* Myotis mystacinus*	Myotis mystacinus*
	Summer	Myotis daubentonii* Nyctalus leisleri Pipistrellus nathusii* Pipistrellus pipistrellus Pipistrellus pygmaeus*	Myotis daubentonii* Nyctalus leisleri Pipistrellus nathusii* Pipistrellus pygmaeus*
	Autumn	Myotis mystacinus* Myotis nattereri* Pipistrellus pipistrellus Plecotus auritus*	Myotis mystacinus Myotis nattereri

Consistently high median activity for Nathusius' pipistrelle was recorded at sample location T9 (spring). Consistently high median activity for Leisler's bat was recorded at T10 (summer) and T11 (summer). Consistently high median activity for common pipistrelle was recorded at T10 (autumn). Consistently high median activity for soprano pipistrelle was recorded at T10 (autumn).

High maximum nightly activity was recorded for Nyctalus leisleri at T9 (spring), T10 (spring), and T11 (summer); Pipistrellus nathusii T9 (spring); Pipistrellus pipistrellus T9(spring), T10 (spring and summer), T11 (summer and autumn), and Pipistrellus pygmaeus T9 (autumn) and T10 (spring, autumn).

4.6.2.2 Site Risk – Project Size

The criteria for assessing project size are evaluated below using NS guidance:

- **Number of turbines:** Three turbines, which corresponds with a 'small' rating;
- **Presence of other wind energy developments within 5km:** six permitted wind farm projects which corresponds with a 'medium' or 'large' rating; and
- **Turbine tip height:** 199.1m to 200m, which corresponds to a 'large' rating.

Overall, given the criteria above the Project is of 'medium' size.



4.6.2.3 Site Risk – Habitat Risk

The criteria for assessing habitat risk are evaluated below using NS guidance:

- **Roost features:** The closest roost is situated ca. 4.43km west of the nearest turbine. This corresponds to a 'low' rating;
- **Foraging habitats:** assessed as 'low' rating, based on habitat data;
- **Connectivity:** Isolated site not connected to the wider landscape by prominent linear features. This corresponds to a 'low' rating;
- **Range edges / flyways:** the project site is at the range edge (the definition of range used here is the Extent of Occurrence) for Nathusius' pipistrelle, Natterer's bat, and whiskered bat. This corresponds to a 'high' rating; and

Overall, given the criteria above the habitat risk for the Project is '**moderate**' risk.

4.6.2.4 Site Risk – Overall

The overall site risk is based on Table 3a of the NatureScot guidance (reproduced in Table 22 below, which gives an overall stage 1 initial site risk assessment of 3, which corresponds to a '**medium (3)**' site risk for bats.

Table 22 - Table 3a: Stage 1 - Initial site risk assessment (NatureScot, 2021)

Site Risk Level (1-5)*	Project Size Small	Project Size Medium	Project Size Large
Habitat Risk Low	1	2	3
Habitat Risk Moderate	2	3	4
Habitat Risk High	3	4	5

Key: 1-2=low site risk, 3=medium site risk, 4-5=high site risk

4.6.2.5 Overall Risk

The overall risk is obtained by multiplying the site risk by the Ecobat activity category.

Overall, Leisler's bat, common pipistrelle, soprano pipistrelle, and Nathusius' pipistrelle reached the **high** overall risk category.

Leisler's bat reached a high overall risk score at T9 during spring and autumn (overall risk score = 15 using max activity), and T10 in spring and summer (overall risk score = 15 using max activity), and T11 in summer (overall risk score = 15 using max activity).

Common pipistrelle reached a high overall risk score at T10 in spring, summer and autumn (overall risk score = 15 using max activity), and T11 in summer and autumn (overall risk score = 15 using max activity), and T10 in autumn (overall risk score = 15 using median activity).

Soprano pipistrelle reached a high overall risk score at T10 in spring, and T9 and 10 in autumn (each an overall risk score = 15 using max activity).

Nathusius' pipistrelle reached a high overall risk score at T9 during spring (overall risk score = 15 using max activity).



Table 23 Overall Risk Score - Max Percentile

Season	Detector	Species	Max Percentile	Activity Class	Ecobat Activity Category	Site Risk	Overall Risk
Spring	T10	Nyctalus leisleri	86	High	5	3	15
		Pipistrellus pipistrellus	100	High	5	3	15
		Pipistrellus pygmaeus	100	High	5	3	15
	T9	Nyctalus leisleri	100	High	5	3	15
		Pipistrellus nathusii	100	High	5	3	15
Summer	T10	Nyctalus leisleri	100	High	5	3	15
		Pipistrellus pipistrellus	100	High	5	3	15
	T11	Nyctalus leisleri	100	High	5	3	15
		Pipistrellus pipistrellus	100	High	5	3	15
Autumn	T10	Pipistrellus pipistrellus	100	High	5	3	15
		Pipistrellus pygmaeus	100	High	5	3	15
	T11	Pipistrellus pipistrellus	85	High	5	3	15
	T9	Nyctalus leisleri	100	High	5	3	15
		Pipistrellus pygmaeus	83	High	5	3	15

Table 24 Overall Risk Score - Median Percentile

Season	Detector	Species	Max Percentile	Activity Class	Ecobat Activity Category	Site Risk	Overall Risk
Autumn	T10	Pipistrellus pipistrellus	85	High	5	3	15

4.6.2.6 Other Bat Species

While brown long-eared bat, Daubenton's bat, Natterer's bat and whiskered bat were also recorded, these species are at low risk of collision with turbines due to their flight and foraging behaviour. They were all recorded at much lower frequencies than soprano pipistrelle, Leisler's bat or common pipistrelle by both static detector and transect surveys and therefore, project site does not represent important foraging or roosting habitats for them, making them unlikely to be negatively affected by any loss of habitat through wind farm construction or decommissioning.



5.0 References

Collins, J. (edn.) (2023) Bat Surveys for Professional Ecologists: Good Practice Guidelines (4th edition). The Bat Conservation Trust, London.

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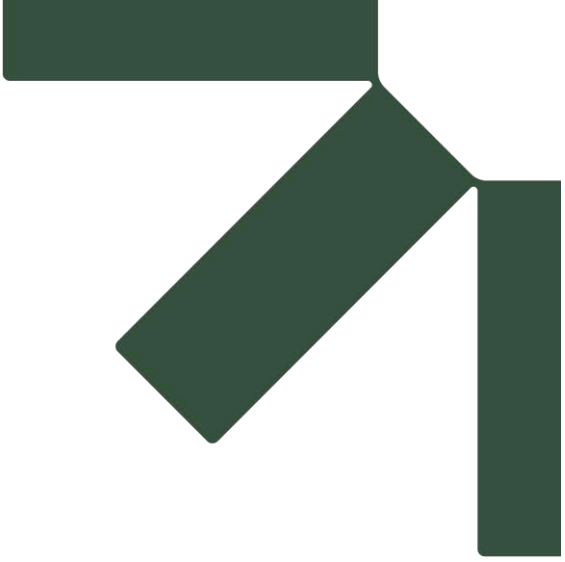
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Rodrigues, L., Bach, M.-J., Dubourg-Savage, B., Karapandža, D., Kovac, T., Kervyn, J., Dekker, A., Kepel, P., Bach, J., Collins, C., Harbusch, C., Park, K., Micevski, B. and Minderman, J., 2015. Guidance for Consideration of Bats in Wind Farm Projects - Revision 2014. EUROBATs Publication Series No. 6 (English Version). UNEP/EUROBATs Secretariat, Bonn.

Lintott, P. R., Davison, S., Breda, J., Kubasiewicz, L., Dowse, D., Daisley, J. & Mathews, F. (2018). Ecobat: An online resource to facilitate transparent, evidence-based interpretation of bat activity data. *Ecology and Evolution* 8(2): 935-941.

Lundy MG, Aughney T, Montgomery WI, Roche N (2011) Landscape conservation for Irish bats & species specific roosting characteristics. Bat Conservation Ireland.





Appendix A Figures

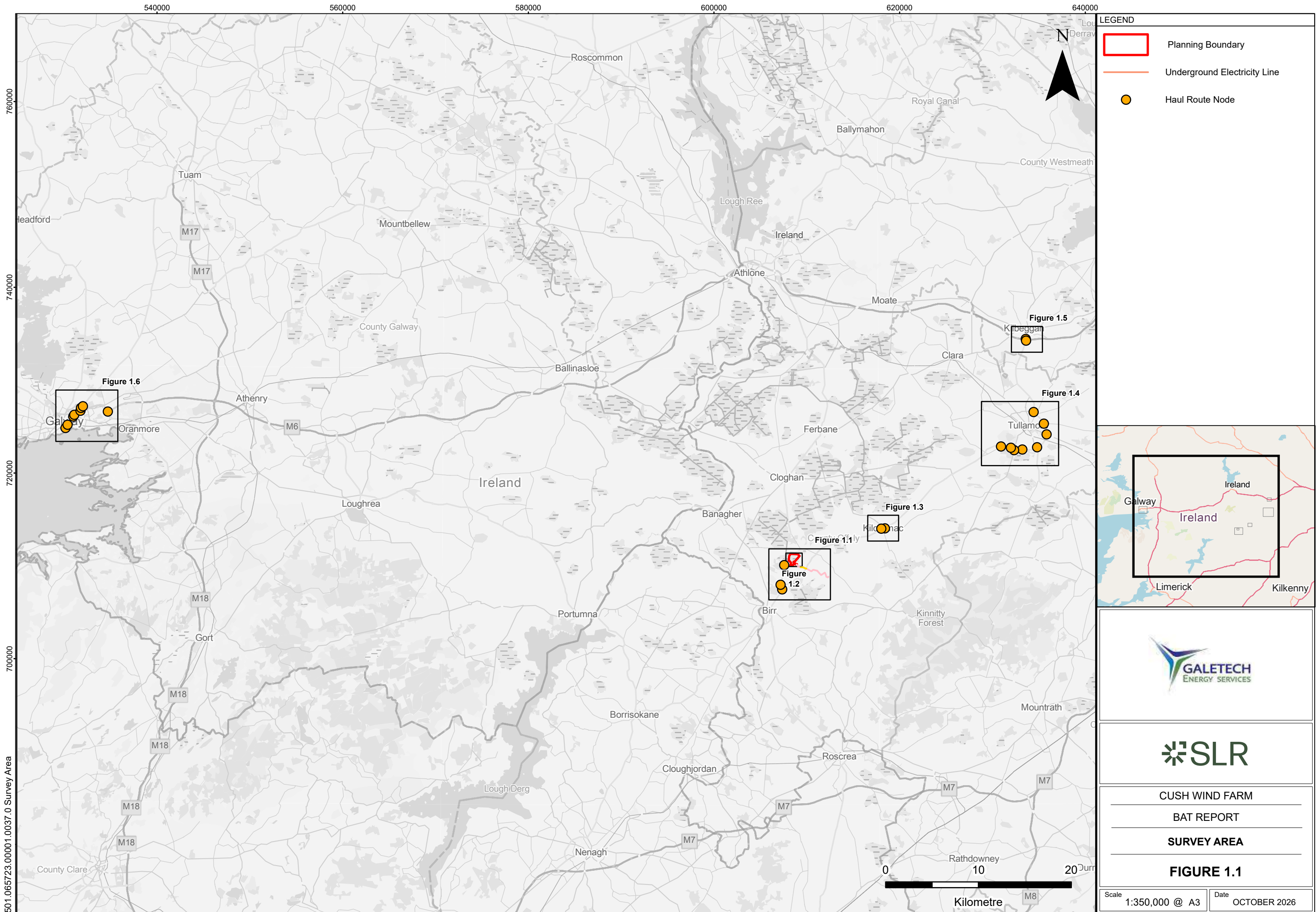
Baseline Bat Survey Report

Cush Wind Farm Phase III

Cush Wind Limited

SLR Project No.: 501.065723.00001

21 October 2026



LEGEND

Planning Boundary

Underground Electricity Line

Haul Route Node



CUSH WIND FARM

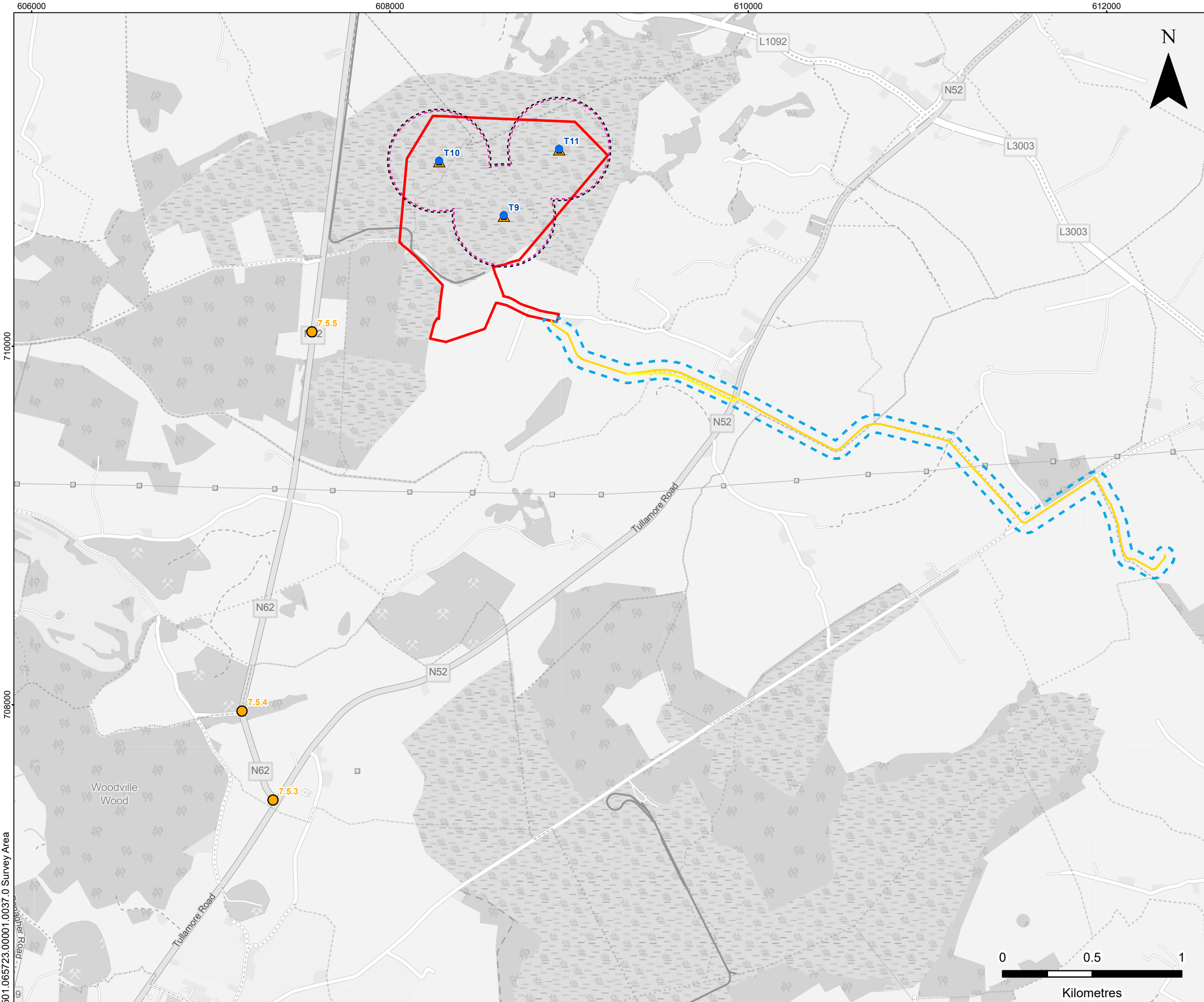
BAT REPORT

SURVEY AREA

FIGURE 1.1

Scale 1:350,000 @ A3

Date OCTOBER 2026



LEGEND

- Planning Boundary
- Turbine Layout
- Turbine 279 m Buffer
- Turbine 287.5 m Buffer
- Underground electricity line
- Underground electricity line 50 m Buffer
- Haul Route Node
- Bat Static Detector Location



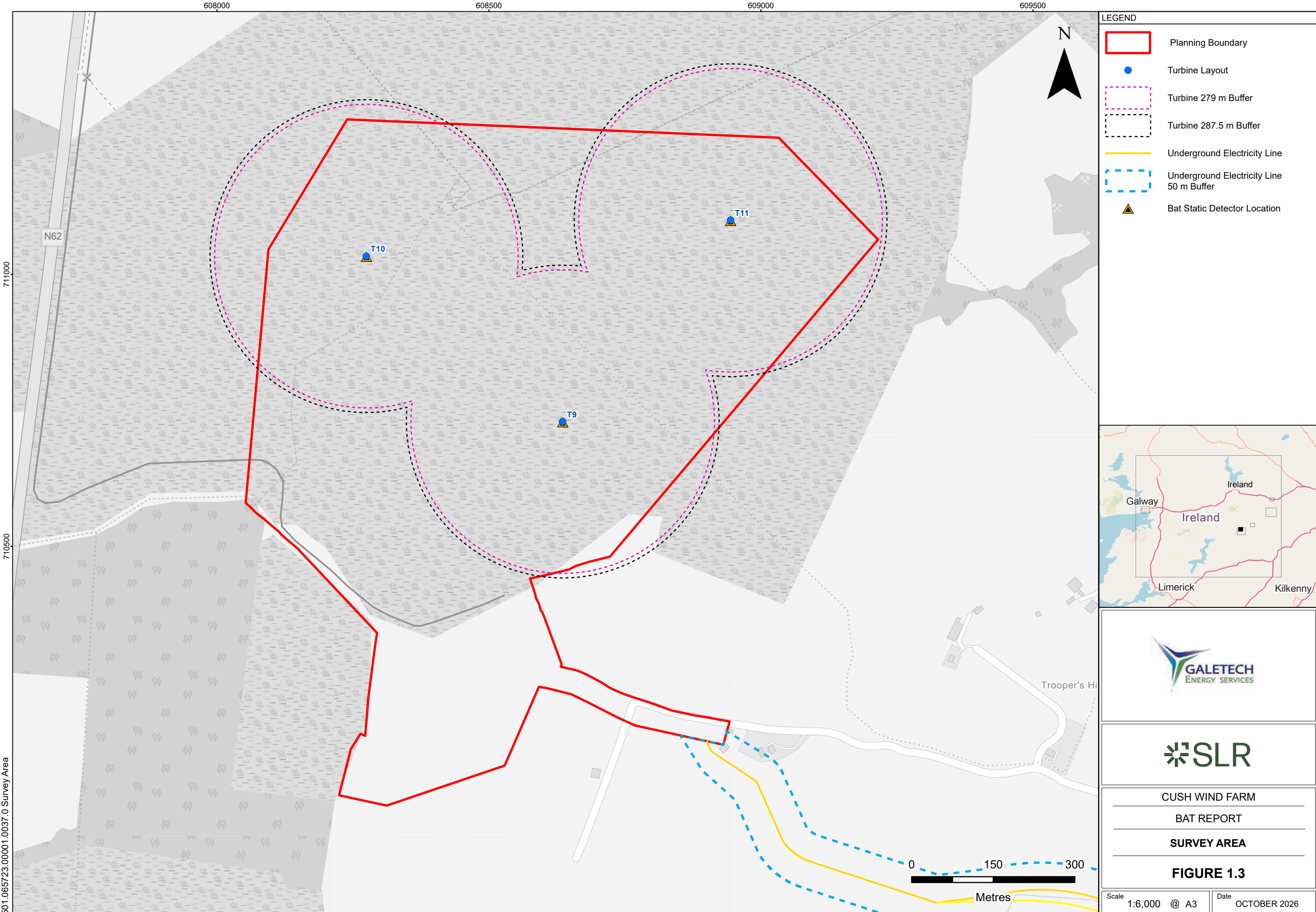
CUSH WIND FARM

BAT REPORT

SURVEY AREA

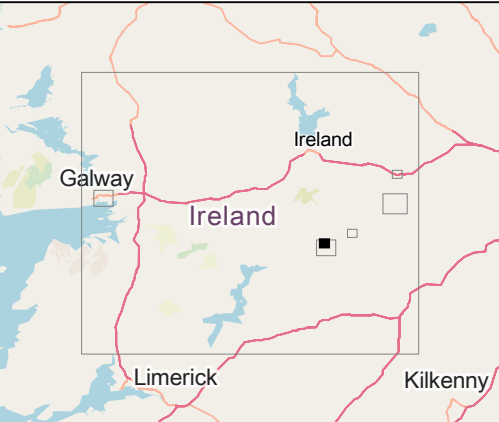
FIGURE 1.2

Scale	1:20,000 @ A3	Date	OCTOBER 2026
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LEGEND

- Planning Boundary
- Turbine Layout
- Turbine 279 m Buffer
- Turbine 287.5 m Buffer
- Underground Electricity Line
- Underground Electricity Line 50 m Buffer
- Bat Static Detector Location



CUSH WIND FARM

BAT REPORT

SURVEY AREA

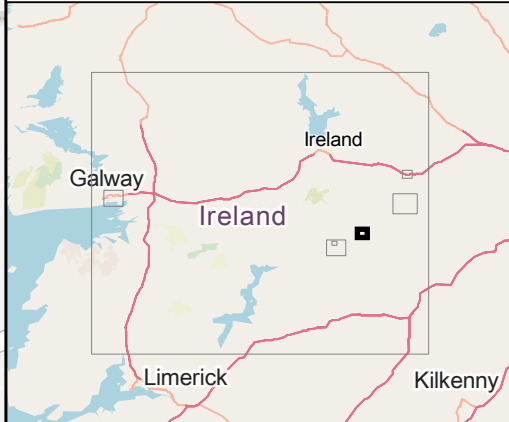
FIGURE 1.3

Scale 1:6,000 @ A3 Date OCTOBER 2026



LEGEND

Haul Route Node



CUSH WIND FARM

BAT REPORT

SURVEY AREA

FIGURE 1.4

Scale	1:10,000 @ A3	Date	OCTOBER 2026
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LEGEND

 Haul Route Node



CUSH WIND FARM

BAT REPORT

SURVEY AREA

FIGURE 1.5

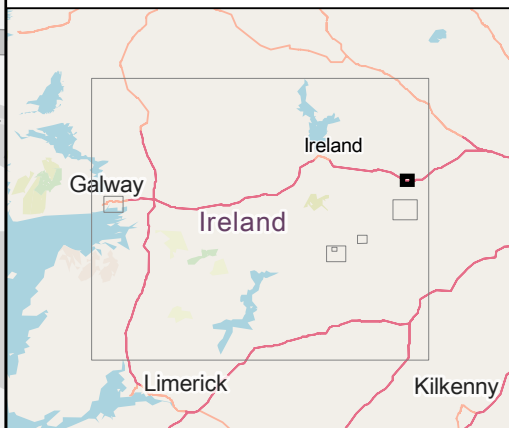
Scale	1:25,000 @ A3	Date	OCTOBER 2026
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501.065723.00001.0037.0 Survey Area



LEGEND

Haul Route Node



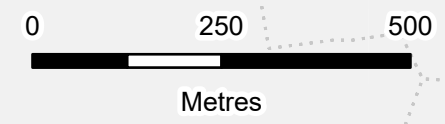
CUSH WIND FARM

BAT REPORT

SURVEY AREA

FIGURE 1.6

Scale	1:10,000 @ A3	Date	OCTOBER 2026
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501.065723.00001.0037.0 Survey Area



LEGEND

 Haul Route Node







CUSH WIND FARM

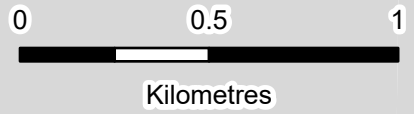
BAT REPORT

SURVEY AREA

FIGURE 1.7

Scale 1:20,000 @ A3

Date OCTOBER 2026

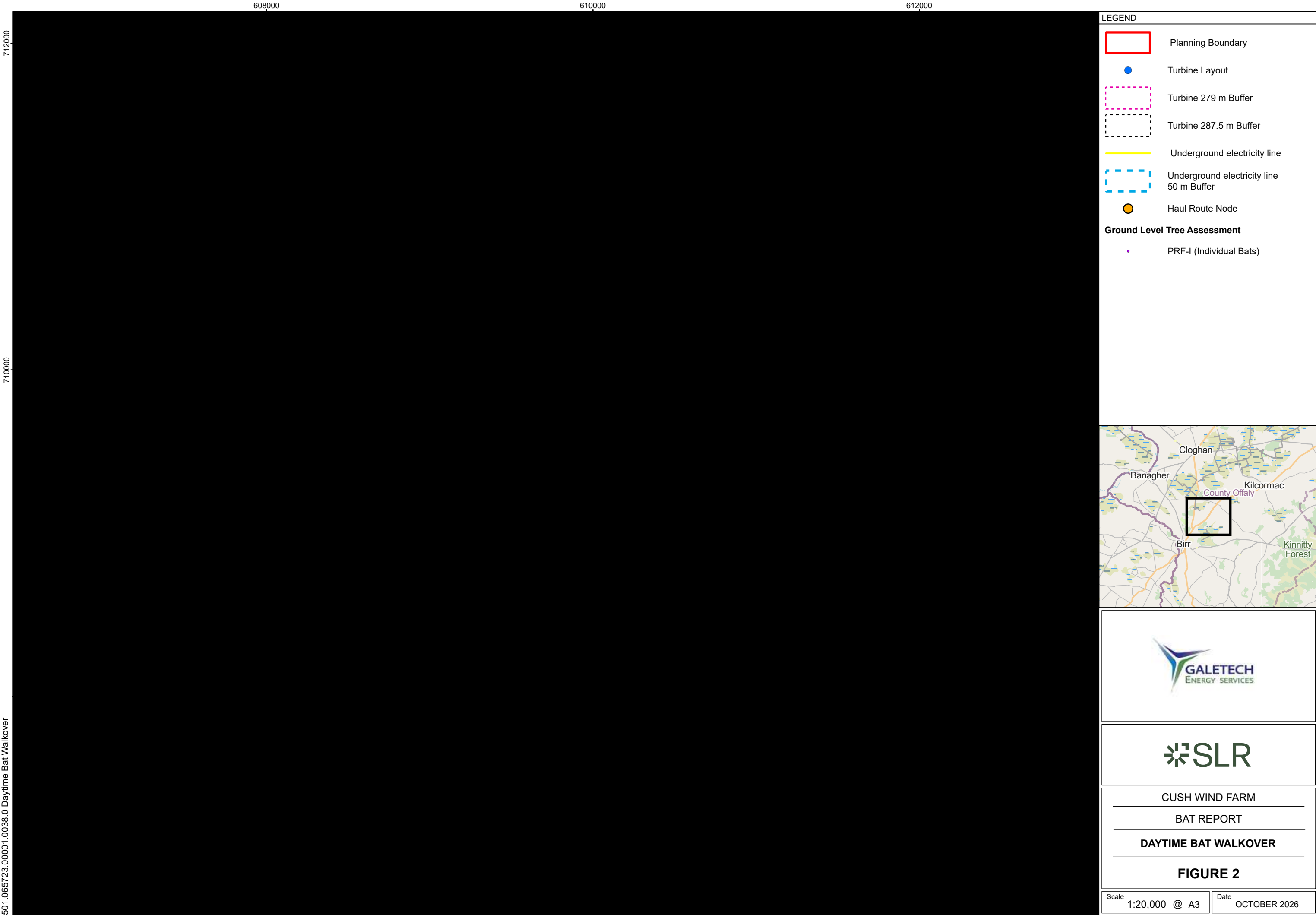


501.065723.00001.0037.0 Survey Area



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LEGEND

Planning Boundary

Turbine Layout

Turbine 279 m Buffer

Turbine 287.5 m Buffer

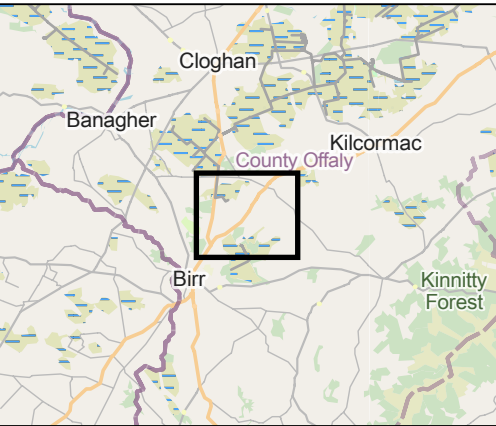
Underground electricity line

Underground electricity line
50 m Buffer

Haul Route Node

Ground Level Tree Assessment

PRF-I (Individual Bats)



CUSH WIND FARM

BAT REPORT

DAYTIME BAT WALKOVER

FIGURE 2

Scale	1:20,000 @ A3	Date	OCTOBER 2026
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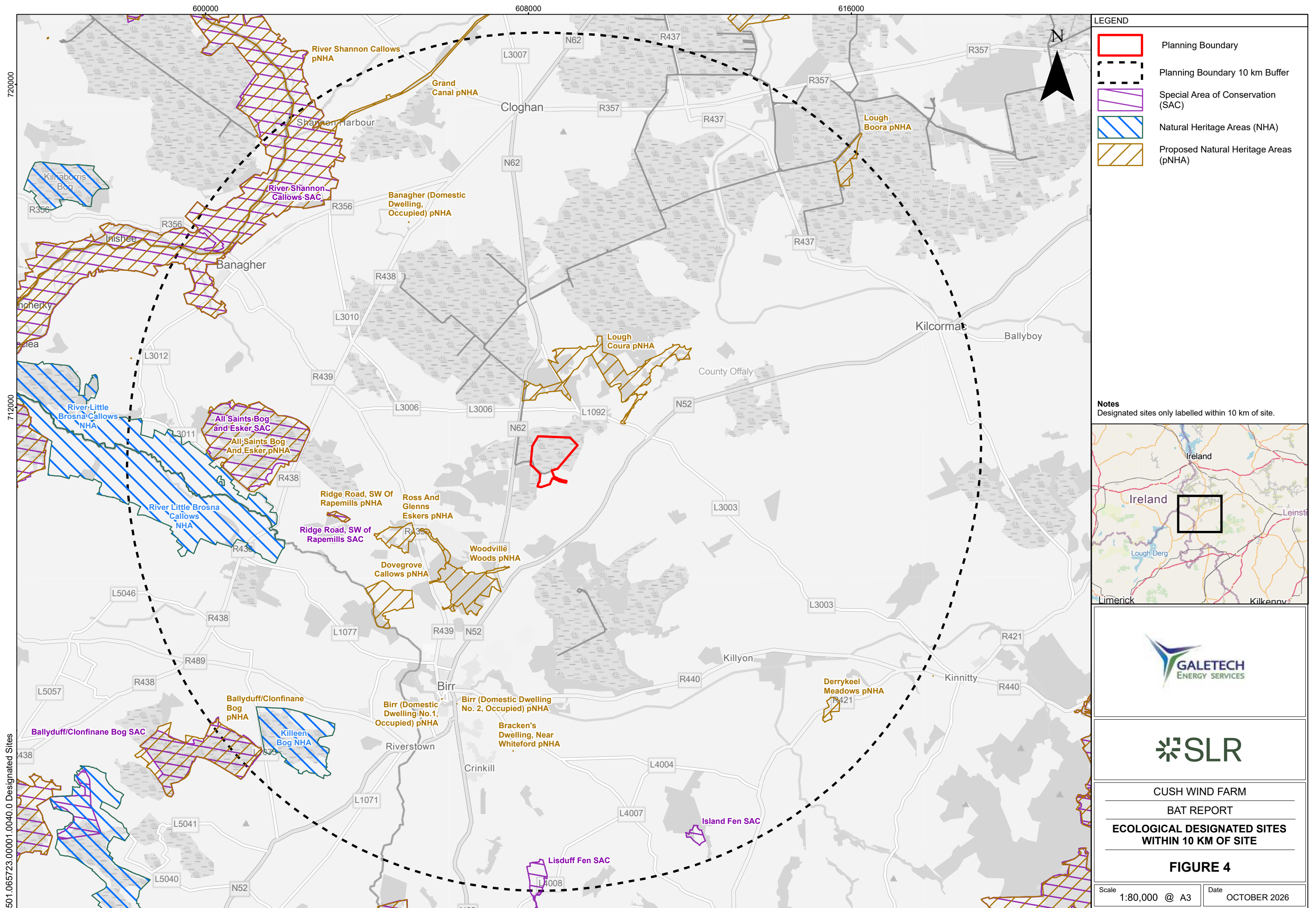
CUSH WIND FARM

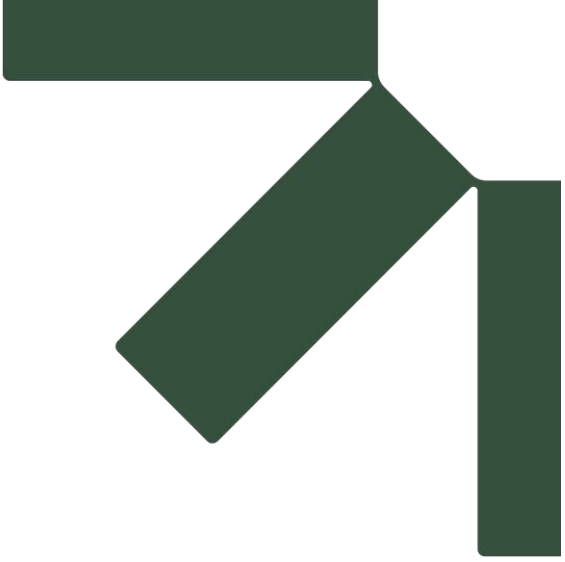
BAT REPORT

BAT CONSERVATION
IRELAND DATA

FIGURE 3

Scale	1:80,000 @ A3	Date	OCTOBER 2026
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Appendix B Criteria for Assessing Habitat Risk for Bats

Baseline Bat Survey Report

Cush Wind Farm Phase IIII

Cush Wind Limited

SLR Project No.: 501.065723.00001

21 October 2026

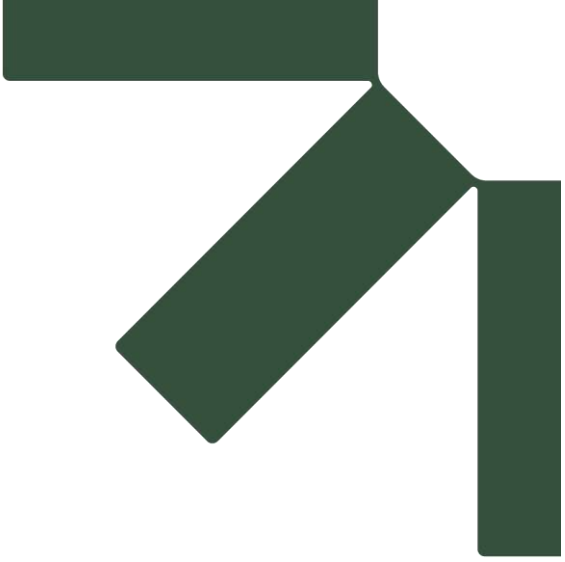
B.1 Criteria for Assessing Habitat Risk for Bats

Table B 1 was taken from the latest NatureScot guidance⁴.

Table B 1: Bat Habitat Risk

Habitat Risk	Description
Low	<ul style="list-style-type: none">• Small number of potential roost features, of low quality• Low quality foraging habitat that could be used by small numbers of foraging bats• Isolated site not connected to the wider landscape by prominent linear features
Moderate	<ul style="list-style-type: none">• Buildings, trees or other structures with moderate-high potential as roosts sites on or near the site• Habitats could be used extensively by foraging bats• Site is connected to the wider landscape by linear features such as scrub, tree lines and streams
High	<ul style="list-style-type: none">• Numerous suitable buildings, trees (particularly mature ancient woodland) or other structures with moderate-high potential as roost sites on or near the site, and/or confirmed roosts present close to or on the site• Extensive and diverse habitat mosaic of high quality for foraging bats• Site is connected to the wider landscape by a network of strong linear features such as rivers, blocks of woodland and mature hedgerows• At/near edge of range and/or on an important flyway• Close to key roost and/or swarming site





Appendix C Collision Risk, Relative Abundance and Overall Population Vulnerability of Bat Species in Ireland

Baseline Bat Survey Report

Cush Wind Farm Phase III

Cush Wind Limited

SLR Project No.: 501.065723.00001

21 October 2026

C.1 Population Vulnerability of Irish Bat Species

Table C 1 below is adapted from NS guidance²⁴ using data from the latest Irish red list²⁴. Red indicates high population vulnerability, orange medium and yellow low population vulnerability.

Table C 1: Collision Risk x Relative Abundance

	Ireland	Collision Risk		
		Low	Medium	High
Relative abundance	Common species			Common pipistrelle Soprano pipistrelle
	Rarer species	Brown long eared bat Daubenton's bat Lesser horseshoe		Leisler's bat
	Rarest species	Natterer's bat Whiskered bat		Nathusius' pipistrelle

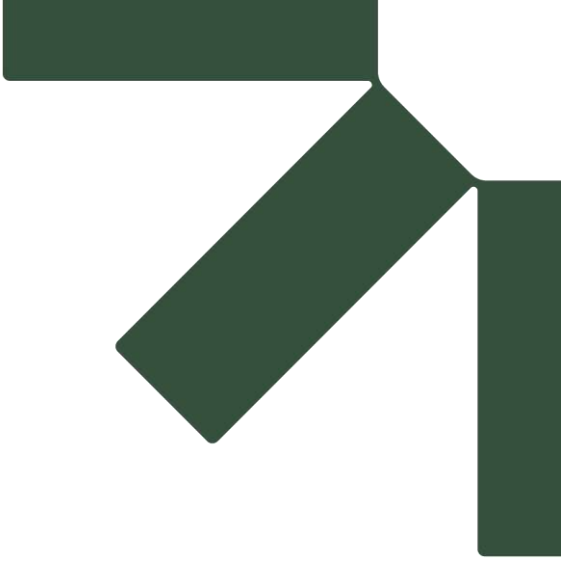
²⁴ Marnell, F., Looney, D. & Lawton, C. (2019) Ireland Red List No. 12: Terrestrial Mammals. National Parks and Wildlife Service, Department of the Culture, Heritage and the Gaeltacht, Dublin, Ireland.





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Appendix D Confidential Appendix: Confidential Roost Data

Baseline Bat Survey Report

Cush Wind Farm Phase III

Cush Wind Limited

SLR Project No.: 501.065723.00001

21 October 2026

Table D 1 Potential Roosting Features - Trees

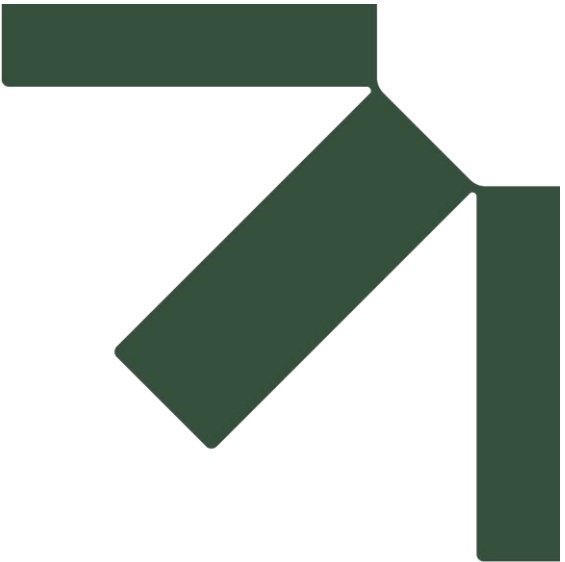
Map Ref.	Type	Suitability	Description	Photo	Coordinates (ITM)	
					X	Y
1	Tree	PRF-I	Mature ash tree with moderate ivy cover. Spaces behind thicker ivy stems may provide shelter for individual bats in suitable weather conditions, but lacks sufficient shelter or features for multiple bats or maternity/hibernation roosts.			





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Appendix E Confidential Appendix: Bat Conservation Ireland Data

Baseline Bat Survey Report

Cush Wind Farm Phase III

Cush Wind Limited

SLR Project No.: 501.065723.00001

21 October 2026

Record No.	Distance from Site (km)	Species
Roosts		
Private	4.22	Plecotus auritus
Private	4.43	Plecotus auritus, Myotis mystacinus
Nursing home	5.26	Myotis mystacinus
██████████	5.50	Myotis daubentonii
Private	5.50	Pipistrellus pipistrellus (45kHz), Pipistrellus pygmaeus, Nyctalus leisleri
Private	5.50	Nyctalus leisleri
██████████	5.60	Pipistrellus pygmaeus
██████████	5.95	Myotis daubentonii
Private	6.43	Nyctalus leisleri
Private	6.84	Nyctalus leisleri
Private	7.12	Nyctalus leisleri
Private	7.37	Pipistrellus pygmaeus
Private	12.62	Nyctalus leisleri

Transect Name	Species
	Myotis daubentonii, Unidentified bat
	Unidentified bat, Myotis daubentonii
	Myotis daubentonii
	Myotis daubentonii, Unidentified bat
	Unidentified bat, Myotis daubentonii
	Pipistrellus pipistrellus (45kHz), Pipistrellus pygmaeus, Nyctalus leisleri, Pipistrellus nathusii, Pipistrellus spp. (45kHz/55kHz)
	Pipistrellus pipistrellus (45kHz), Nyctalus leisleri, Pipistrellus pygmaeus, Pipistrellus spp. (45kHz/55kHz)
	Pipistrellus pipistrellus (45kHz), Pipistrellus pygmaeus, Pipistrellus spp. (45kHz/55kHz), Nyctalus leisleri
	Myotis daubentonii, Unidentified bat
	Myotis daubentonii, Unidentified bat



Table E 3 Bat Conservation Ireland Data – Ad-Hoc

Survey Name	Species
Consultancy Surveys	Pipistrellus pipistrellus (45kHz)
Consultancy Surveys	Pipistrellus pipistrellus (45kHz)
Consultancy Surveys	Pipistrellus pipistrellus (45kHz)
Consultancy Surveys	Pipistrellus pipistrellus (45kHz)
Consultancy Surveys	Pipistrellus pipistrellus (45kHz)
Consultancy Surveys	Pipistrellus pipistrellus (45kHz)
Consultancy Surveys	Pipistrellus pipistrellus (45kHz)
Consultancy Surveys	Pipistrellus pipistrellus (45kHz)
Consultancy Surveys	Pipistrellus pipistrellus (45kHz)
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Consultancy Surveys	Pipistrellus pipistrellus (45kHz)
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Consultancy Surveys	Pipistrellus pipistrellus (45kHz)
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Consultancy Surveys	Pipistrellus pipistrellus (45kHz)
Consultancy Surveys	Pipistrellus pipistrellus (45kHz)
Consultancy Surveys	Pipistrellus pipistrellus (45kHz)
Consultancy Surveys	Pipistrellus pipistrellus (45kHz)
Consultancy Surveys	Pipistrellus pipistrellus (45kHz)
Consultancy Surveys	Pipistrellus pygmaeus
Consultancy Surveys	Pipistrellus pygmaeus
Consultancy Surveys	Pipistrellus pygmaeus
Consultancy Surveys	Pipistrellus pygmaeus
Consultancy Surveys	Pipistrellus pygmaeus
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Consultancy Surveys	Pipistrellus pygmaeus
Consultancy Surveys	Pipistrellus pygmaeus
Consultancy Surveys	Pipistrellus pygmaeus
Consultancy Surveys	Pipistrellus pygmaeus

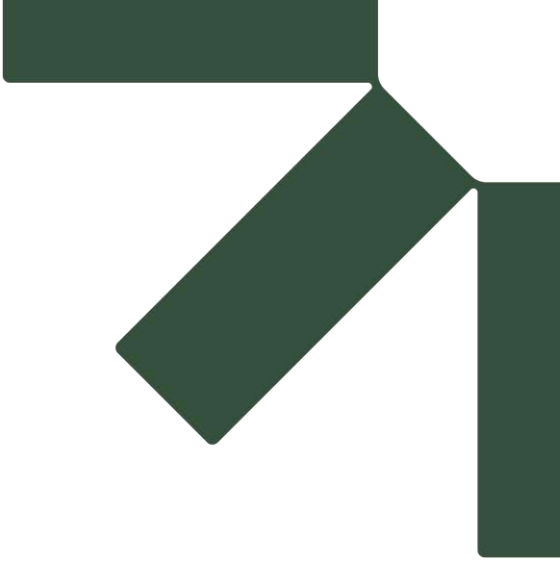


Survey Name	Species
Consultancy Surveys	Nyctalus leisleri, Myotis daubentonii, Pipistrellus pipistrellus (45kHz), Pipistrellus pygmaeus, Myotis spp.
Consultancy Surveys	Pipistrellus pipistrellus (45kHz), Pipistrellus pygmaeus, Nyctalus leisleri
BATLAS 2010	Pipistrellus pipistrellus (45kHz), Pipistrellus pygmaeus
BATLAS 2010	Pipistrellus pipistrellus (45kHz), Pipistrellus pygmaeus, Nyctalus leisleri, Myotis daubentonii, Plecotus auritus
BATLAS 2010	Pipistrellus pipistrellus (45kHz), Pipistrellus pygmaeus, Nyctalus leisleri, Myotis daubentonii
BATLAS 2020	Pipistrellus pygmaeus, Nyctalus leisleri
BATLAS 2020	Pipistrellus pipistrellus (45kHz), Nyctalus leisleri, Plecotus auritus
BATLAS 2020	Pipistrellus pipistrellus (45kHz), Pipistrellus pygmaeus, Nyctalus leisleri, Myotis daubentonii
BATLAS 2020	Pipistrellus pipistrellus (45kHz), Pipistrellus pygmaeus
BATLAS 2020	Pipistrellus pipistrellus (45kHz), Pipistrellus pygmaeus, Nyctalus leisleri, Myotis daubentonii
BATLAS 2020	Pipistrellus pipistrellus (45kHz), Pipistrellus pygmaeus, Myotis daubentonii, Myotis nattereri
BATLAS 2020	Pipistrellus pipistrellus (45kHz), Nyctalus leisleri, Myotis daubentonii
BATLAS 2020	Pipistrellus pipistrellus (45kHz), Pipistrellus pygmaeus, Nyctalus leisleri, Myotis daubentonii
BATLAS 2020	Pipistrellus pipistrellus (45kHz)
BATLAS 2020	Pipistrellus pipistrellus (45kHz), Pipistrellus pygmaeus
BATLAS 2020	Pipistrellus pygmaeus, Myotis daubentonii
BATLAS 2020	Pipistrellus pipistrellus (45kHz), Pipistrellus pygmaeus
BATLAS 2020	Pipistrellus pipistrellus (45kHz), Pipistrellus pygmaeus
BATLAS 2020	Pipistrellus pygmaeus, Plecotus auritus
BATLAS 2020	Pipistrellus pipistrellus (45kHz), Pipistrellus pygmaeus
BATLAS 2020	Pipistrellus spp. (45kHz/55kHz)
Consultancy Surveys	Pipistrellus pipistrellus (45kHz), Plecotus auritus
Consultancy Surveys	Nyctalus leisleri, Pipistrellus pygmaeus, Pipistrellus pipistrellus (45kHz), Myotis nattereri, Plecotus auritus
Consultancy Surveys	Pipistrellus pipistrellus (45kHz)
Consultancy Surveys	Pipistrellus pipistrellus (45kHz)
Consultancy Surveys	Pipistrellus pipistrellus (45kHz)
Consultancy Surveys	Pipistrellus pipistrellus (45kHz)
Consultancy Surveys	Pipistrellus pipistrellus (45kHz)
Consultancy Surveys	Pipistrellus pipistrellus (45kHz)
Consultancy Surveys	Pipistrellus pipistrellus (45kHz)
Consultancy Surveys	Pipistrellus pipistrellus (45kHz)
Consultancy Surveys	Pipistrellus pipistrellus (45kHz)



Survey Name	Species
Consultancy Surveys	Pipistrellus pipistrellus (45kHz)
Consultancy Surveys	Pipistrellus pipistrellus (45kHz)
Consultancy Surveys	Pipistrellus pipistrellus (45kHz)
Consultancy Surveys	Pipistrellus pipistrellus (45kHz)
Consultancy Surveys	Pipistrellus pipistrellus (45kHz)
Consultancy Surveys	Pipistrellus pipistrellus (45kHz)
Consultancy Surveys	Pipistrellus pipistrellus (45kHz)
Consultancy Surveys	Pipistrellus pipistrellus (45kHz)
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Consultancy Surveys	Pipistrellus pipistrellus (45kHz)
Consultancy Surveys	Pipistrellus pipistrellus (45kHz)
Consultancy Surveys	Pipistrellus pipistrellus (45kHz)
Consultancy Surveys	Pipistrellus pipistrellus (45kHz)
Consultancy Surveys	Pipistrellus pipistrellus (45kHz)
Consultancy Surveys	Pipistrellus pygmaeus
Consultancy Surveys	Pipistrellus pygmaeus
Consultancy Surveys	Pipistrellus pygmaeus
Consultancy Surveys	Pipistrellus pygmaeus
Consultancy Surveys	Pipistrellus pygmaeus
Consultancy Surveys	Pipistrellus pygmaeus
Consultancy Surveys	Pipistrellus pygmaeus
Consultancy Surveys	Pipistrellus pygmaeus
Consultancy Surveys	Pipistrellus pygmaeus
Consultancy Surveys	Pipistrellus pygmaeus
Consultancy Surveys	Nyctalus leisleri, Myotis daubentonii, Pipistrellus pipistrellus (45kHz), Pipistrellus pygmaeus, Myotis spp.





Appendix F Ecobat Reports

Baseline Bat Survey Report

Cush Wind Farm Phase III

Cush Wind Limited

SLR Project No.: 501.065723.00001

21 October 2026



Ecobat Report

2025-11-01

Geo filter: county, Time filter: +- 1 month

Summary

Bats were detected on **10** nights between **06/05/2025** and **15/05/2025**, using **3** static bat detectors. Throughout this period, **7** species were recorded. **Table 1.**
Detectors were placed at the following locations:

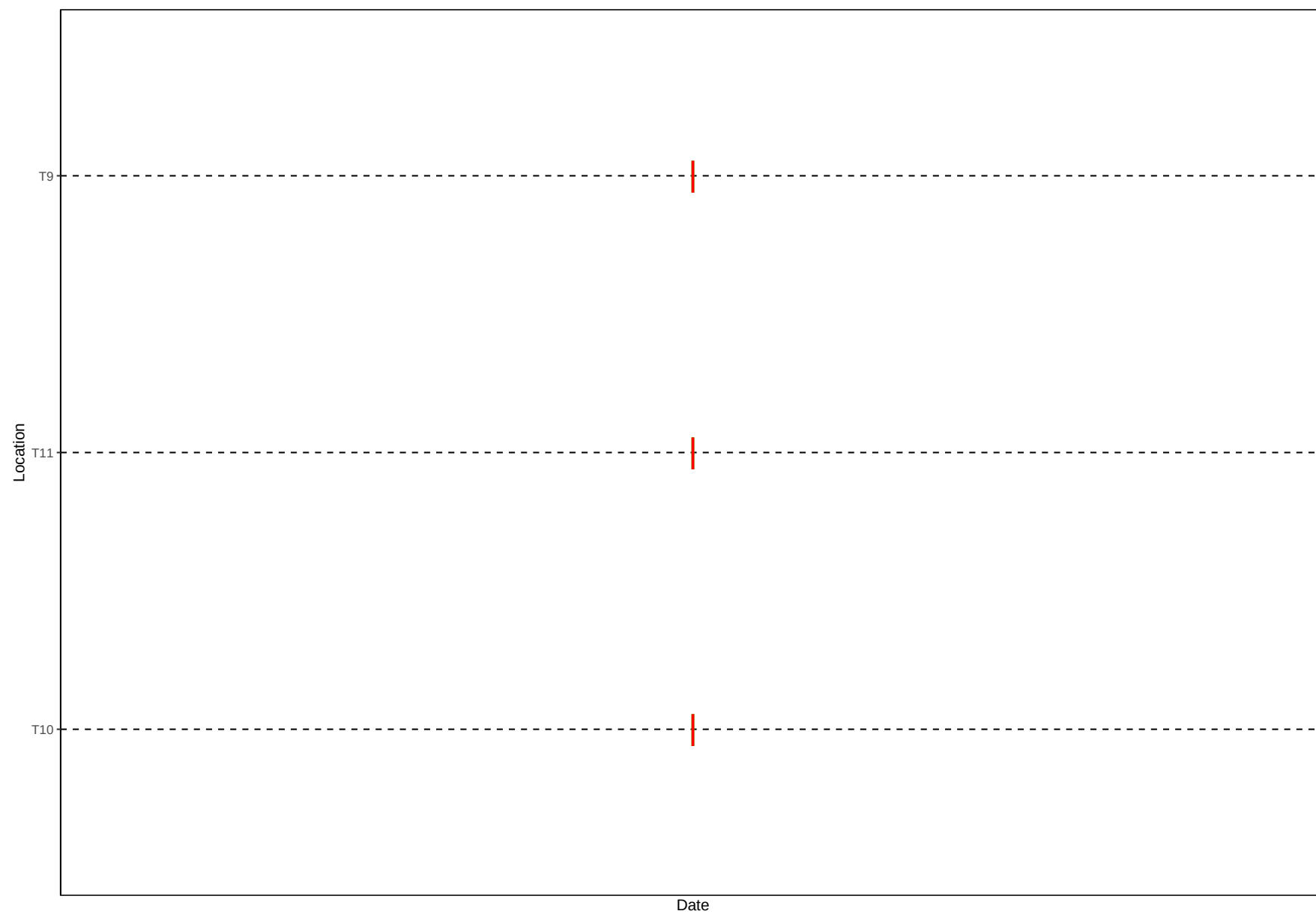
Detector ID	Latitude	Longitude
T9	53.14700	-7.870906
T10	53.14975	-7.876294
T11	53.15033	-7.866291

Survey Nights

Table 2. The number of nights that bats were detected on each recorder. This is not the same as the number of nights that detectors were active if there were nights when no bats were detected.

Detector ID	No. of Nights
T10	10
T11	10
T9	10

Figure 1. Horizontal bars show nights when acoustic detectors recorded bats.



Part 1: Percentile Analysis

This first part of the analysis looks at the relative activity levels of the bats you recorded. We take your value for the total bat passes each night for each species, and compare this to the values in our reference database. We tell you what percentile your data falls at, and therefore what the relative activity level is. For example, if the reference database has values of 5, 10, 15, 20 and you submit a value of 18, this will be the 80th percentile, and be classed as high activity.

Per Detector

Table 3. Summary table showing the number of nights recorded bat activity fell into each activity band for each species.

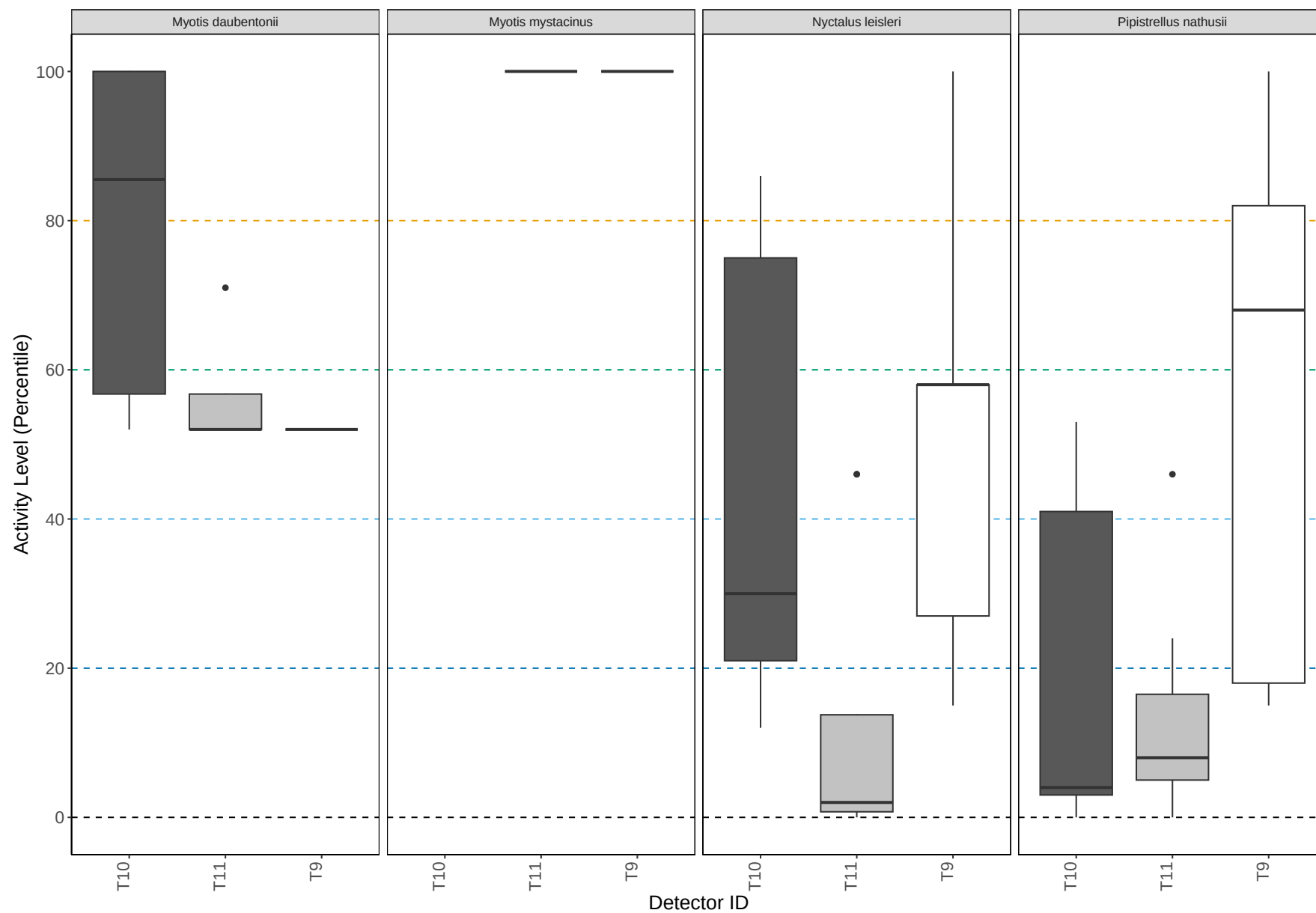
Detector ID	Species/Species Group	Nights of Exceptional Activity	Nights of High Activity	Nights of Moderate/High Activity	Nights of Moderate Activity	Nights of Low/Moderate Activity	Nights of Low Activity
T10	Myotis daubentonii	3	0	1	2	0	0
T10	Nyctalus leisleri	0	2	2	0	4	1
T10	Pipistrellus nathusii	0	0	0	3	1	5
T10	Pipistrellus pipistrellus	2	1	1	0	4	1
T10	Pipistrellus pygmaeus	2	0	1	5	1	0
T10	Plecotus auritus	2	0	0	0	1	0
T11	Myotis daubentonii	0	0	1	3	0	0
T11	Myotis mystacinus	1	0	0	0	0	0
T11	Nyctalus leisleri	0	0	0	2	0	6
T11	Pipistrellus nathusii	0	0	0	1	1	5
T11	Pipistrellus pipistrellus	0	0	0	2	0	7
T11	Pipistrellus pygmaeus	0	0	0	0	2	7
T9	Myotis daubentonii	0	0	0	2	0	0
T9	Myotis mystacinus	1	0	0	0	0	0
T9	Nyctalus leisleri	2	0	0	4	2	1
T9	Pipistrellus nathusii	2	2	1	1	0	3
T9	Pipistrellus pipistrellus	0	0	4	1	3	1

Detector ID	Species/Species Group	Nights of Exceptional Activity	Nights of High Activity	Nights of Moderate/High Activity	Nights of Moderate Activity	Nights of Low/Moderate Activity	Nights of Low Activity
T9	Pipistrellus pygmaeus	0	0	0	0	2	7
T9	Plecotus auritus	0	0	0	0	1	0

Table 4. Summary table showing key metrics for each species recorded. The reference range is the number of nights for each species that your data were compared to. We recommend a Reference Range of 200+ to be confident in the relative activity level.

Detector ID	Species/Species Group	Median Percentile	95% CIs	Max Percentile	Nights Recorded	Reference Range
T10	Myotis daubentonii	86	61.5 - 100	100	6	21
T10	Nyctalus leisleri	30	21 - 80.5	86	9	2457
T10	Pipistrellus nathusii	4	2.5 - 47	53	9	825
T10	Pipistrellus pipistrellus	29	21 - 88	100	9	5391
T10	Pipistrellus pygmaeus	49	41 - 79	100	9	1489
T10	Plecotus auritus	100	100 - 100	100	3	6
T11	Myotis daubentonii	52	52 - 52	71	4	21
T11	Myotis mystacinus	100	0	100	1	2
T11	Nyctalus leisleri	2	1.5 - 46	46	8	2457
T11	Pipistrellus nathusii	8	5 - 27.5	46	7	825
T11	Pipistrellus pipistrellus	12	3 - 30	42	9	5391
T11	Pipistrellus pygmaeus	9	6 - 21	28	9	1489
T9	Myotis daubentonii	52	52 - 52	52	2	21
T9	Myotis mystacinus	100	0	100	1	2
T9	Nyctalus leisleri	58	27 - 79	100	9	2457
T9	Pipistrellus nathusii	68	18 - 91	100	9	825
T9	Pipistrellus pipistrellus	54	33.5 - 68.5	76	9	5391
T9	Pipistrellus pygmaeus	13	8 - 19.5	22	9	1489
T9	Plecotus auritus	33	0	33	1	6

Figure 2. The recorded activity of bats during the survey. The centre line indicates the median activity level whereas the box represents the interquartile range (the spread of the middle 50% of nights of activity).



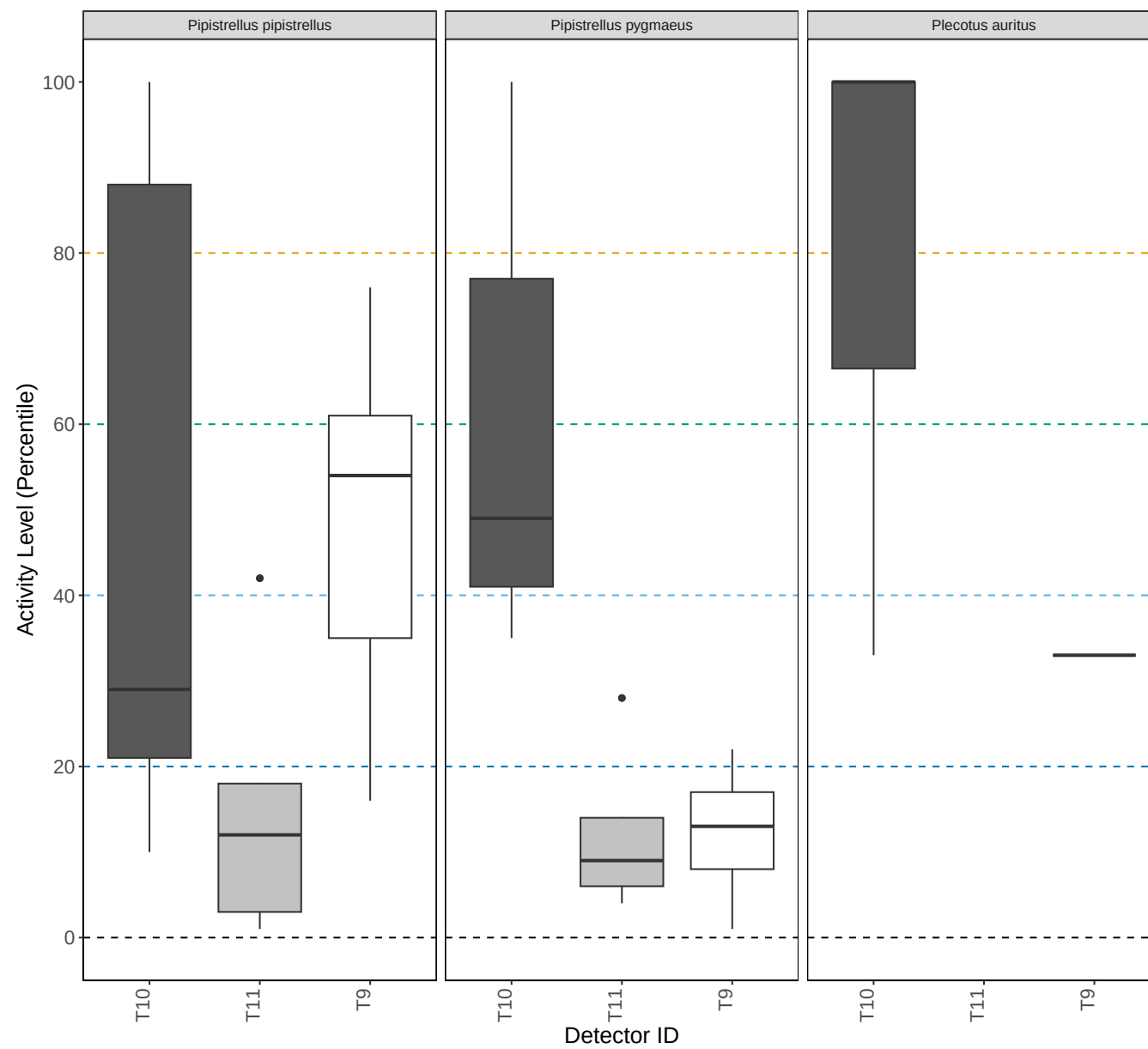
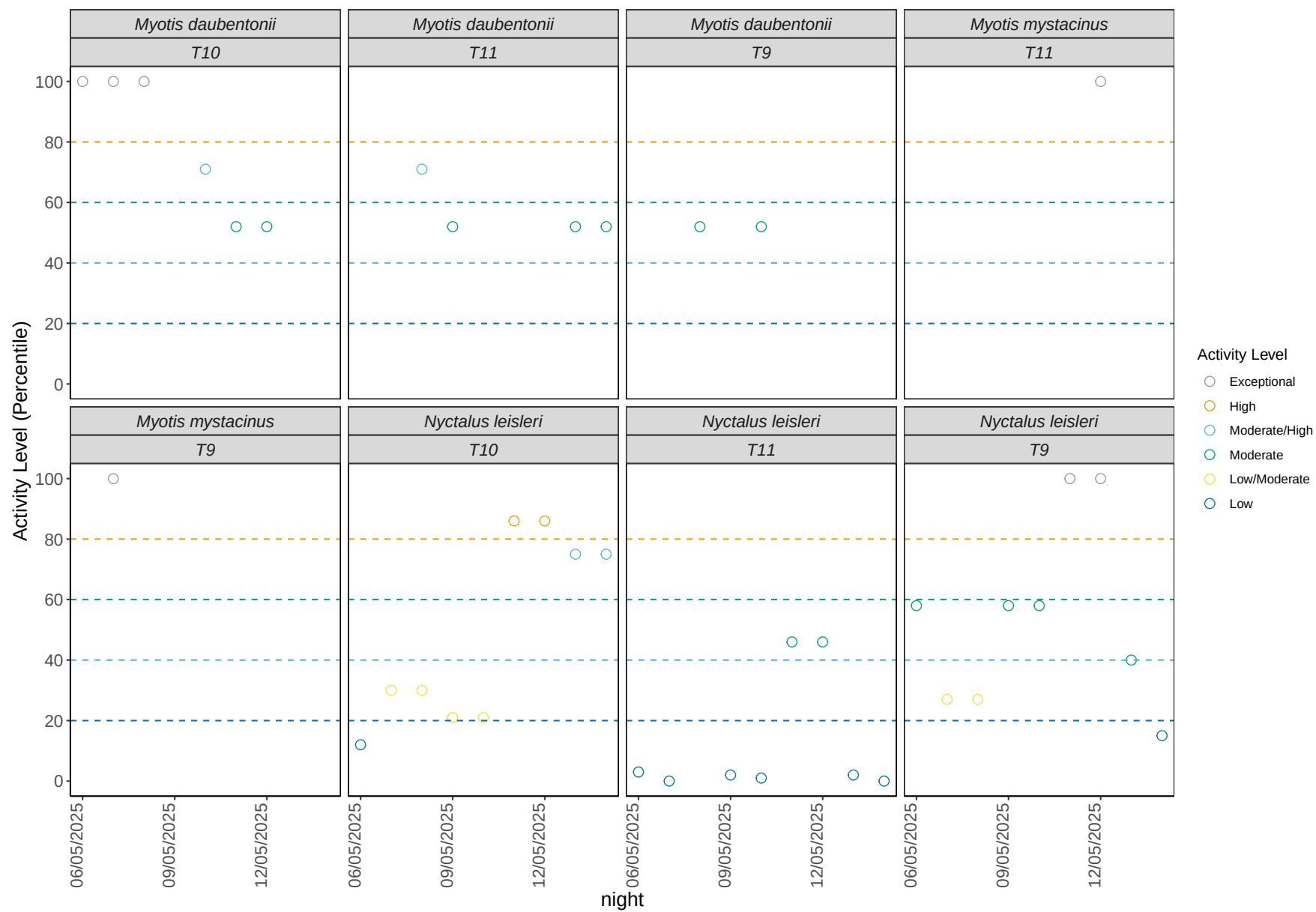
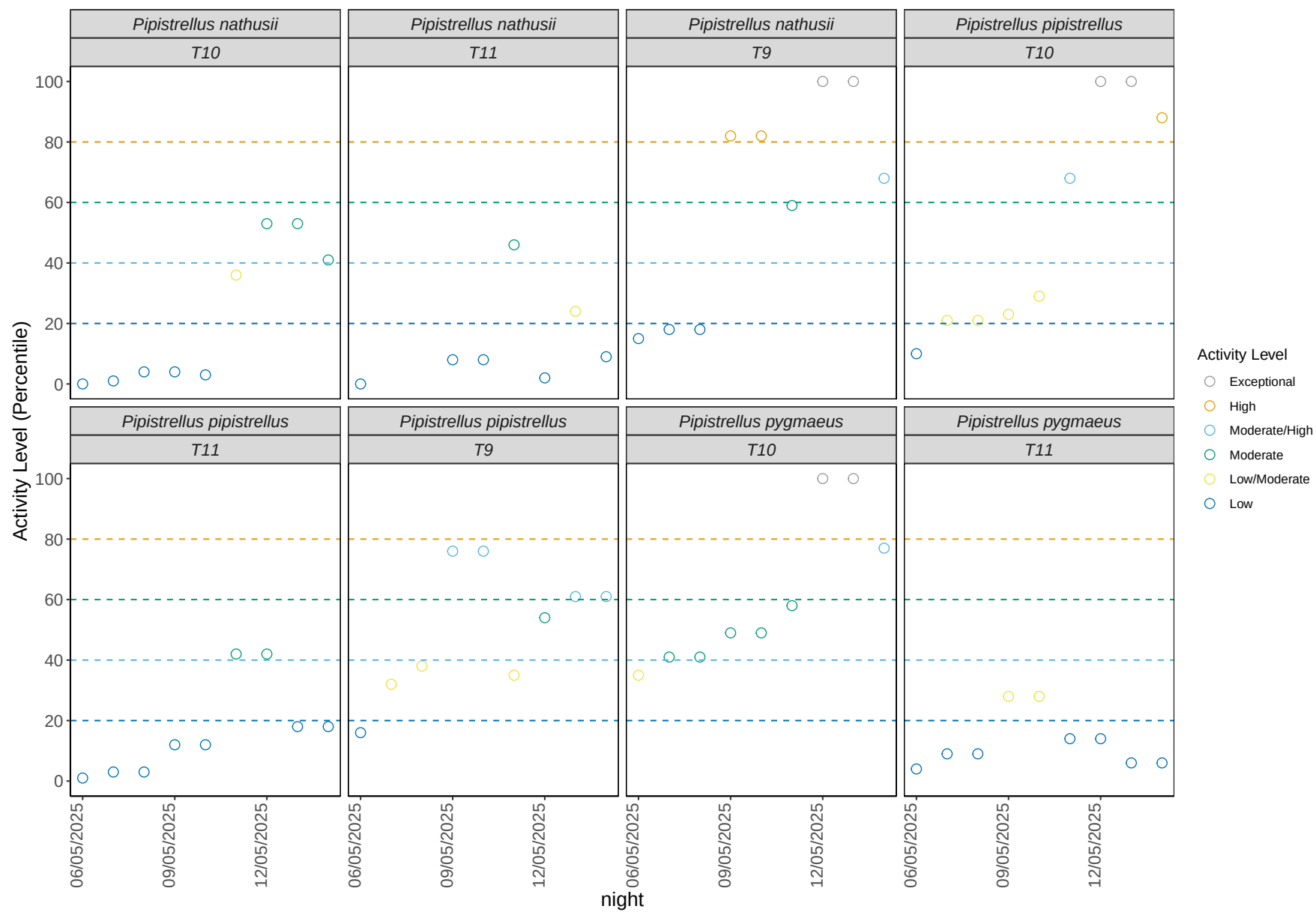
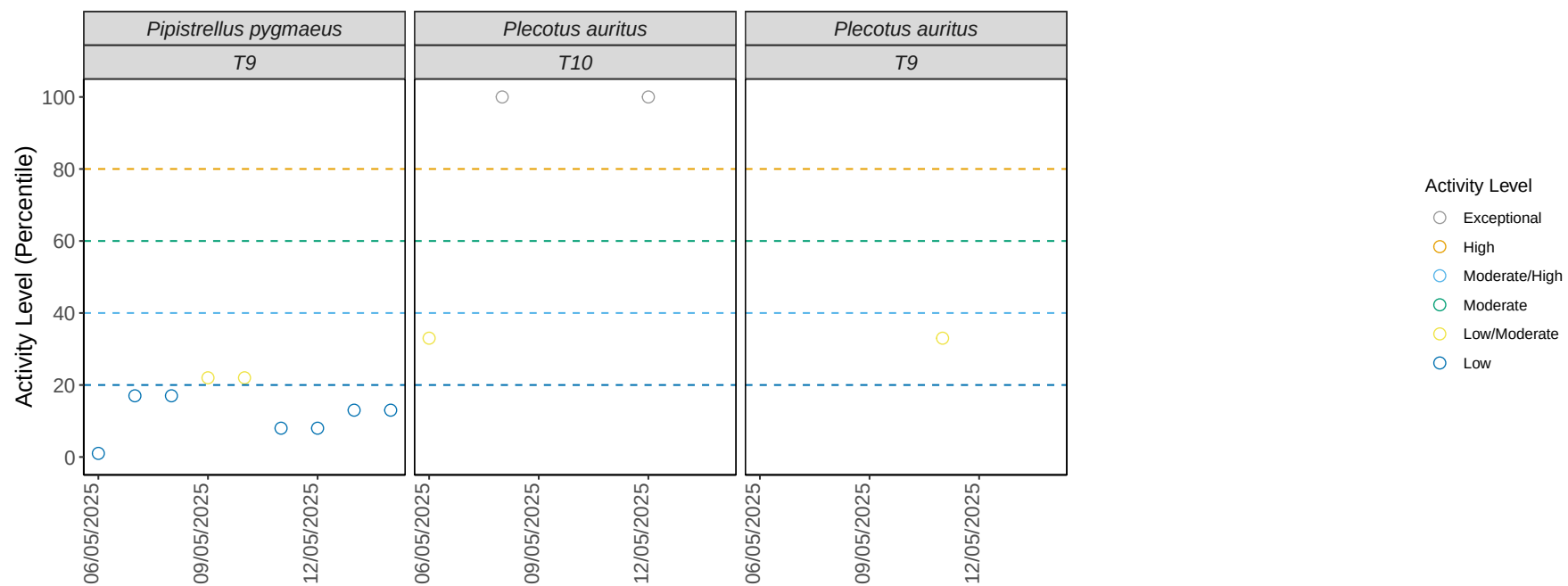


Figure 3. The activity level (percentile) of bats recorded across each night of the bat survey.







night

Per Detector, Per Month

Table 5. Summary table showing the number of nights recorded bat activity fell into each activity band for each species at each detector during each month.

Detector ID	Species/Species Group	month	Nights of Exceptional Activity	Nights of High Activity	Nights of Moderate/High Activity	Nights of Moderate Activity	Nights of Low/Moderate Activity	Nights of Low Activity
T10	Myotis daubentonii	May	3	0	1	2	0	0
T10	Nyctalus leisleri	May	0	2	2	0	4	1
T10	Pipistrellus nathusii	May	0	0	0	3	1	5
T10	Pipistrellus pipistrellus	May	2	1	1	0	4	1
T10	Pipistrellus pygmaeus	May	2	0	1	5	1	0
T10	Plecotus auritus	May	2	0	0	0	1	0
T11	Myotis daubentonii	May	0	0	1	3	0	0
T11	Myotis mystacinus	May	1	0	0	0	0	0
T11	Nyctalus leisleri	May	0	0	0	2	0	6
T11	Pipistrellus nathusii	May	0	0	0	1	1	5
T11	Pipistrellus pipistrellus	May	0	0	0	2	0	7
T11	Pipistrellus pygmaeus	May	0	0	0	0	2	7
T9	Myotis daubentonii	May	0	0	0	2	0	0
T9	Myotis mystacinus	May	1	0	0	0	0	0
T9	Nyctalus leisleri	May	2	0	0	4	2	1
T9	Pipistrellus nathusii	May	2	2	1	1	0	3
T9	Pipistrellus pipistrellus	May	0	0	4	1	3	1

Detector ID	Species/Species Group	month	Nights of Exceptional Activity	Nights of High Activity	Nights of Moderate/High Activity	Nights of Moderate Activity	Nights of Low/Moderate Activity	Nights of Low Activity
T9	Pipistrellus pygmaeus	May	0	0	0	0	2	7
T9	Plecotus auritus	May	0	0	0	0	1	0

Table 6. Summary table showing key metrics for each species recorded per month. Please note that we cannot split the reference range by month, hence this column is not shown in this table.

Detector ID	Species/Species Group	month	Median Percentile	95% CIs	Max. Percentile	Nights Recorded
T10	Myotis daubentonii	May	86	61.5 - 100	100	6
T10	Nyctalus leisleri	May	30	21 - 80.5	86	9
T10	Pipistrellus nathusii	May	4	2.5 - 47	53	9
T10	Pipistrellus pipistrellus	May	29	21 - 88	100	9
T10	Pipistrellus pygmaeus	May	49	41 - 79	100	9
T10	Plecotus auritus	May	100	100 - 100	100	3
T11	Myotis daubentonii	May	52	52 - 52	71	4
T11	Myotis mystacinus	May	100	0	100	1
T11	Nyctalus leisleri	May	2	1.5 - 46	46	8
T11	Pipistrellus nathusii	May	8	5 - 27.5	46	7
T11	Pipistrellus pipistrellus	May	12	3 - 30	42	9
T11	Pipistrellus pygmaeus	May	9	6 - 21	28	9
T9	Myotis daubentonii	May	52	52 - 52	52	2
T9	Myotis mystacinus	May	100	0	100	1
T9	Nyctalus leisleri	May	58	27 - 79	100	9
T9	Pipistrellus nathusii	May	68	18 - 91	100	9
T9	Pipistrellus pipistrellus	May	54	33.5 - 68.5	76	9
T9	Pipistrellus pygmaeus	May	13	8 - 19.5	22	9
T9	Plecotus auritus	May	33	0	33	1

Per Site

In this 'Per Site' section of the analysis, all values are taken from across all of the detectors to provide site-wide averages/medians.

Table 7. Summary table showing the number of nights recorded bat activity fell into each activity band for each species.

Species/Species Group	Nights of Exceptional Activity	Nights of High Activity	Nights of Moderate/High Activity	Nights of Moderate Activity	Nights of Low/Moderate Activity	Nights of Low Activity
Myotis daubentonii	3	0	2	7	0	0
Myotis mystacinus	2	0	0	0	0	0
Nyctalus leisleri	2	2	2	6	6	8
Pipistrellus nathusii	2	2	1	5	2	13
Pipistrellus pipistrellus	2	1	5	3	7	9
Pipistrellus pygmaeus	2	0	1	5	5	14
Plecotus auritus	2	0	0	0	2	0

Table 8. Summary table showing key metrics for each species recorded.

Species/Species Group	Median Percentile	95% CIs	Max. Percentile	Nights Recorded
Myotis daubentonii	52	61.5 - 100	100	12
Myotis mystacinus	100	0	100	2
Nyctalus leisleri	30	27 - 79	100	26
Pipistrellus nathusii	18	5 - 27.5	100	25
Pipistrellus pipistrellus	32	33.5 - 68.5	100	27
Pipistrellus pygmaeus	17	8 - 19.5	100	27
Plecotus auritus	67	100 - 100	100	4

Figure 4. The activity level (percentile) of bats recorded across each night of the bat survey for the **entire site**.

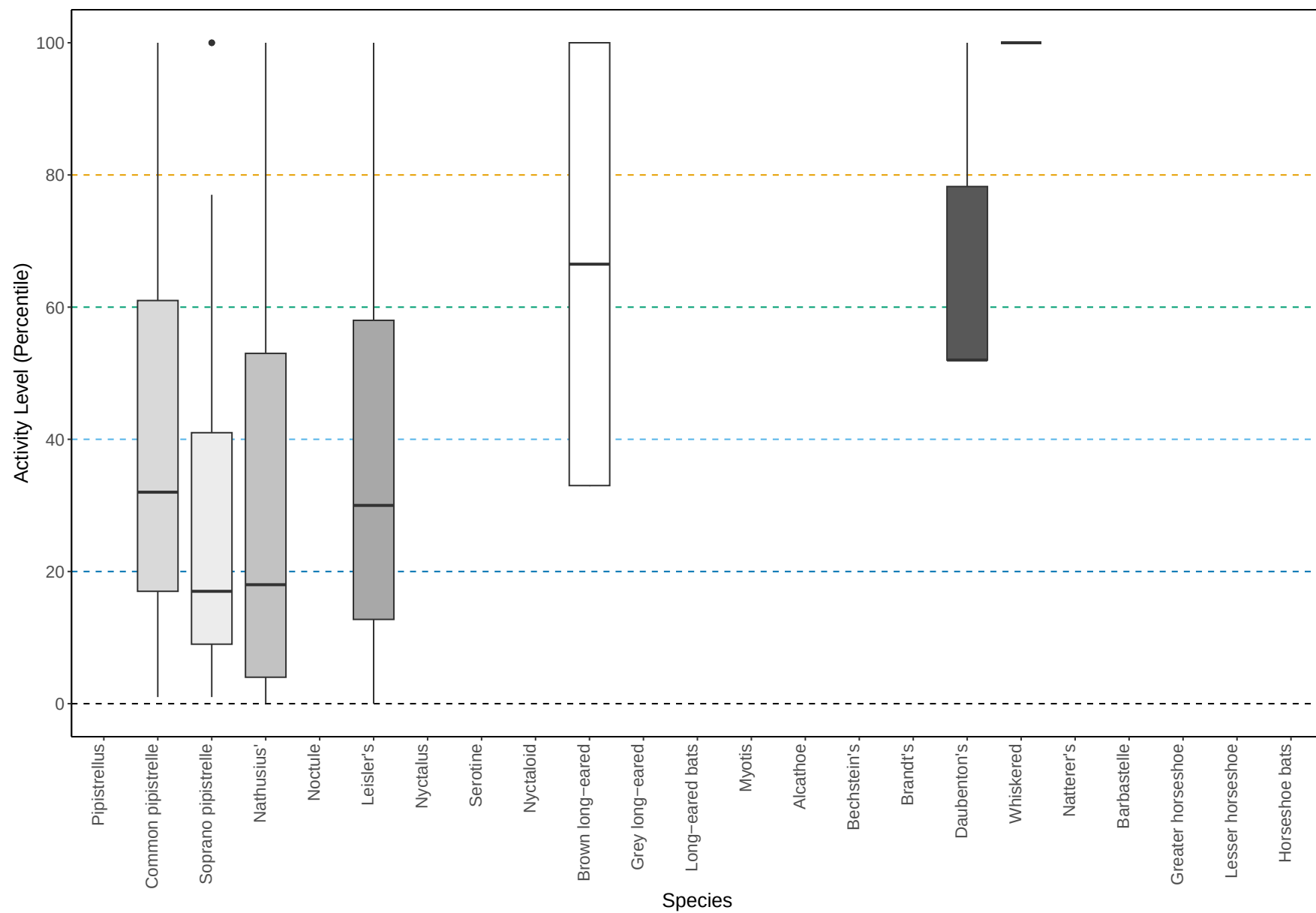


Figure 5. The median activity levels of bats recorded across all detectors each night.

Per Site, Per Month

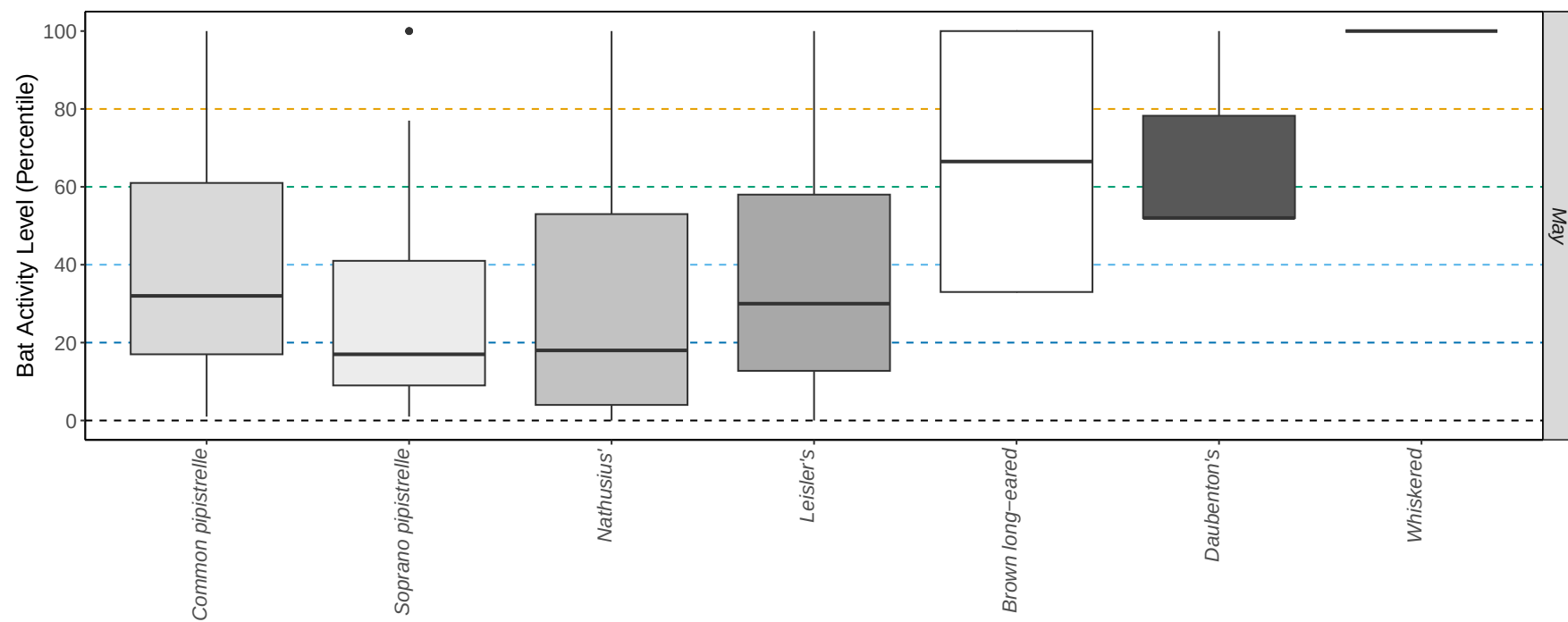
Table 9. Summary table showing the number of nights recorded bat activity fell into each activity band for each species during each month.

Species/Species Group	month	Nights of Exceptional Activity	Nights of High Activity	Nights of Moderate/High Activity	Nights of Moderate Activity	Nights of Low/Moderate Activity	Nights of Low Activity
Myotis daubentonii	May	3	0	2	7	0	0
Myotis mystacinus	May	2	0	0	0	0	0
Nyctalus leisleri	May	2	2	2	6	6	8
Pipistrellus nathusii	May	2	2	1	5	2	13
Pipistrellus pipistrellus	May	2	1	5	3	7	9
Pipistrellus pygmaeus	May	2	0	1	5	5	14
Plecotus auritus	May	2	0	0	0	2	0

Table 10. Summary table showing key metrics for each species recorded per month.

Species/Species Group	month	Median Percentile	95% CIs	Max. Percentile	Nights Recorded
Myotis daubentonii	May	52	61.5 - 100	100	12
Myotis mystacinus	May	100	0	100	2
Nyctalus leisleri	May	30	27 - 79	100	26
Pipistrellus nathusii	May	18	5 - 27.5	100	25
Pipistrellus pipistrellus	May	32	33.5 - 68.5	100	27
Pipistrellus pygmaeus	May	17	8 - 19.5	100	27
Plecotus auritus	May	67	100 - 100	100	4

Figure 6. The activity level (percentile) of bats recorded across each night of the bat survey for the entire site, split between months.



Species

Part 2: Nightly Analysis

Entire Survey Period

Sunrise and Sunset Times

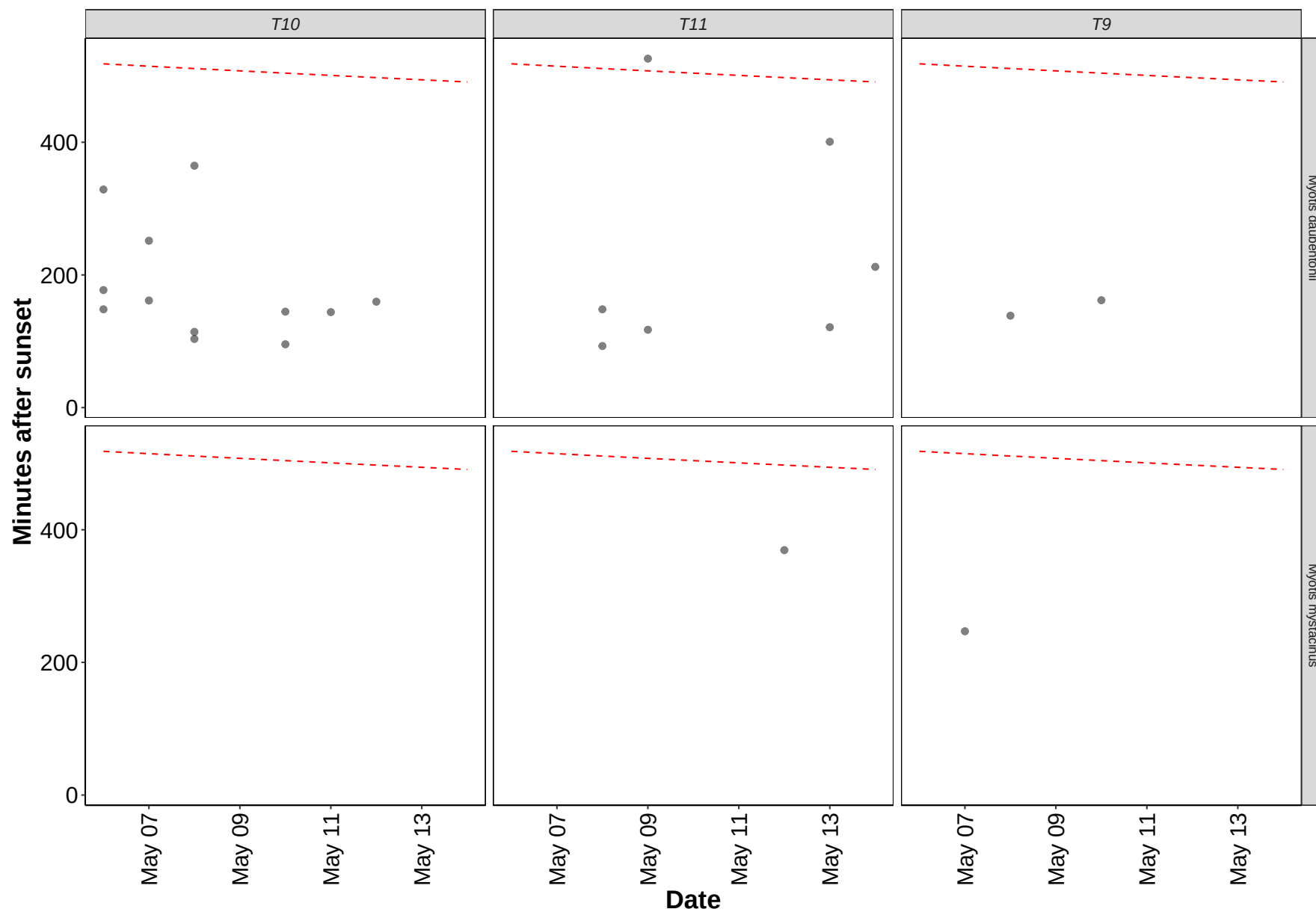
Table 11. The times of sunset and sunrise the following morning for surveys beginning on the date shown.

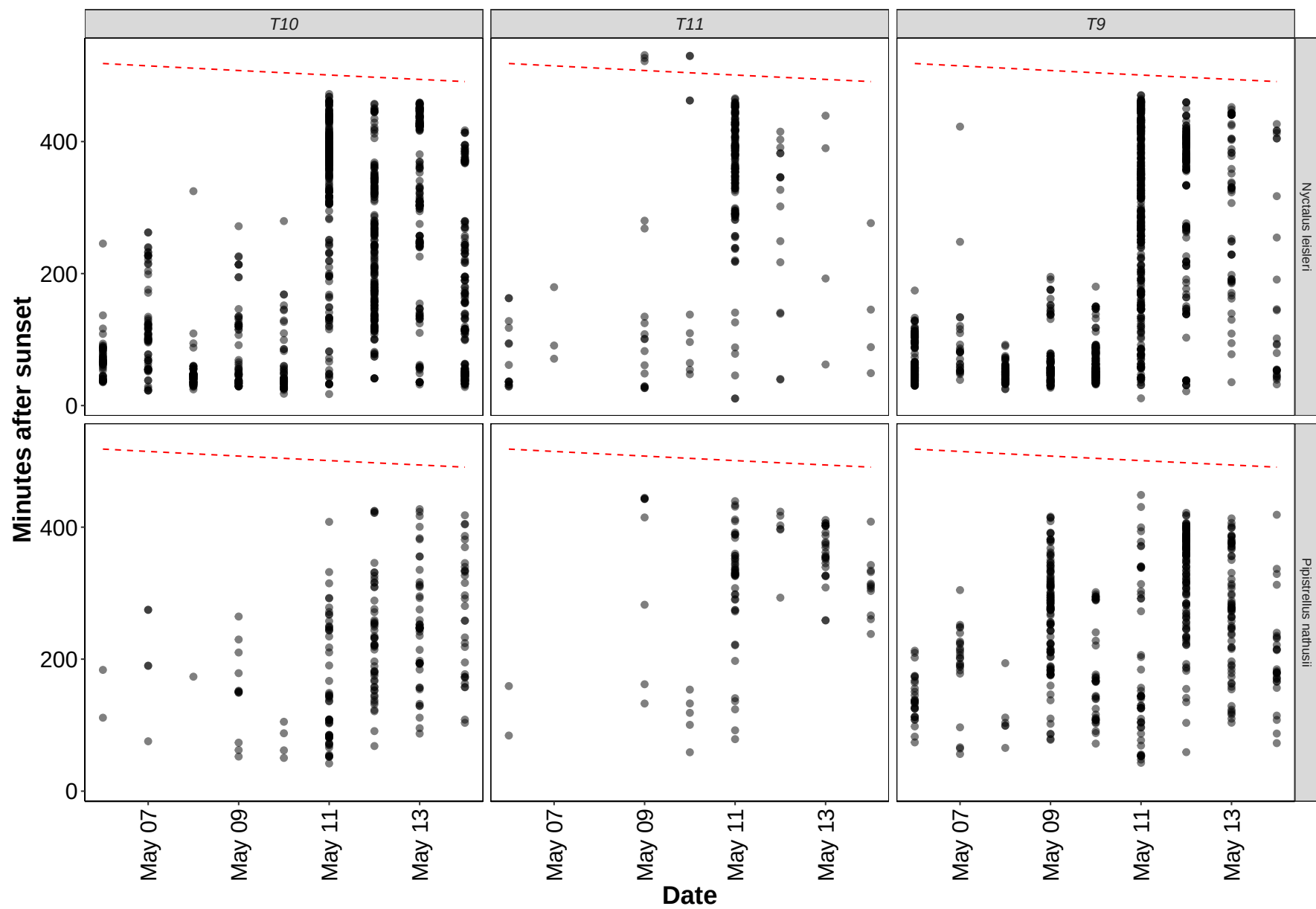
Night (y-m-d)	Sunset (h:m)	Sunrise (h:m)	Night Length (hours)
2025-05-06	21:09	05:47	8.6
2025-05-07	21:11	05:45	8.6
2025-05-08	21:12	05:43	8.5
2025-05-09	21:14	05:42	8.5
2025-05-10	21:16	05:40	8.4
2025-05-11	21:17	05:38	8.3
2025-05-12	21:19	05:37	8.3
2025-05-13	21:21	05:35	8.2
2025-05-14	21:22	05:33	8.2
2025-05-15	21:27	05:43	8.2

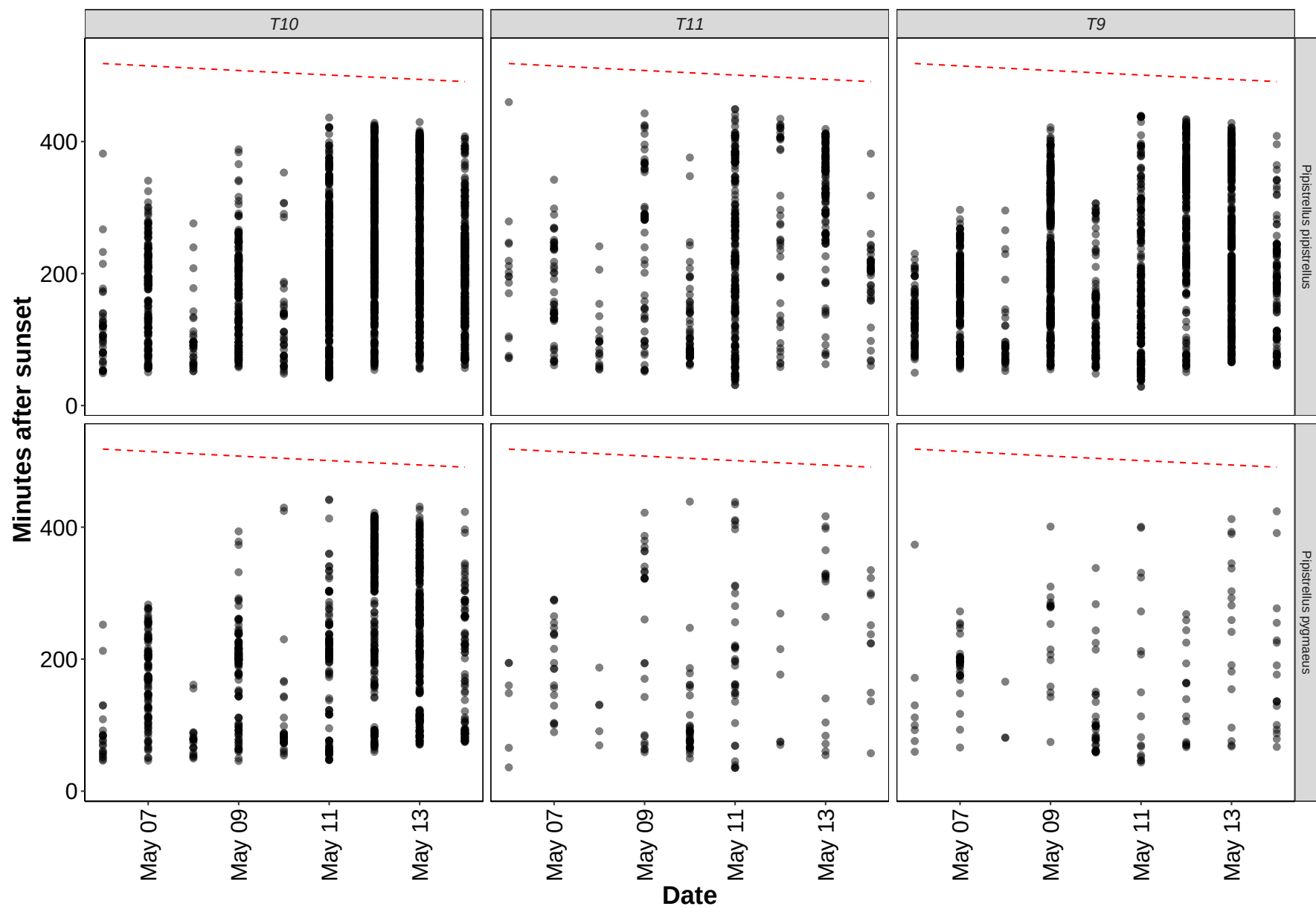
Distribution of Bat Activity Across the Night through Time

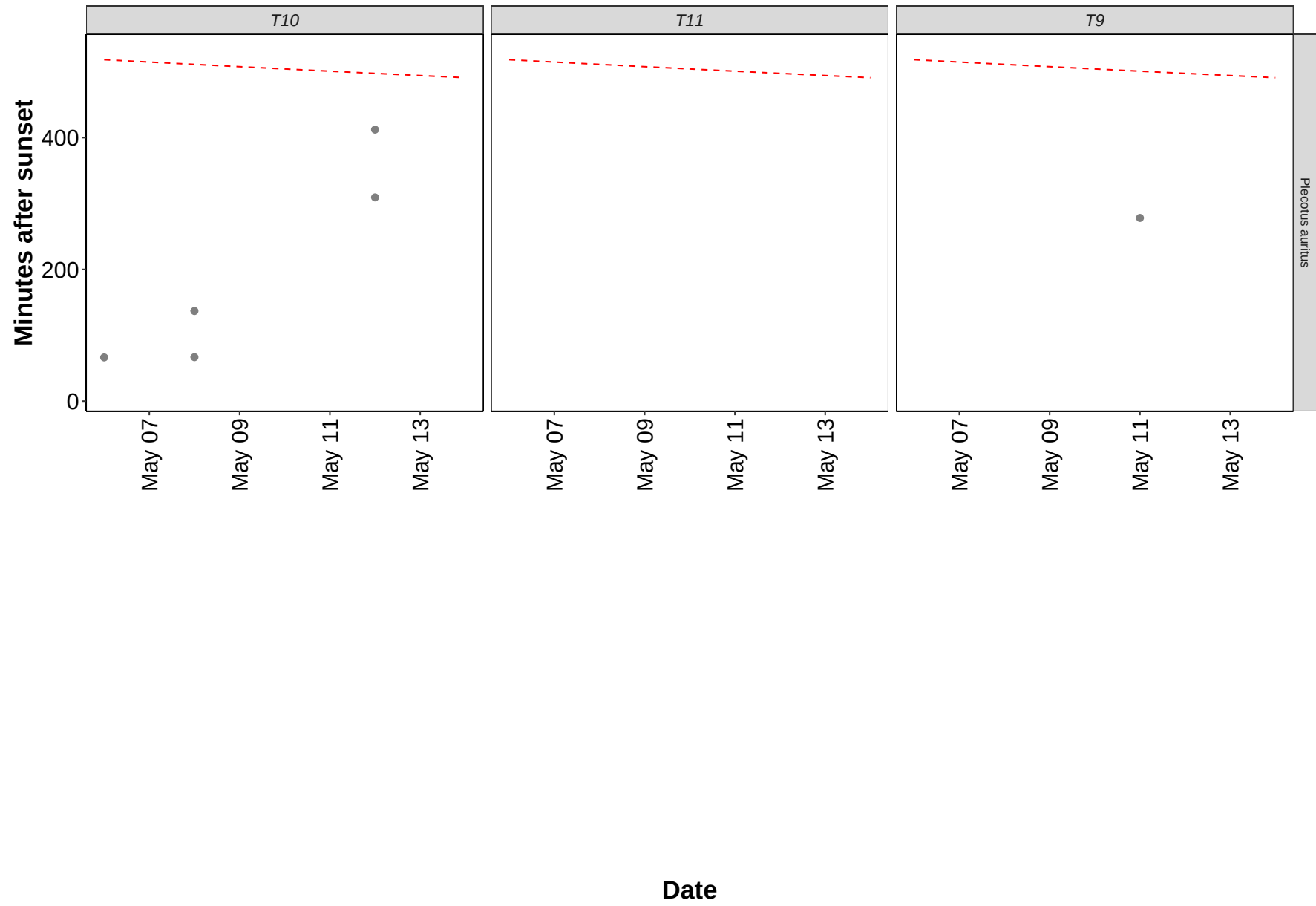
Per Detector

Figure 7. Timing of bat calls plotted as minutes before/after sunset, whereby 0 on the y axis represents sunset. Sunrise throughout the survey period is depicted as the red dashed line. Colours indicate kernel densities, with darkest colours showing peaks of activity. These colours are comparative only within each plot, and do not account for overall activity.









Roost Emergence Time and Bat Observation

Based on: Russ, Jon. 2012. British Bat Calls a Guide to species Identification. Pelagic Publishing.

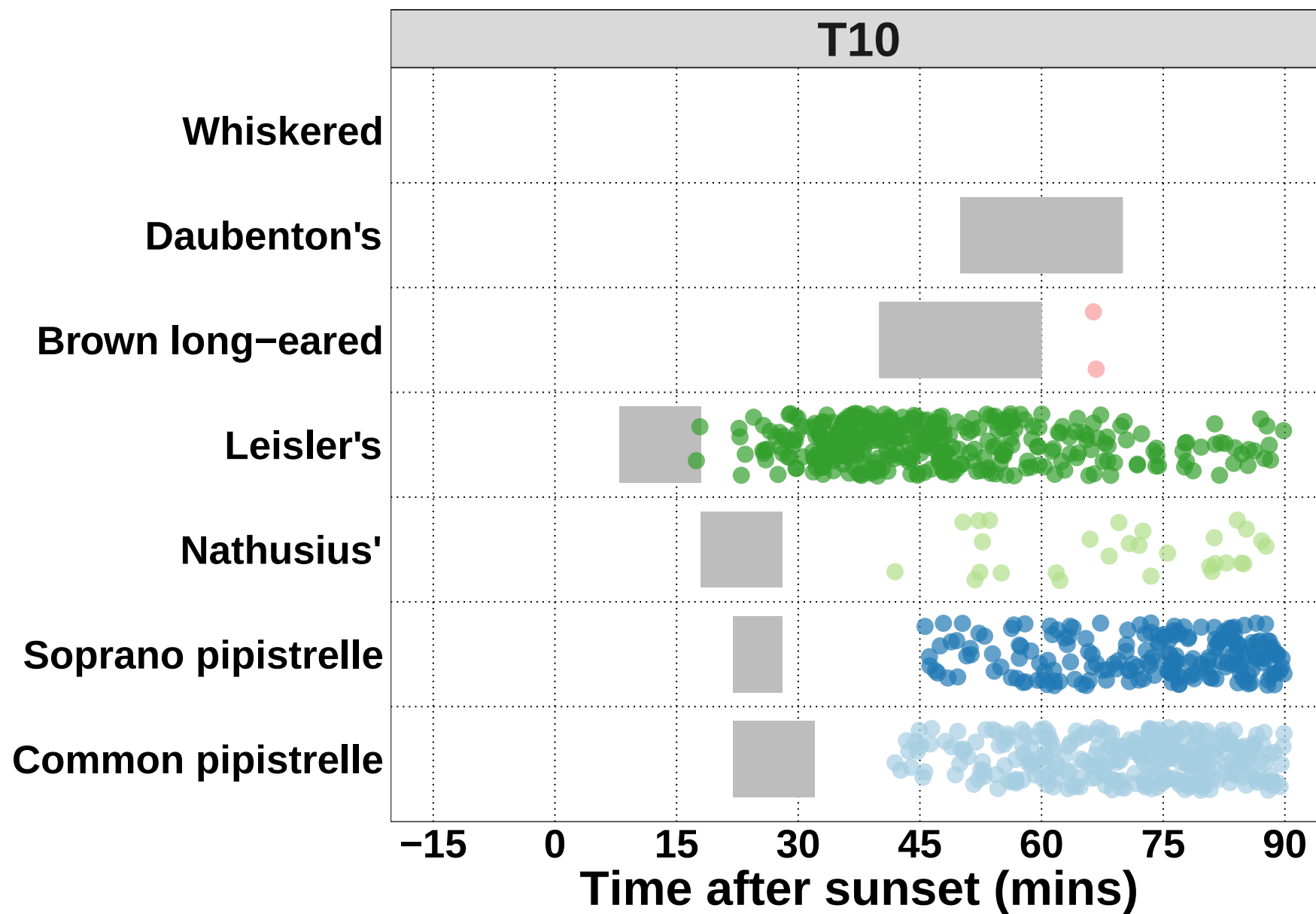
Bat Passes Potentially Indicating Close Proximity to a Roost (Russ 2012)

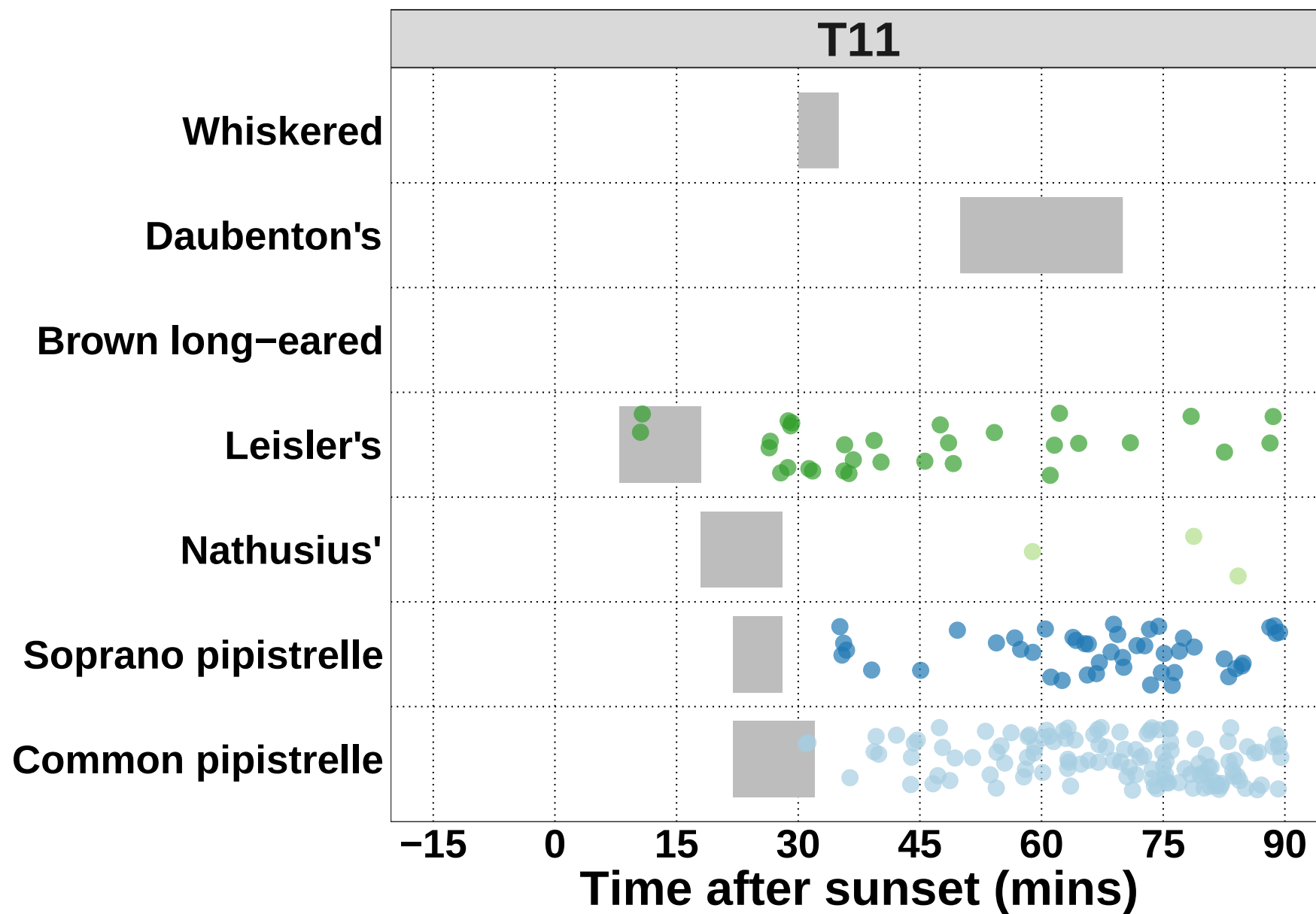
Table 12. Number of bat calls recorded before the upper time of the species-specific emergence time range, and which therefore may potentially indicate the presence of a nearby roost.

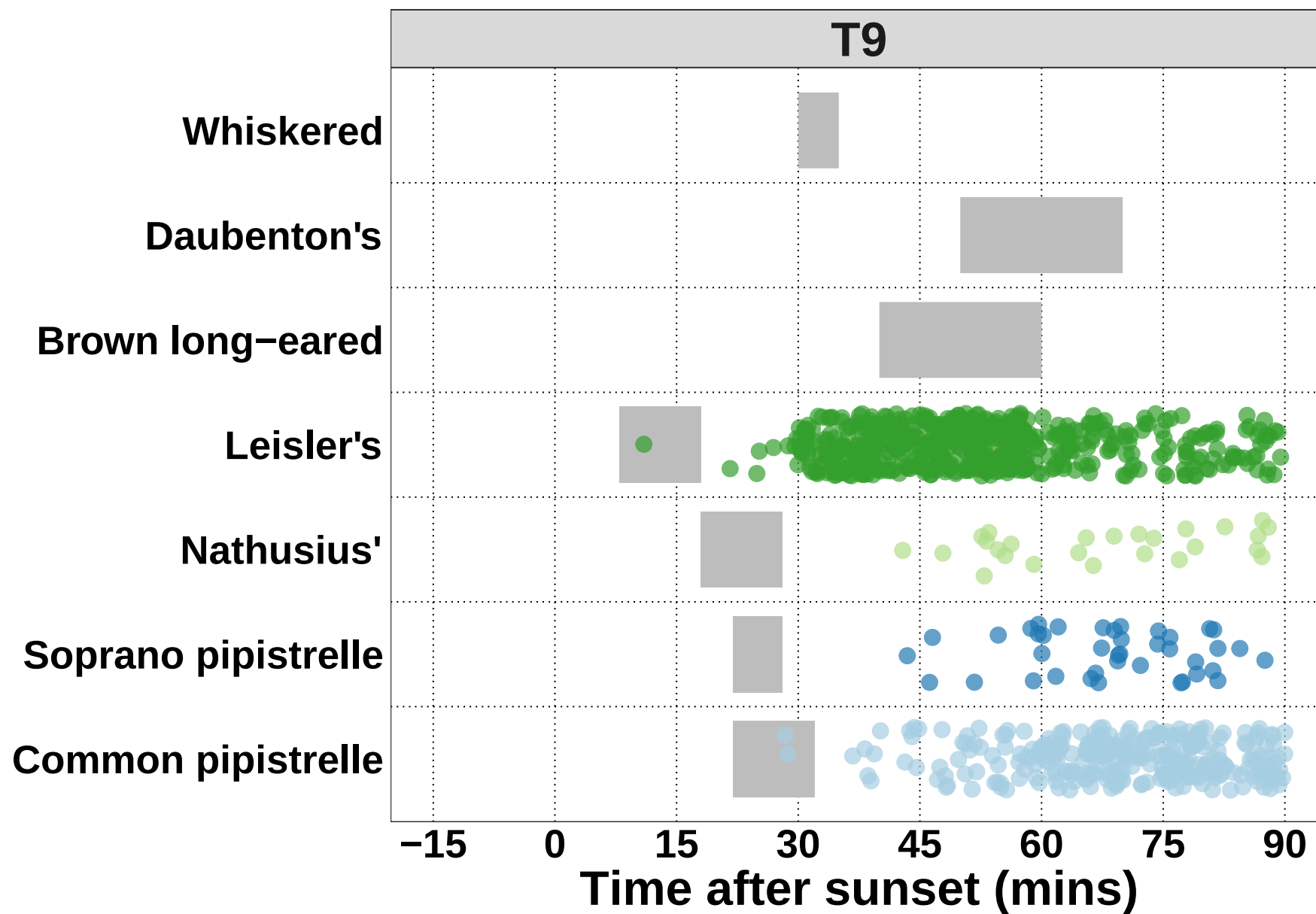
Species	Detector ID	2025-05-10	2025-05-11
Common pipistrelle	T11	0	2
Common pipistrelle	T9	0	2
Leisler's	T10	1	1
Leisler's	T11	0	2
Leisler's	T9	0	1

Bat Passes Potentially Indicating Close Proximity to a Roost (Russ 2012)

Figure 8. Time from 15 minutes before to 90 minutes after sunset. Species-specific emergence time ranges are shown as grey bars. Bat passes overlapping species-specific grey bars, or occurring earlier than this time range, may potentially indicate the presence of a nearby roost.







Count of Bat Passes

All Detectors

Table 14. The total number of passes recorded for each species across all of the detectors.

The 'Total' percentage may not be exactly 100% due to rounding of the percentages per species.

Species	Passes (no.)	Percentage of Total (%)
Myotis daubentonii	21	0.2
Myotis mystacinus	2	0.0
Nyctalus leisleri	2457	24.1
Pipistrellus nathusii	825	8.1
Pipistrellus pipistrellus	5391	52.9
Pipistrellus pygmaeus	1489	14.6
Plecotus auritus	6	0.1
Total	10191	100.0

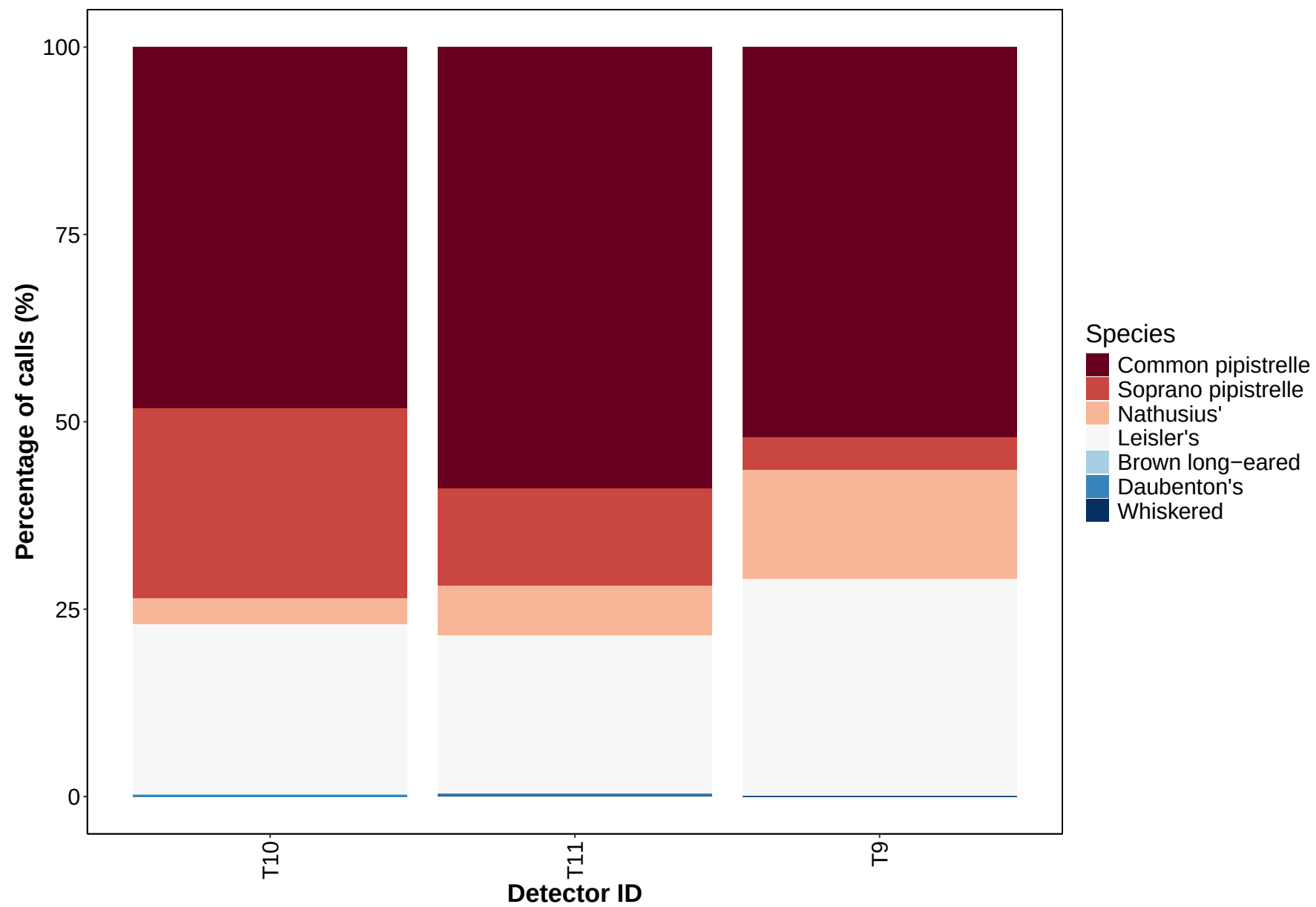
Per Detector

The number of passes recorded for each species at each detector.

Species	Detector ID	Count (no.)	Percentage by Detector (%)
Common pipistrelle	T10	2610	50.9069631
Common pipistrelle	T11	711	58.8089330
Common pipistrelle	T9	2070	53.6964981
Soprano pipistrelle	T10	1165	22.7228399
Soprano pipistrelle	T11	163	13.4822167
Soprano pipistrelle	T9	161	4.1763943
Nathusius'	T10	214	4.1739809
Nathusius'	T11	107	8.8502895
Nathusius'	T9	504	13.0739300
Leisler's	T10	1121	21.8646382
Leisler's	T11	220	18.1968569
Leisler's	T9	1116	28.9494163
Brown long-eared	T10	5	0.0975229
Brown long-eared	T9	1	0.0259403
Daubenton's	T10	12	0.2340550
Daubenton's	T11	7	0.5789909
Daubenton's	T9	2	0.0518807
Whiskered	T11	1	0.0827130
Whiskered	T9	1	0.0259403

Species Composition

Figure 10. Percentage species composition of passes at each detector.



Part 2a: Presence Only

THE NEXT SECTION OF THE REPORT FEATURES THE RAW DATA SUPPLIED TO ECOBAT AND ONLY TAKES INTO ACCOUNT THE PRESENCE, AND NOT THE ABSENCE, OF EACH BAT SPECIES. FOR EACH NIGHT, THERE IS NO 'ZERO DATA' FOR WHEN SPECIES WERE NOT DETECTED.

Nightly Bat Passes Per Hour

Median Per Detector

Table 16. The median Nightly Pass Rate (bat passes per hour, per night) of each species. If NA, then no bat passes.

Bat pass rates are often highly variable between nights, with some nights having few or no passes and other nights having high activity. In these circumstances, the median is likely to be a more useful summary of the 'average' activity than is the mean. For further information see: Lintott, P. R., & Mathews, F. (2018). Basic mathematical errors may make ecological assessments unreliable. *Biodiversity and Conservation*, 27(1), 265-267. <https://doi.org/10.1007/s10531-017-1418-5>

Species	Detector ID	Median Pass Rate
Common pipistrelle	T10	18.1
Common pipistrelle	T11	12.3
Common pipistrelle	T9	41.9
Soprano pipistrelle	T10	14.0
Soprano pipistrelle	T11	2.0
Soprano pipistrelle	T9	2.6
Nathusius'	T10	1.1
Nathusius'	T11	1.3
Nathusius'	T9	8.6
Leisler's	T10	10.2
Leisler's	T11	1.6
Leisler's	T9	17.9
Brown long-eared	T10	0.2
Brown long-eared	T9	0.1
Daubenton's	T10	0.3
Daubenton's	T11	0.1
Daubenton's	T9	0.1
Whiskered	T11	0.1
Whiskered	T9	0.1

Mean Per Detector

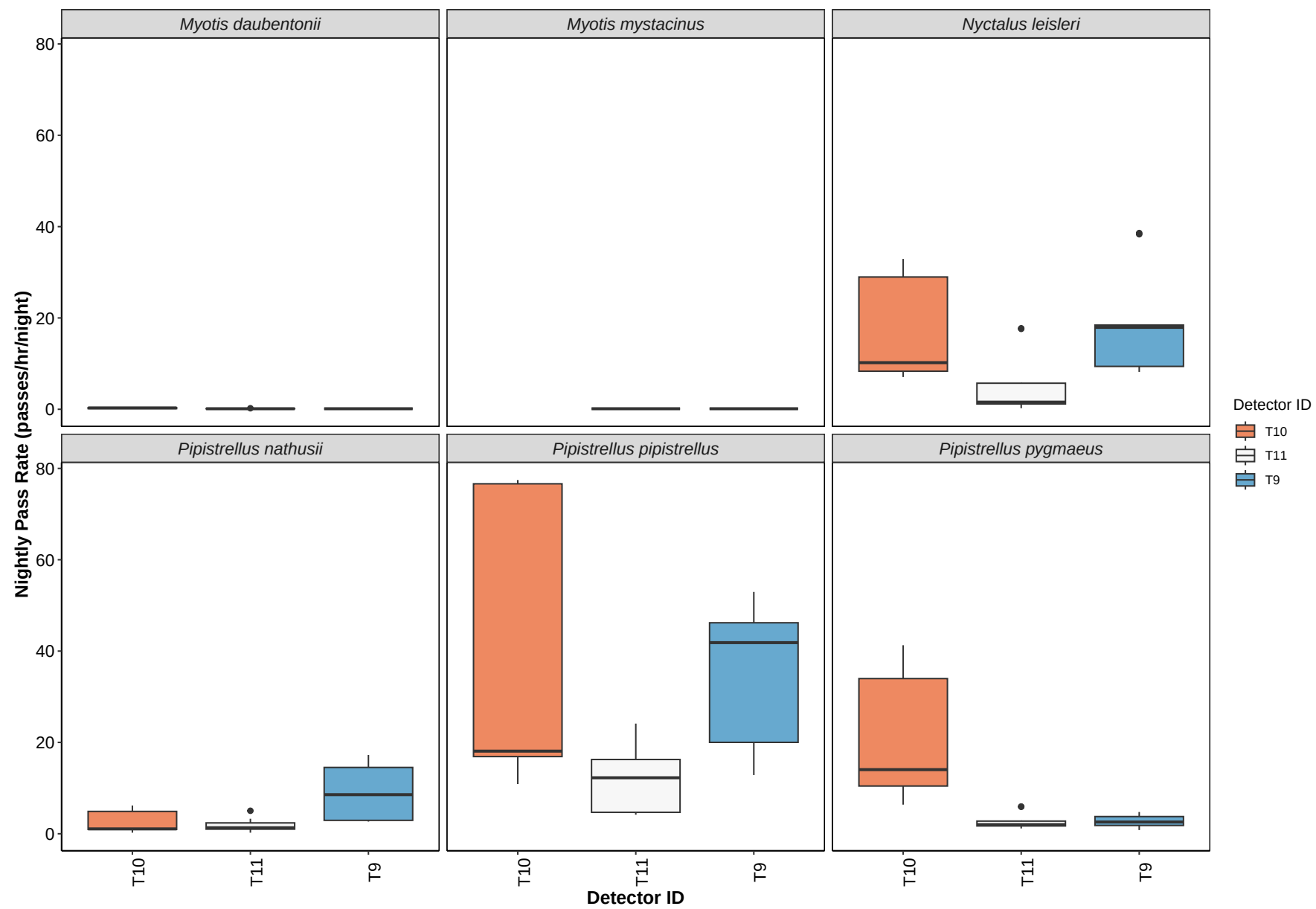
Table 17. The mean Nightly Pass Rate (bat passes per hour, per night) of each species at each detector. Values are given to 1 decimal place.

We recommend using the median values given above, for the reasons stated above, but provide the mean values in the table below.

Species	Detector ID	Mean Pass Rate
Common pipistrelle	T10	39.6
Common pipistrelle	T11	13.2
Common pipistrelle	T9	34.6
Soprano pipistrelle	T10	20.8
Soprano pipistrelle	T11	2.9
Soprano pipistrelle	T9	2.9
Nathusius'	T10	2.8
Nathusius'	T11	1.9
Nathusius'	T9	9.6
Leisler's	T10	18.6
Leisler's	T11	5.3
Leisler's	T9	19.2
Brown long-eared	T10	0.2
Brown long-eared	T9	0.1
Daubenton's	T10	0.3
Daubenton's	T11	0.1
Daubenton's	T9	0.1
Whiskered	T11	0.1
Whiskered	T9	0.1

Per Detector

Figure 11. Boxplots for the number of bat passes per hour each night, for each detector. The 'box' shows the interquartile range, which is where the middle 50% of the data lie. The line dividing the box is the median, the mid-point of the data. The 'whiskers' extend from the box and represent the ranges for the bottom 25% and the top 25% of the data values, excluding outliers. An outlier is any extreme value that lies further away from the box than 1.5 times the interquartile range. Outliers are shown as dots. Where very few passes are recorded it is not possible to produce the box, so the data are shown as a line.





Detector ID

Split by Month

Total Bat Passes per Detector each Month

Table 18. The total number of bat passes of each species in each month at each detector.

This table simply tells you how many bats of each species were recorded passing each detector during each month. These numbers are not standardised by the night length, or how many nights each detector was active for during each month.

Species	Detector ID	May
Common pipistrelle	T10	2962
Common pipistrelle	T11	988
Common pipistrelle	T9	2605
Soprano pipistrelle	T10	1556
Soprano pipistrelle	T11	218
Soprano pipistrelle	T9	223
Nathusius'	T10	210
Nathusius'	T11	111
Nathusius'	T9	724
Leisler's	T10	1395
Leisler's	T11	354
Leisler's	T9	1450
Brown long-eared	T10	5
Brown long-eared	T9	1
Daubenton's	T10	13
Daubenton's	T11	5
Daubenton's	T9	2
Whiskered	T11	1
Whiskered	T9	1

Survey Effort

Table 19. The number of survey nights per month per detector.

month	Detector ID	No. of Survey Nights
May	T10	9
May	T11	9
May	T9	9

Nightly Bat Passes for Each Month

Median Per Detector

Table 20. The median Nightly Pass Rate (bat passes per hour, per night) of each species throughout each month. If NA, then no bat passes.

Bat pass rates are often highly variable between nights, with some nights having few or no passes and other nights having high activity. In these circumstances, the median is likely to be a more useful summary of the 'average' activity than is the mean. For further information see: Lintott, P. R., & Mathews, F. (2018). Basic mathematical errors may make ecological assessments unreliable. *Biodiversity and Conservation*, 27(1), 265-267. <https://doi.org/10.1007/s10531-017-1418-5>

Species	Detector ID	May
Common pipistrelle	T10	18.1
Common pipistrelle	T11	12.3
Common pipistrelle	T9	41.9
Soprano pipistrelle	T10	14.0
Soprano pipistrelle	T11	2.0
Soprano pipistrelle	T9	2.6
Nathusius'	T10	1.1
Nathusius'	T11	1.3
Nathusius'	T9	8.6
Leisler's	T10	10.2
Leisler's	T11	1.6
Leisler's	T9	17.9
Brown long-eared	T10	0.2
Brown long-eared	T9	0.1
Daubenton's	T10	0.3
Daubenton's	T11	0.1
Daubenton's	T9	0.1
Whiskered	T11	0.1
Whiskered	T9	0.1

Mean Per Detector

Table 21: The mean Nightly Pass Rate (bat passes per hour, per night) of each species throughout each month. Values are given to 1 decimal place.

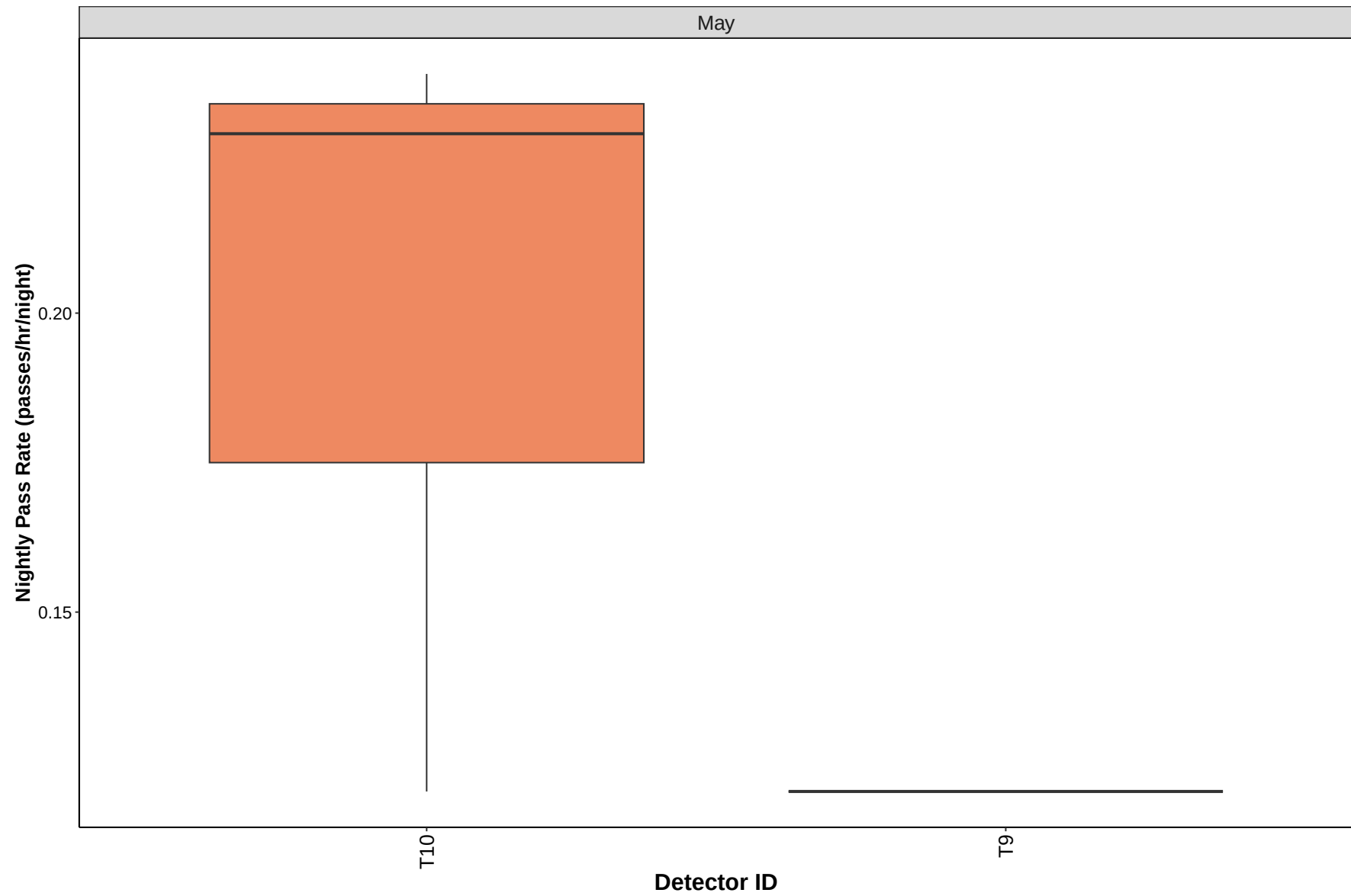
We recommend using the median values given above, for the reasons stated above, but provide the mean values in the table below.

Species	Detector ID	May
Common pipistrelle	T10	39.6
Common pipistrelle	T11	13.2
Common pipistrelle	T9	34.6
Soprano pipistrelle	T10	20.8
Soprano pipistrelle	T11	2.9
Soprano pipistrelle	T9	2.9
Nathusius'	T10	2.8
Nathusius'	T11	1.9
Nathusius'	T9	9.6
Leisler's	T10	18.6
Leisler's	T11	5.3
Leisler's	T9	19.2
Brown long-eared	T10	0.2
Brown long-eared	T9	0.1
Daubenton's	T10	0.3
Daubenton's	T11	0.1
Daubenton's	T9	0.1
Whiskered	T11	0.1
Whiskered	T9	0.1

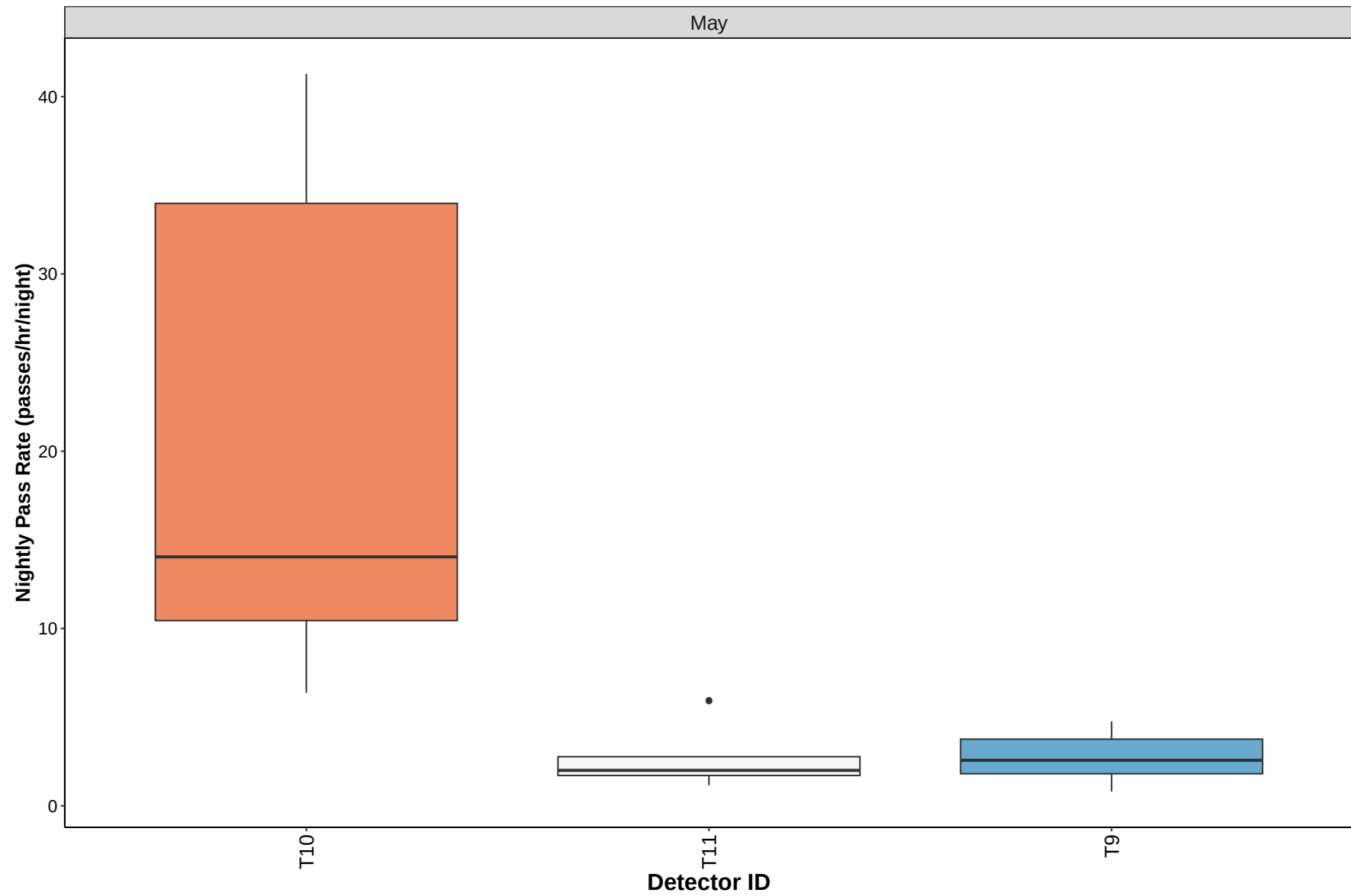
Per Detector

Figure 12. Figures show boxplots for the number of bat passes per hour by detector, for each month. The 'box' shows the interquartile range, which is where the middle 50% of the data lie. The line dividing the box is the median, the mid-point of the data. The 'whiskers' extend from the box and represent the ranges for the bottom 25% and the top 25% of the data values, excluding outliers. An outlier is any extreme value that lies further away from the box than 1.5 times the interquartile range. Outliers are shown as dots. Where very few passes are recorded it is not possible to produce the box, so the data are shown as a line.

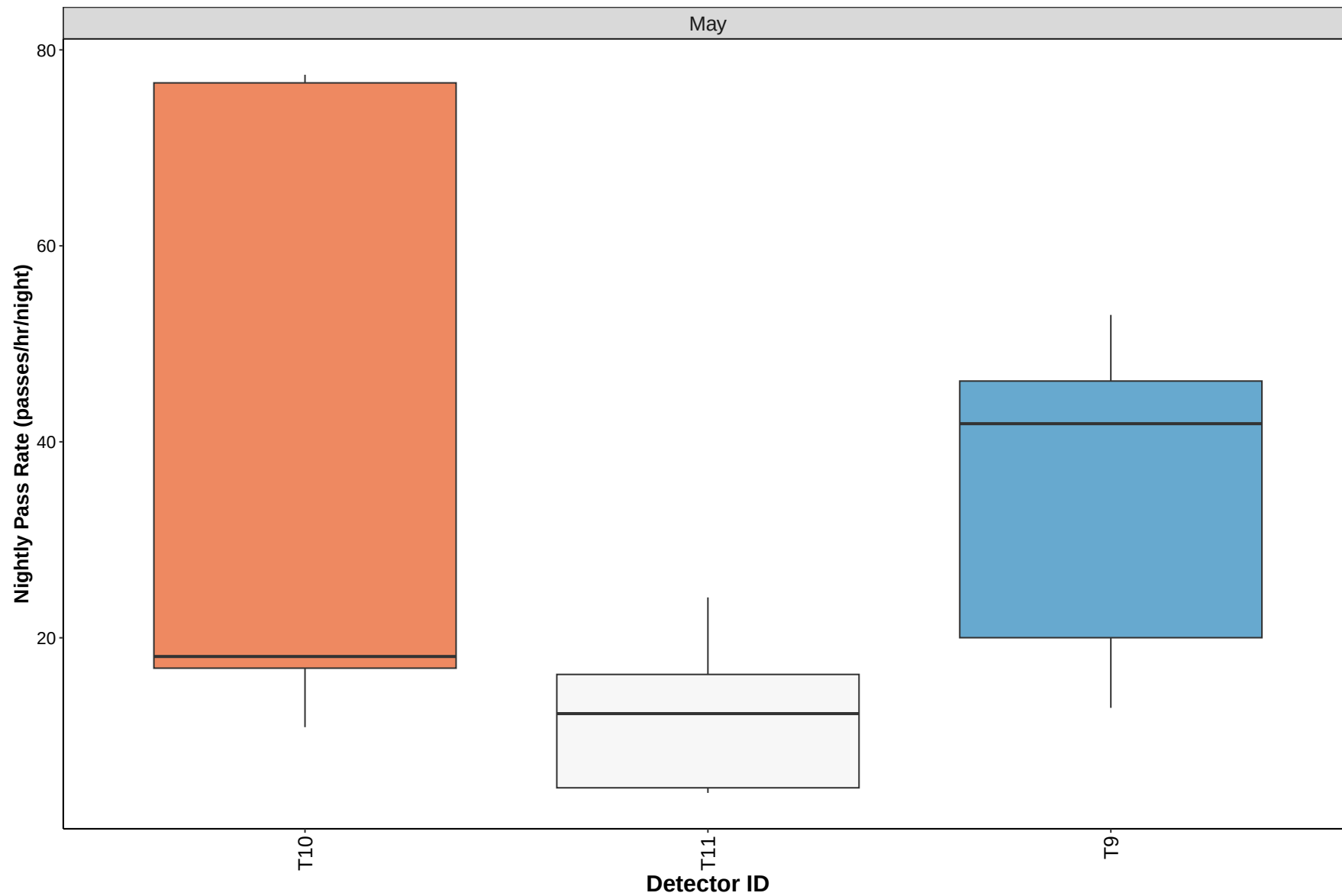
Brown long-eared



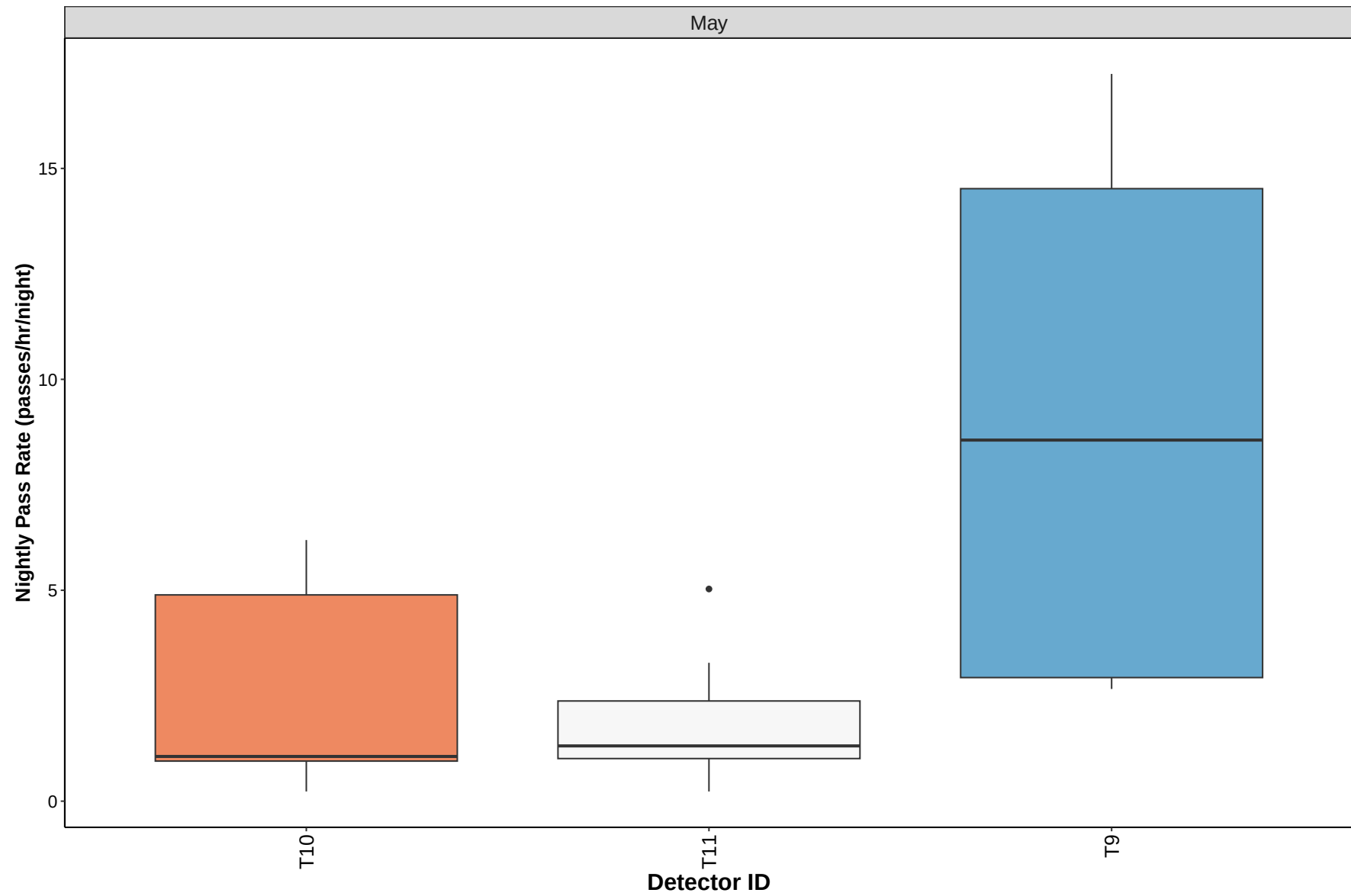
Soprano pipistrelle



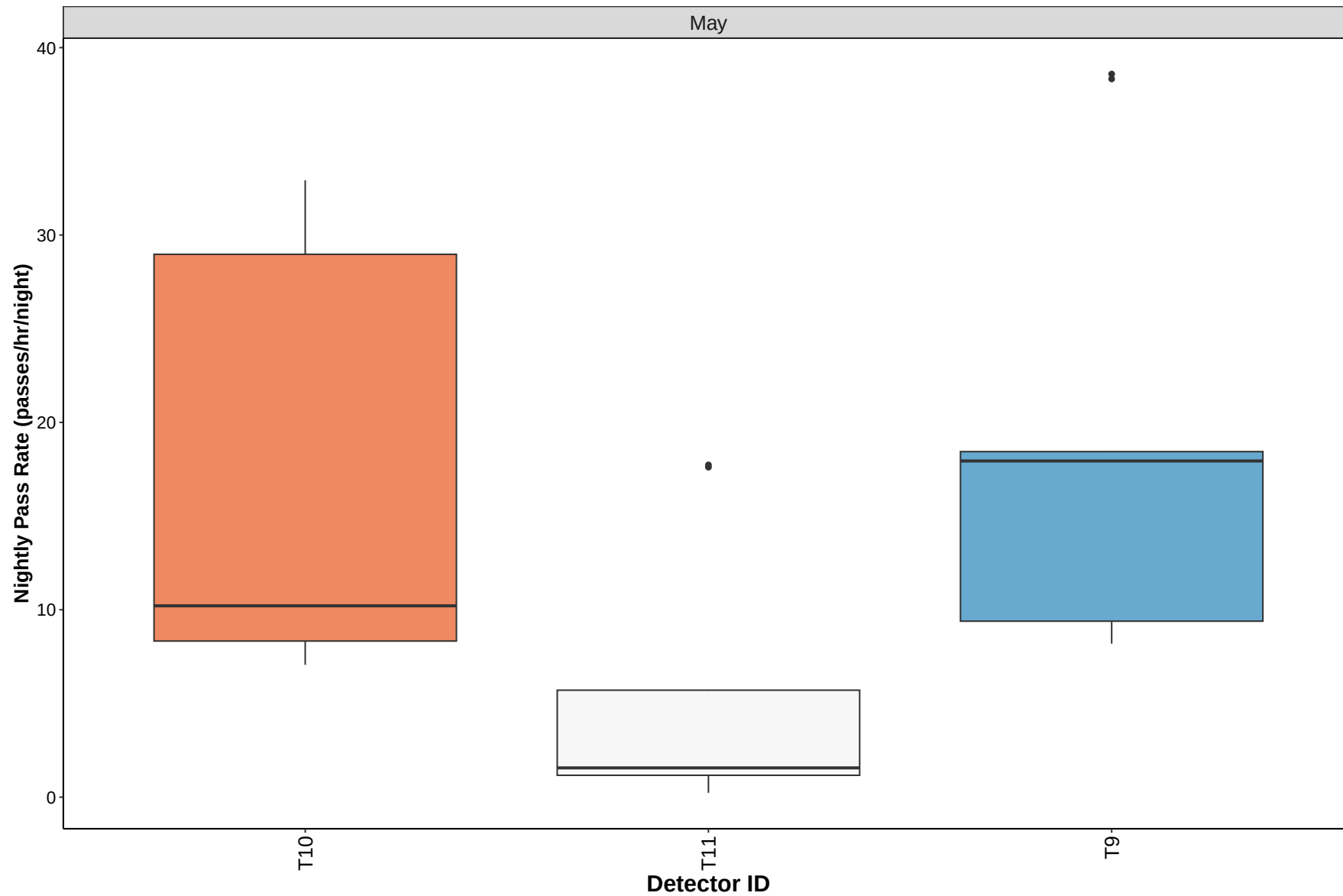
Common pipistrelle

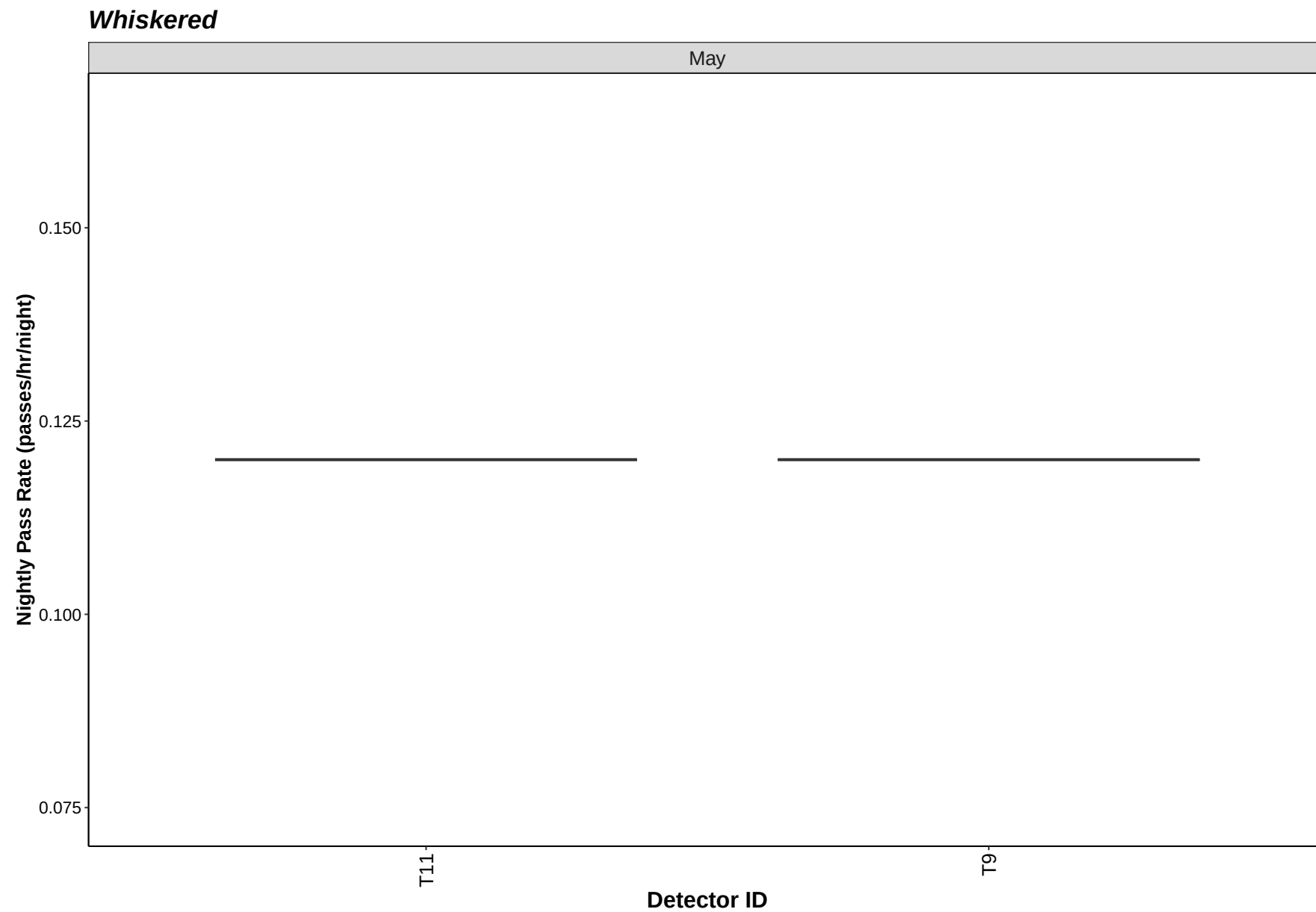


Nathusius'

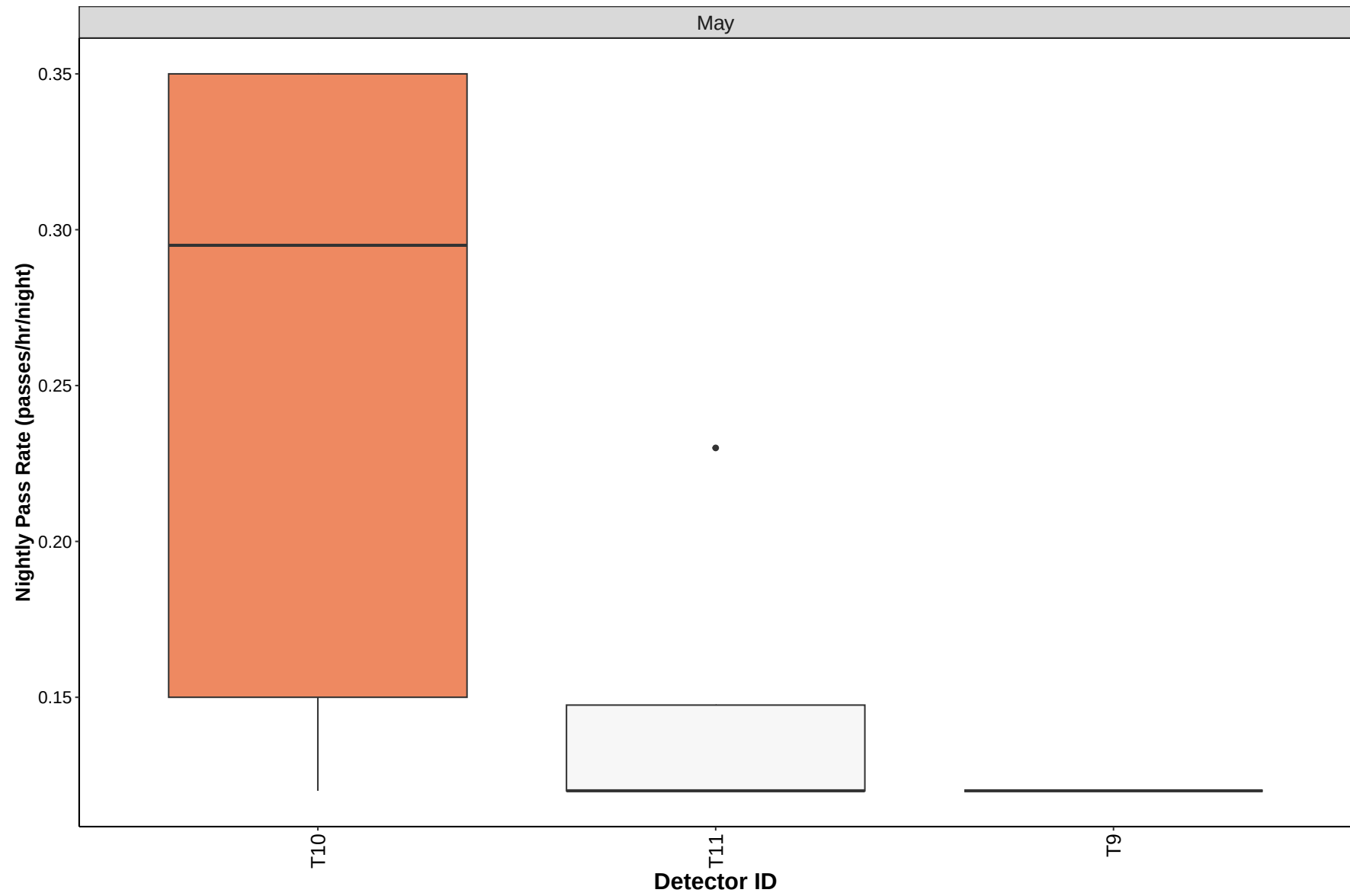


Leisler's





Daubenton's



Bat Activity per Detector Location

Figure 13. Detector ID reference:

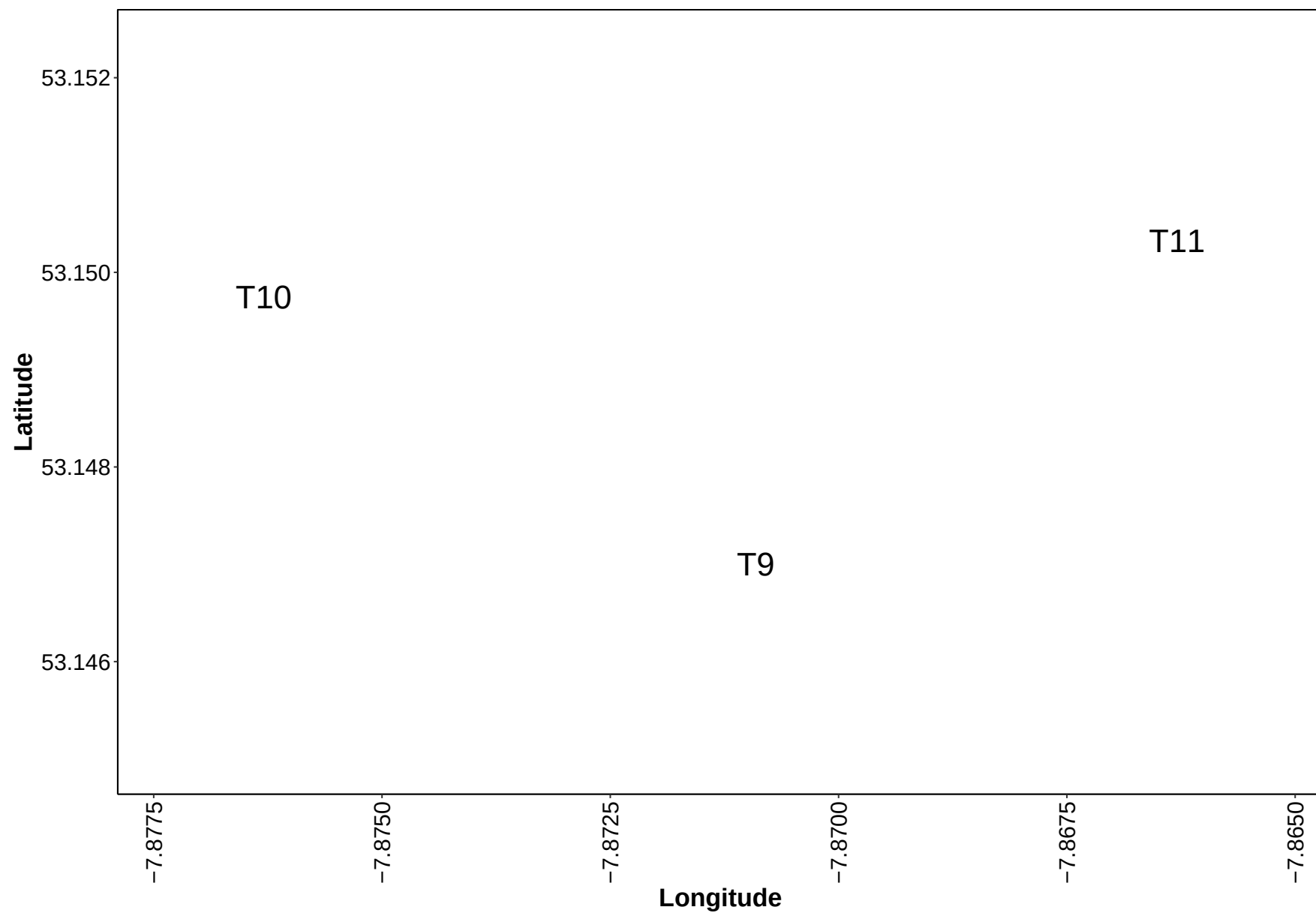
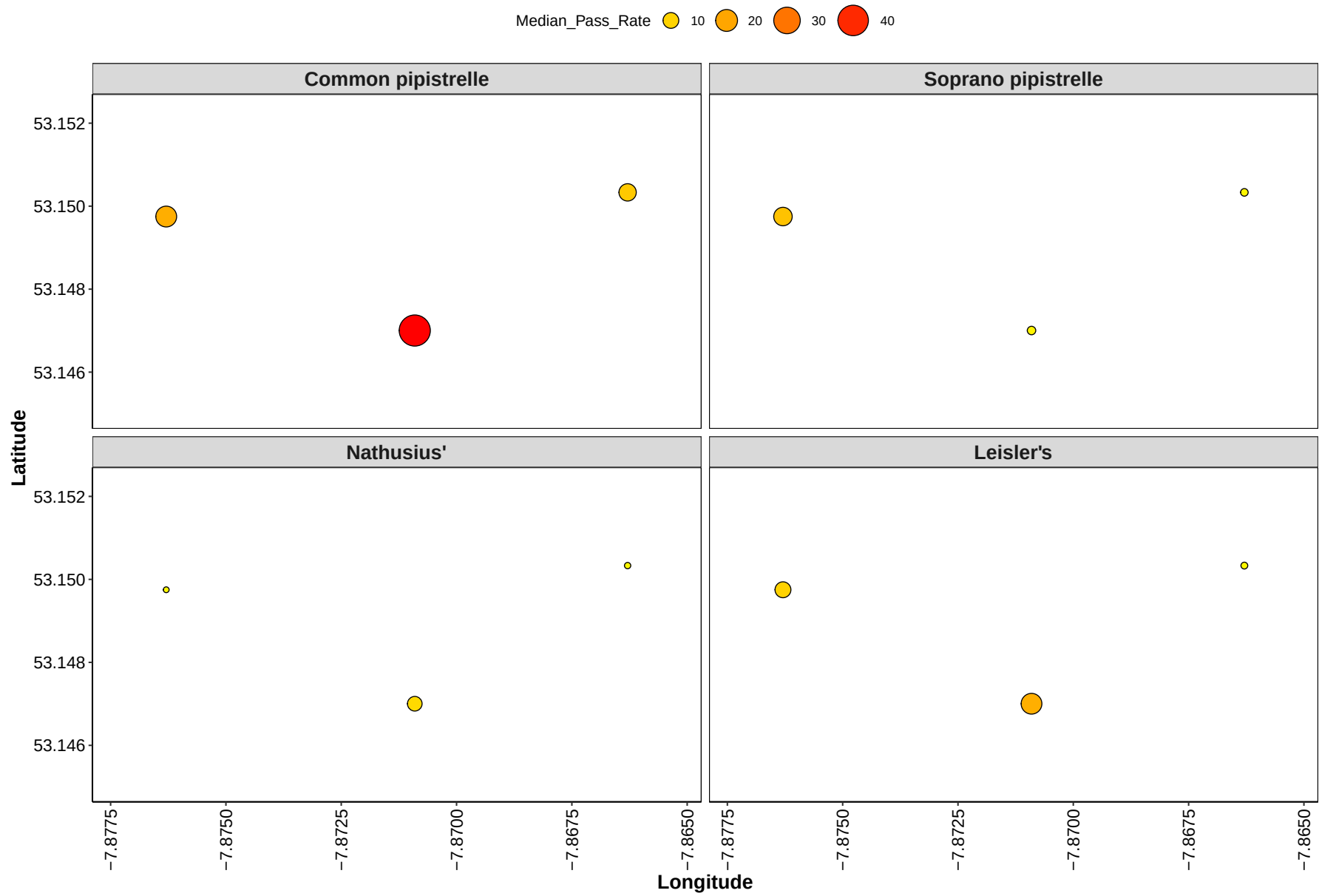


Figure 14. Median Nightly Pass Rate (bat passes/hr/night) throughout the survey period - represented by the size and colour of the point at each detector location.



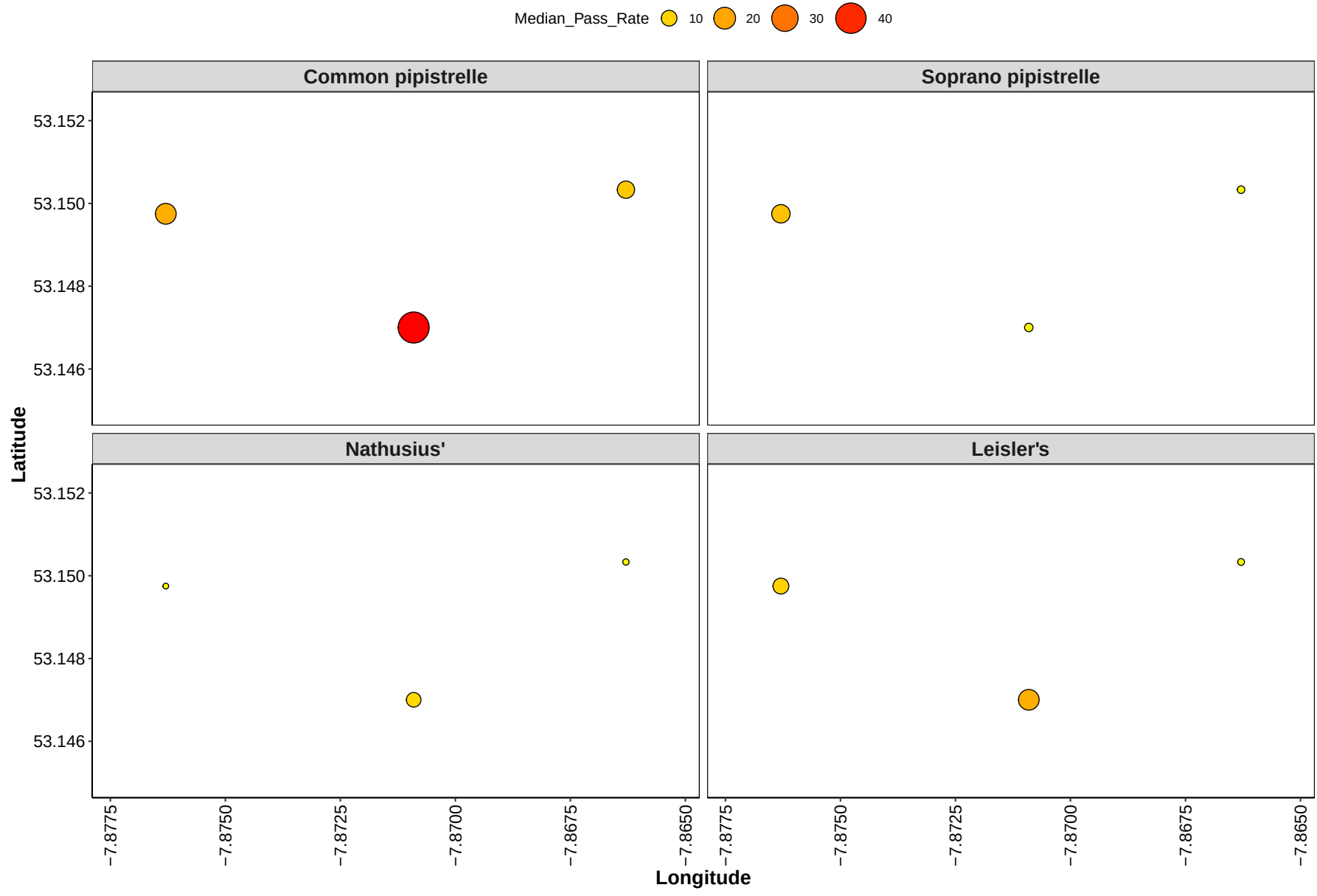
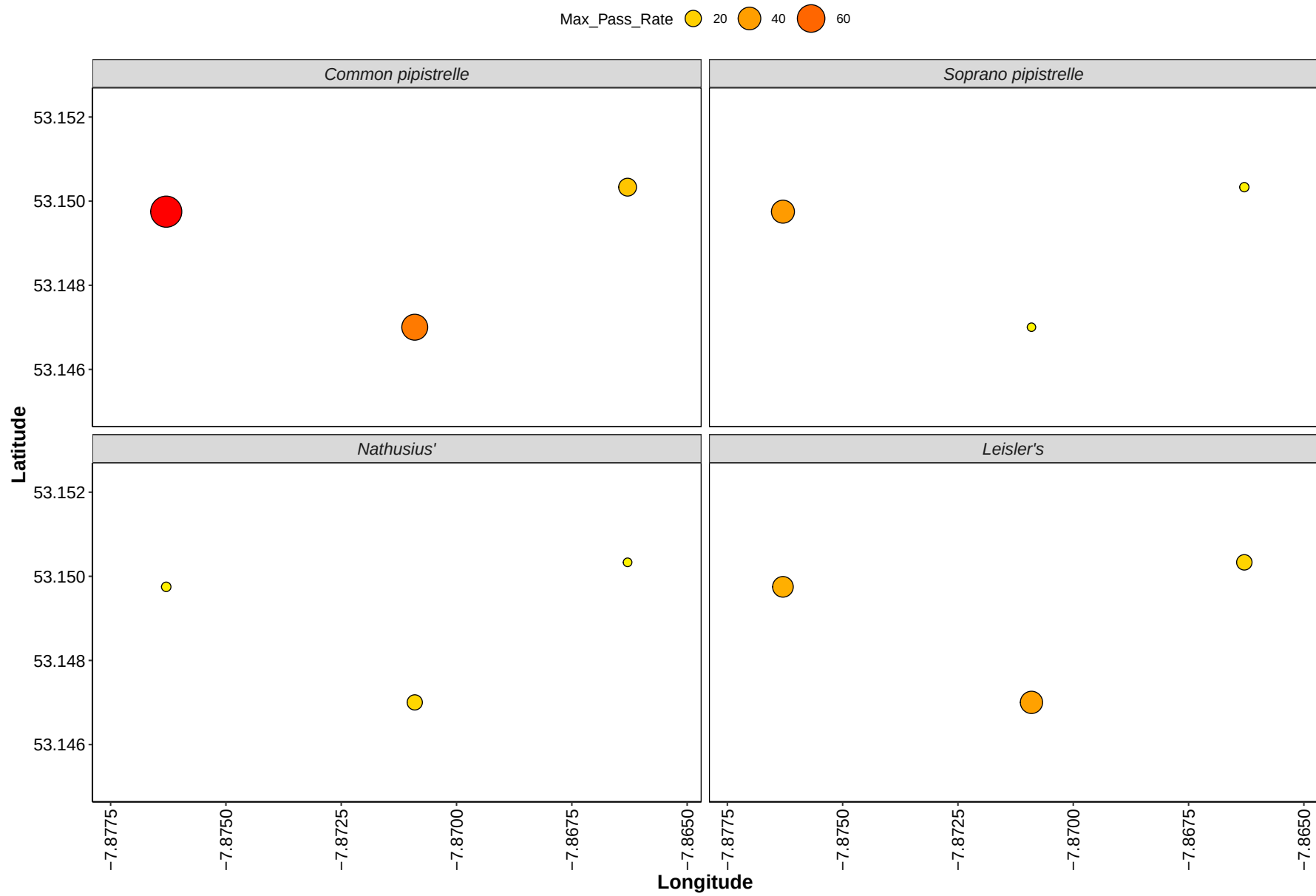
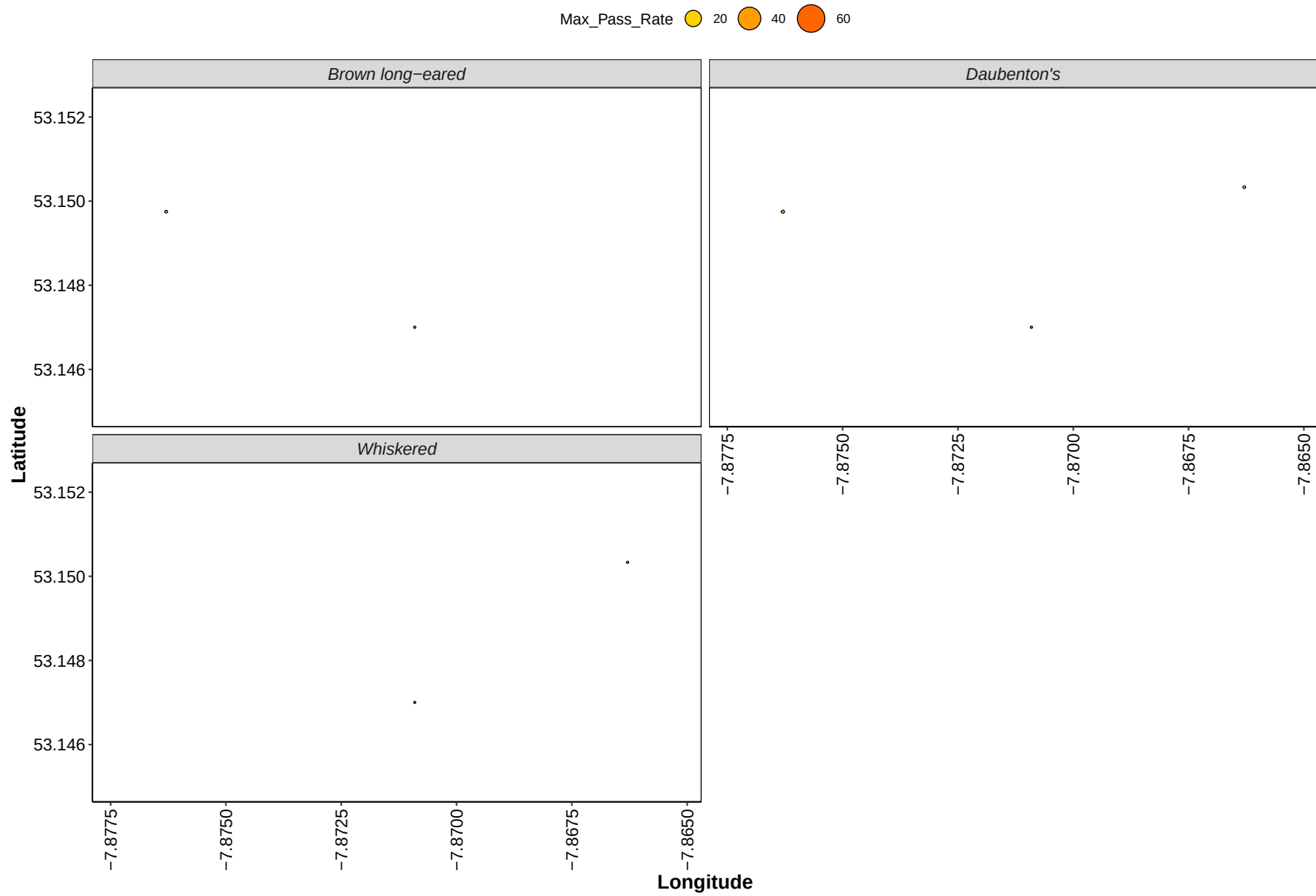


Figure 15. Maximum Nightly Pass Rate (bat passes/hr/night) recorded in a single night throughout the survey period - represented by the size and colour of the point at each detector location.





Part 2b: Includes Absences

THE NEXT SECTION OF THE REPORT FEATURES THE DATA SUPPLIED TO ECOBAT BUT TAKES INTO ACCOUNT SPECIES ABSENCES, AND THEREFORE INCLUDES 'ZERO DATA' FOR WHEN SPECIES WERE NOT DETECTED AT EACH DETECTOR ON A NIGHT. THIS DRAMATICALLY LOWERS THE MEANS AND MEDIANS OF THE DATA PRESENTED.

Nightly Bat Pass Rate

Median per Detector

Table 22. The median Nightly Pass Rate (bat passes per hour, per night) of each species. If NA, then no bat passes.

Bat pass rates are often highly variable between nights, with some nights having few or no passes and other nights having high activity. In these circumstances, the median is likely to be a more useful summary of the 'average' activity than is the mean. For further information see: Lintott, P. R., & Mathews, F. (2018). Basic mathematical errors may make ecological assessments unreliable. *Biodiversity and Conservation*, 27(1), 265-267. <https://doi.org/10.1007/s10531-017-1418-5>

Species	Detector ID	Median Pass Rate
Brown long-eared	T10	0.0
Brown long-eared	T11	0.0
Brown long-eared	T9	0.0
Common pipistrelle	T10	18.1
Common pipistrelle	T11	12.3
Common pipistrelle	T9	41.9
Daubenton's	T10	0.1
Daubenton's	T11	0.0
Daubenton's	T9	0.0
Leisler's	T10	10.2
Leisler's	T11	1.5
Leisler's	T9	17.9
Nathusius'	T10	1.1
Nathusius'	T11	1.3
Nathusius'	T9	8.6
Soprano pipistrelle	T10	14.0
Soprano pipistrelle	T11	2.0
Soprano pipistrelle	T9	2.6
Whiskered	T10	0.0
Whiskered	T11	0.0
Whiskered	T9	0.0

Mean per Detector

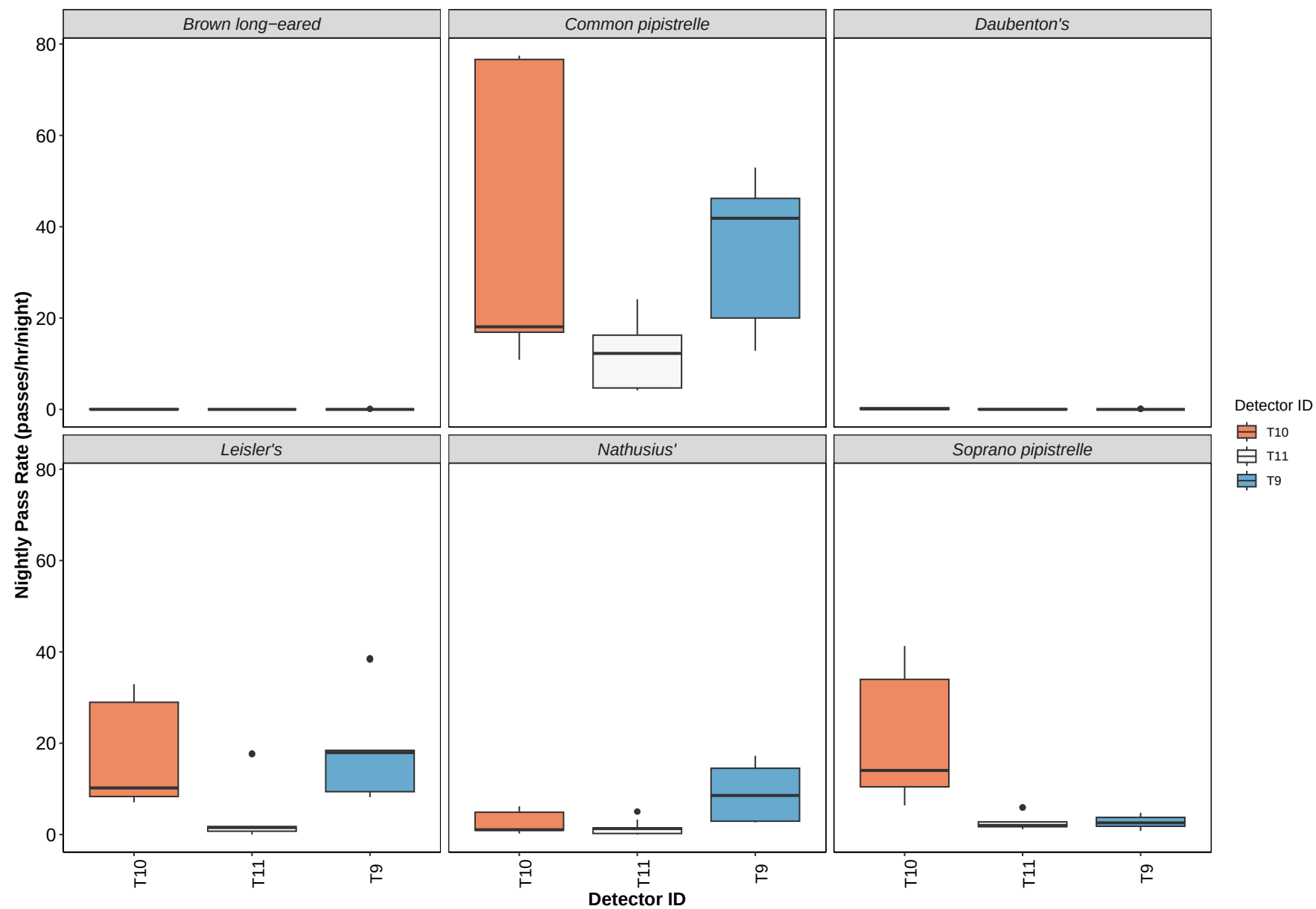
Table 23. The mean Nightly Pass Rate (bat passes per hour, per night) of each species at each detector. Values are given to 1 decimal place.

We recommend using the median values given above, for the reasons stated above, but provide the mean values in the table below.

Species	Detector ID	Mean Pass Rate
Brown long-eared	T10	0.1
Brown long-eared	T11	0.0
Brown long-eared	T9	0.0
Common pipistrelle	T10	39.6
Common pipistrelle	T11	13.2
Common pipistrelle	T9	34.6
Daubenton's	T10	0.2
Daubenton's	T11	0.1
Daubenton's	T9	0.0
Leisler's	T10	18.6
Leisler's	T11	4.7
Leisler's	T9	19.2
Nathusius'	T10	2.8
Nathusius'	T11	1.5
Nathusius'	T9	9.6
Soprano pipistrelle	T10	20.8
Soprano pipistrelle	T11	2.9
Soprano pipistrelle	T9	2.9
Whiskered	T10	0.0
Whiskered	T11	0.0
Whiskered	T9	0.0

Per Detector

Figure 16. Figures show boxplots for the number of bat passes per hour each night, for each detector. The 'box' shows the interquartile range, which is where the middle 50% of the data lie. The line dividing the box is the median, the mid-point of the data. The 'whiskers' extend from the box and represent the ranges for the bottom 25% and the top 25% of the data values, excluding outliers. An outlier is any extreme value that lies further away from the box than 1.5 times the interquartile range. Outliers are shown as dots. Where very few passes are recorded it is not possible to produce the box, so the data are shown as a line.





Detector ID

Survey Effort

Table 24. The number of nights bats were detected per month per detector.

month	Detector ID	No. of Survey Nights
May	T10	9
May	T11	9
May	T9	9

Nightly Bat Pass Rate for Each Month

Median per Detector

Table 25. The median Nightly Pass Rate (bat passes per hour, per night) of each species throughout each month. If NA, then no bat passes.

Bat pass rates are often highly variable between nights, with some nights having few or no passes and other nights having high activity. In these circumstances, the median is likely to be a more useful summary of the ‘average’ activity than is the mean. For further information see: Lintott, P. R., & Mathews, F. (2018). Basic mathematical errors may make ecological assessments unreliable. *Biodiversity and Conservation*, 27(1), 265-267. <https://doi.org/10.1007/s10531-017-1418-5>

Species	Detector ID	May
Brown long-eared	T10	0.0
Brown long-eared	T11	0.0
Brown long-eared	T9	0.0
Common pipistrelle	T10	18.1
Common pipistrelle	T11	12.3
Common pipistrelle	T9	41.9
Daubenton's	T10	0.1
Daubenton's	T11	0.0
Daubenton's	T9	0.0
Leisler's	T10	10.2
Leisler's	T11	1.5
Leisler's	T9	17.9
Nathusius'	T10	1.1
Nathusius'	T11	1.3
Nathusius'	T9	8.6
Soprano pipistrelle	T10	14.0
Soprano pipistrelle	T11	2.0
Soprano pipistrelle	T9	2.6
Whiskered	T10	0.0
Whiskered	T11	0.0
Whiskered	T9	0.0

Mean per Detector

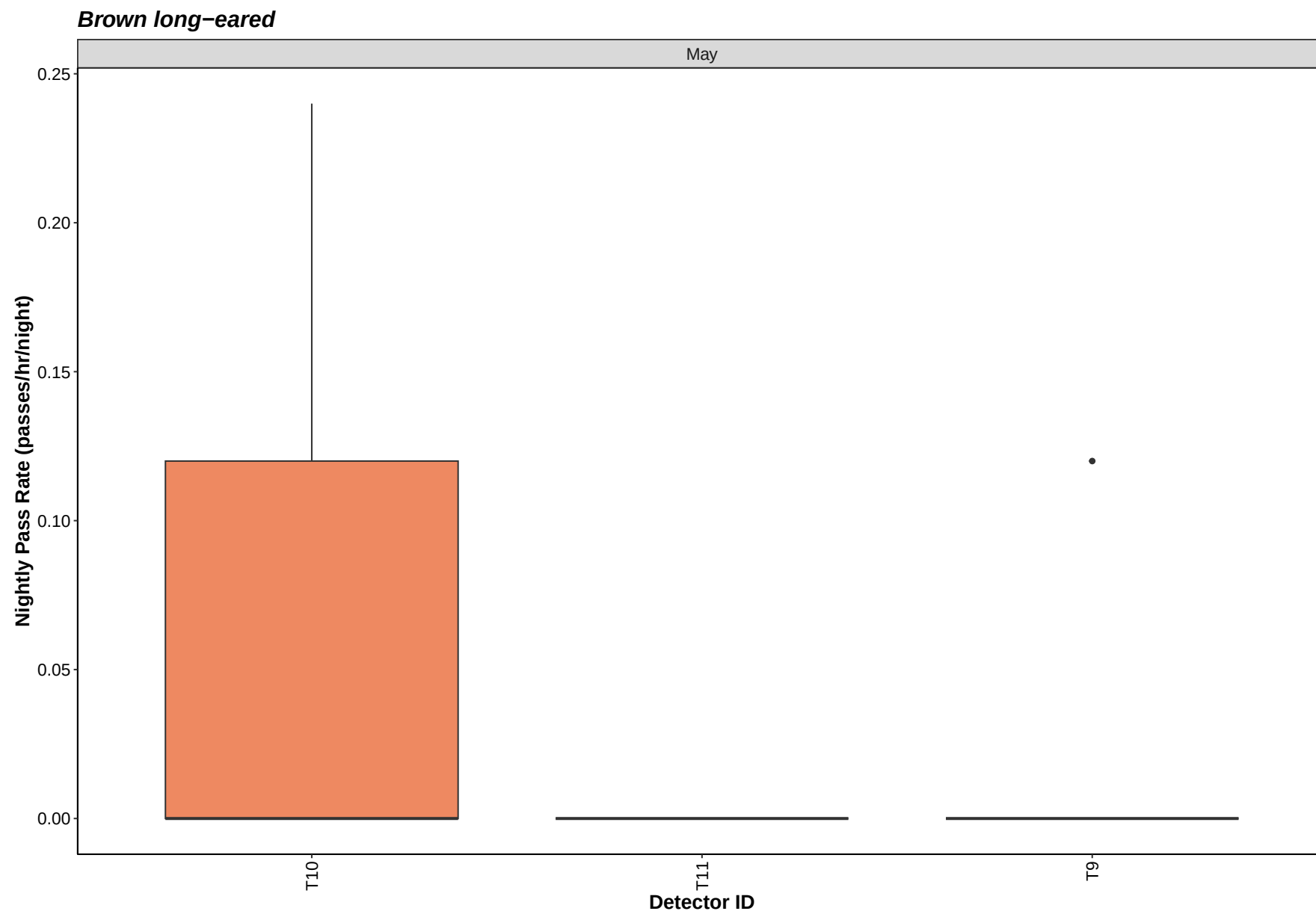
Table 26. The mean Nightly Pass Rate (bat passes per hour, per night) of each species throughout each month. Values are given to 1 decimal place.

We recommend using the median values given above, for the reasons stated above, but provide the mean values in the table below.

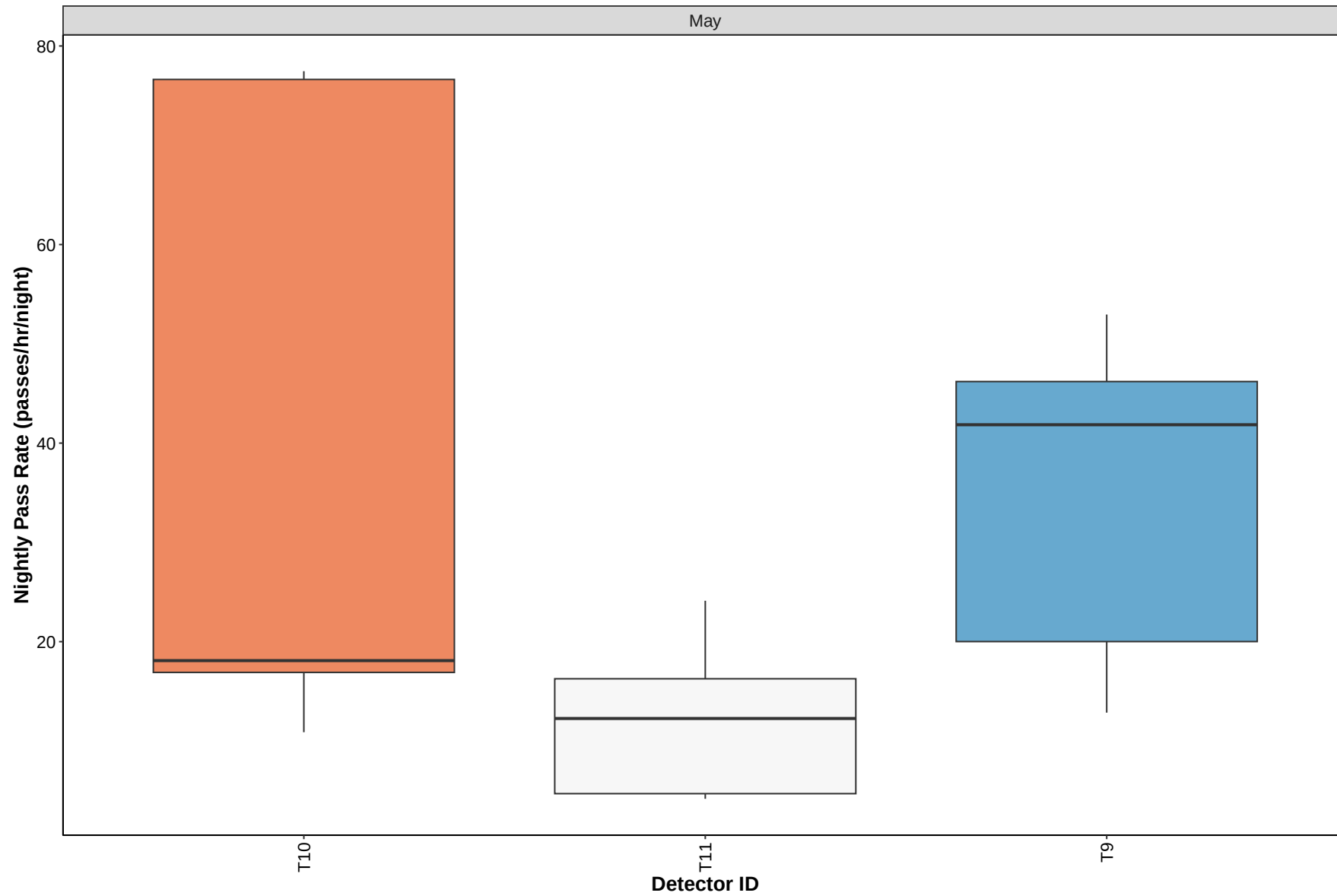
Species	Detector ID	May
Brown long-eared	T10	0.1
Brown long-eared	T11	0.0
Brown long-eared	T9	0.0
Common pipistrelle	T10	39.6
Common pipistrelle	T11	13.2
Common pipistrelle	T9	34.6
Daubenton's	T10	0.2
Daubenton's	T11	0.1
Daubenton's	T9	0.0
Leisler's	T10	18.6
Leisler's	T11	4.7
Leisler's	T9	19.2
Nathusius'	T10	2.8
Nathusius'	T11	1.5
Nathusius'	T9	9.6
Soprano pipistrelle	T10	20.8
Soprano pipistrelle	T11	2.9
Soprano pipistrelle	T9	2.9
Whiskered	T10	0.0
Whiskered	T11	0.0
Whiskered	T9	0.0

Per Detector

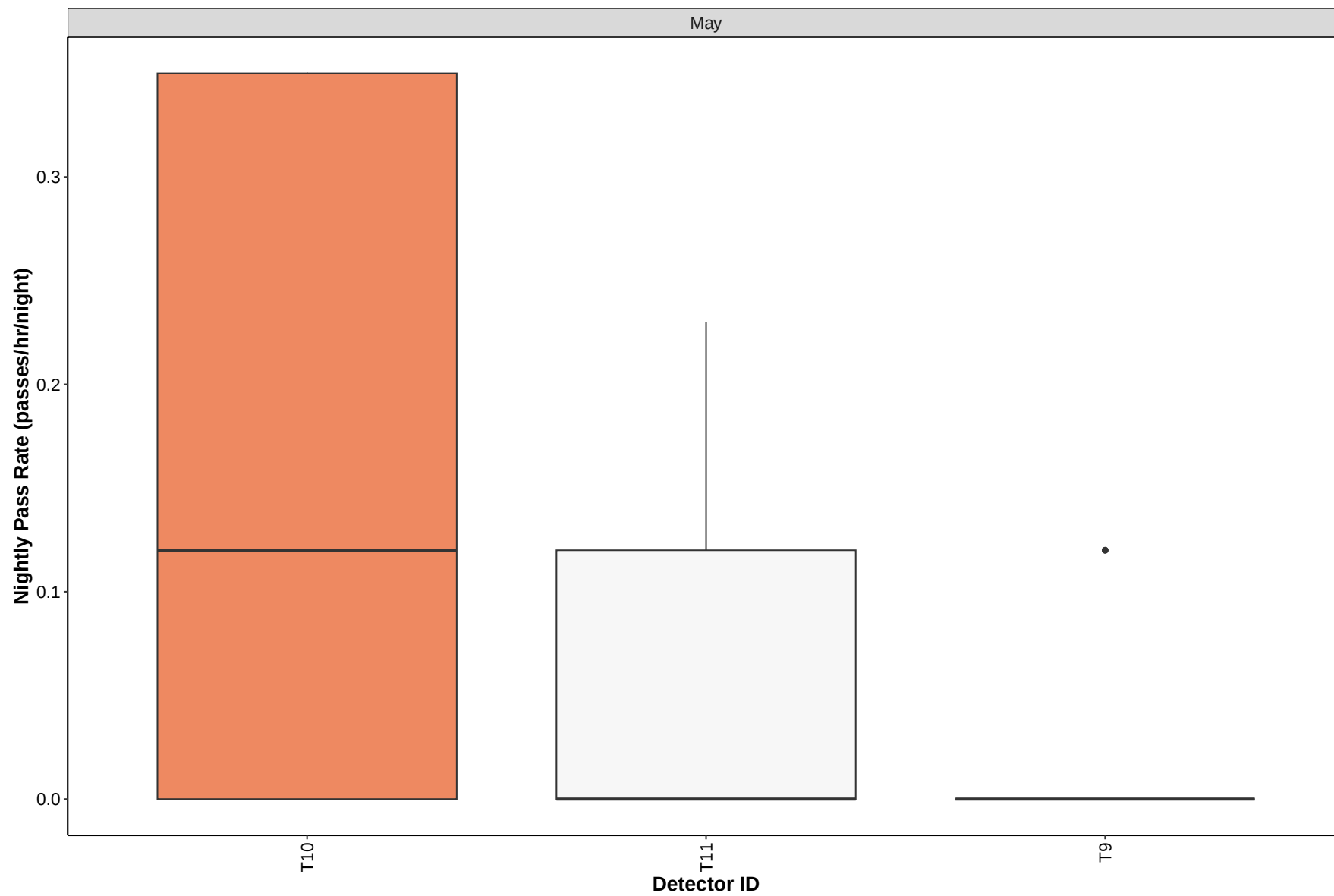
Figure 17. Figures show boxplots for the number of bat passes per hour by detector, for each month. The 'box' shows the interquartile range, which is where the middle 50% of the data lie. The line dividing the box is the median, the mid-point of the data. The 'whiskers' extend from the box and represent the ranges for the bottom 25% and the top 25% of the data values, excluding outliers. An outlier is any extreme value that lies further away from the box than 1.5 times the interquartile range. Outliers are shown as dots. Where very few passes are recorded it is not possible to produce the box, so the data are shown as a line.



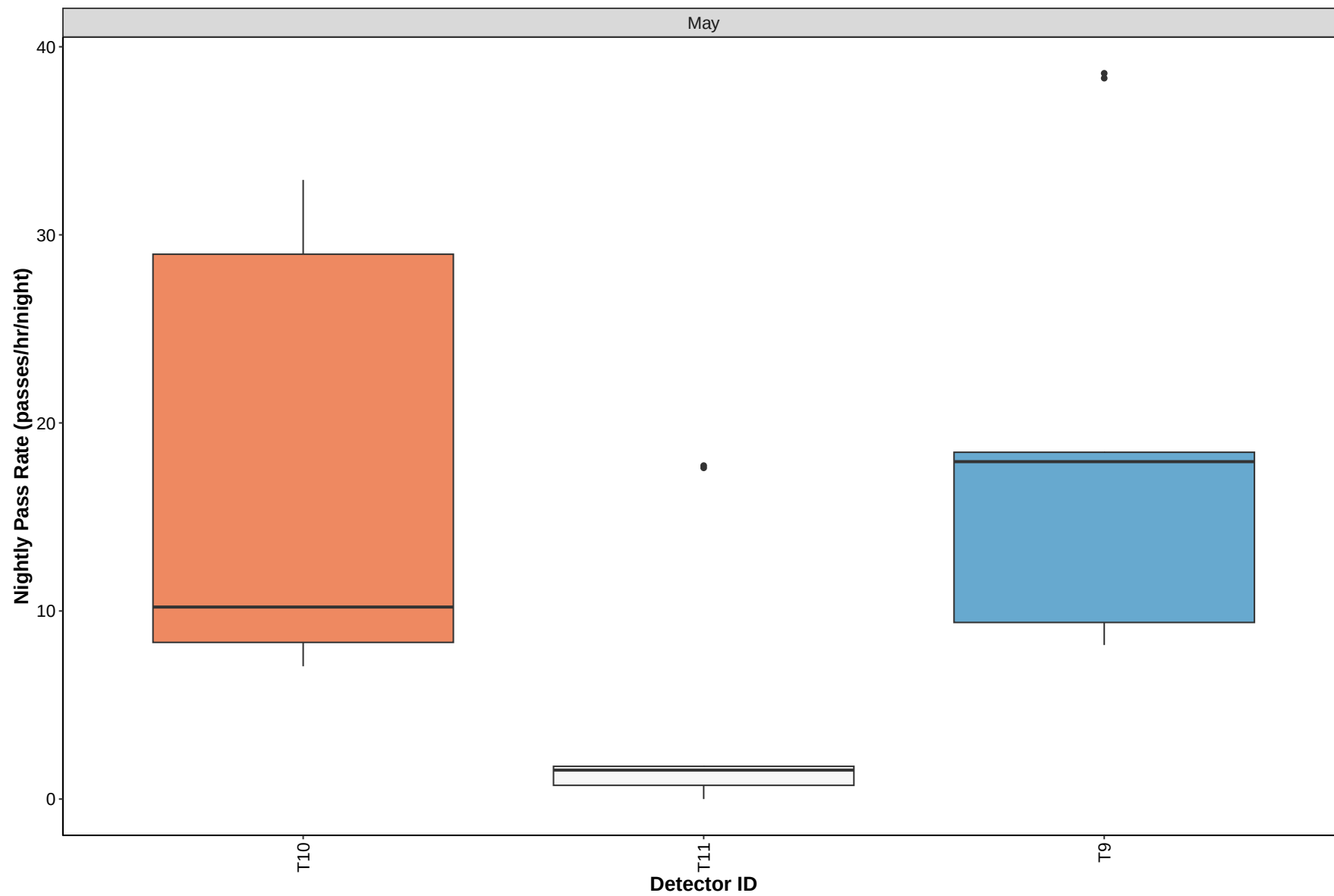
Common pipistrelle



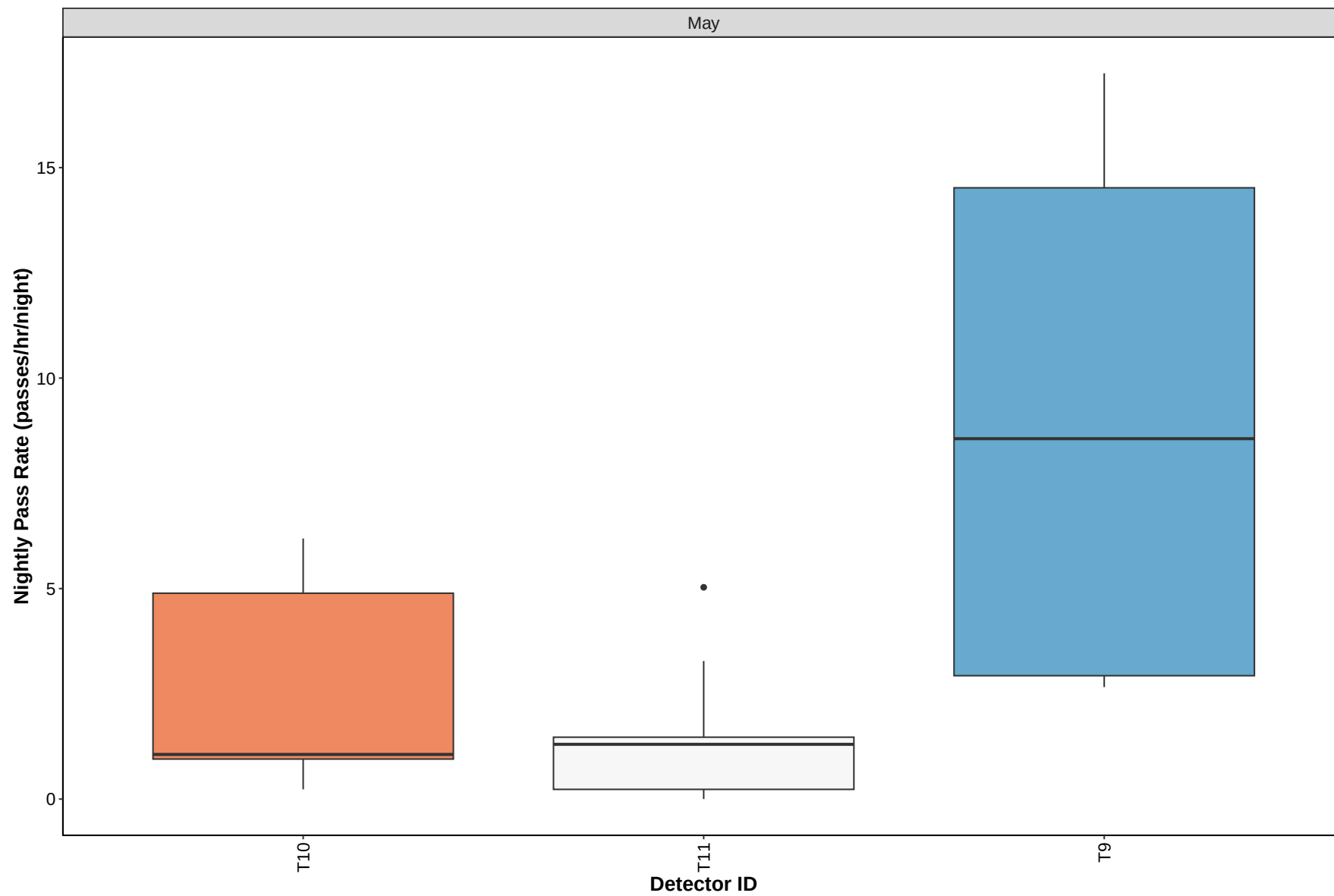
Daubenton's



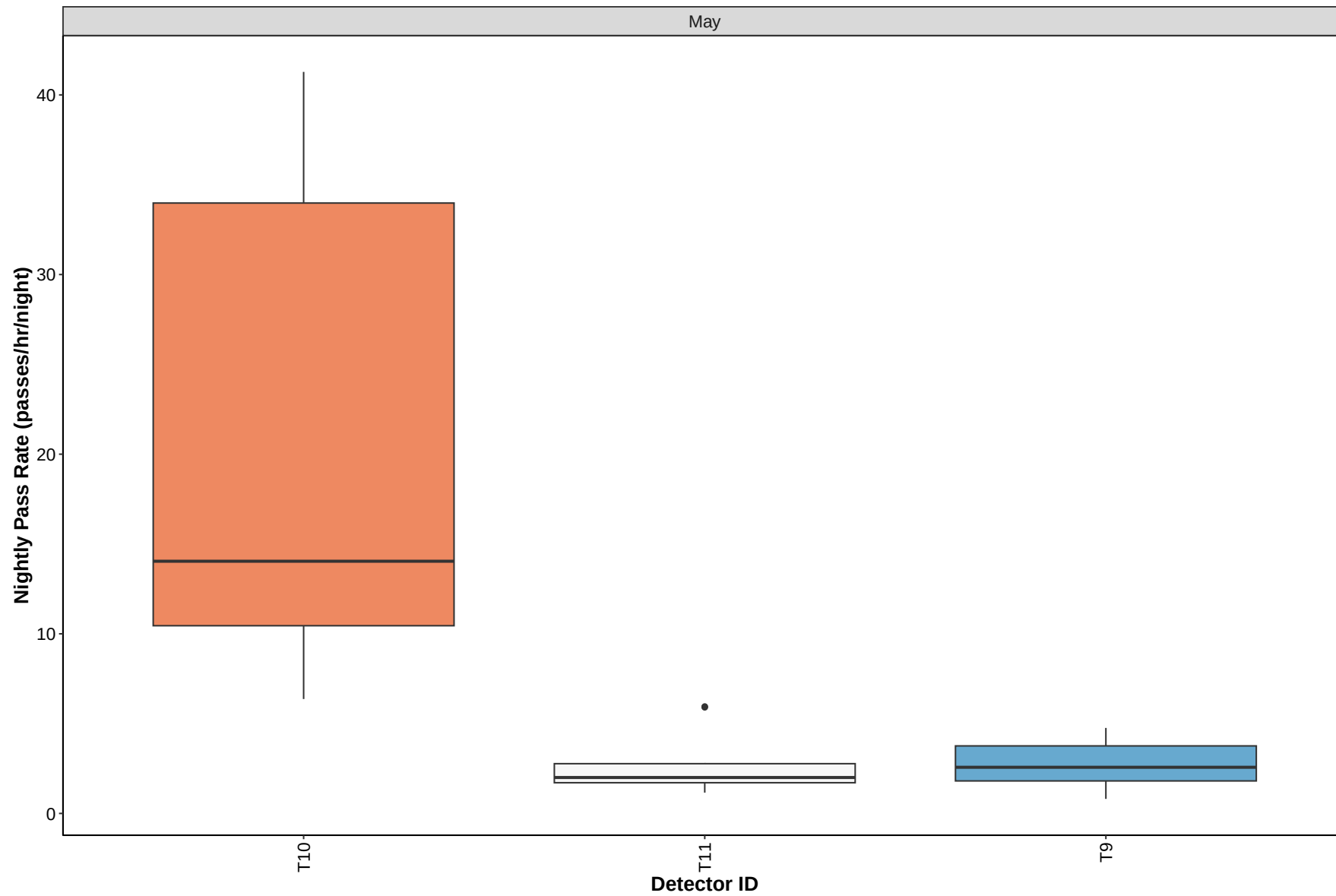
Leisler's

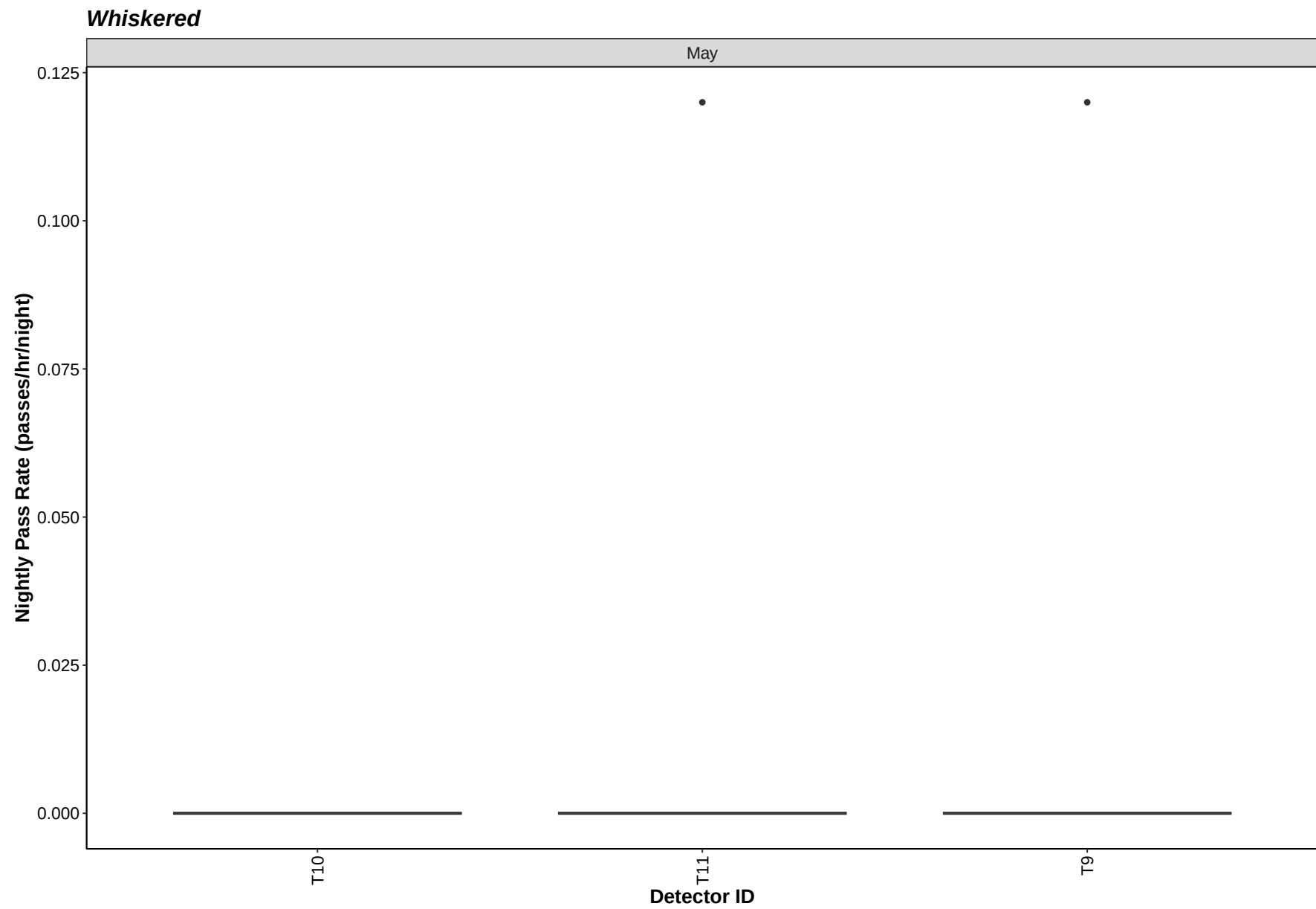


Nathusius'



Soprano pipistrelle





Bat Activity per Detector Location

Figure 18. Detector ID reference:

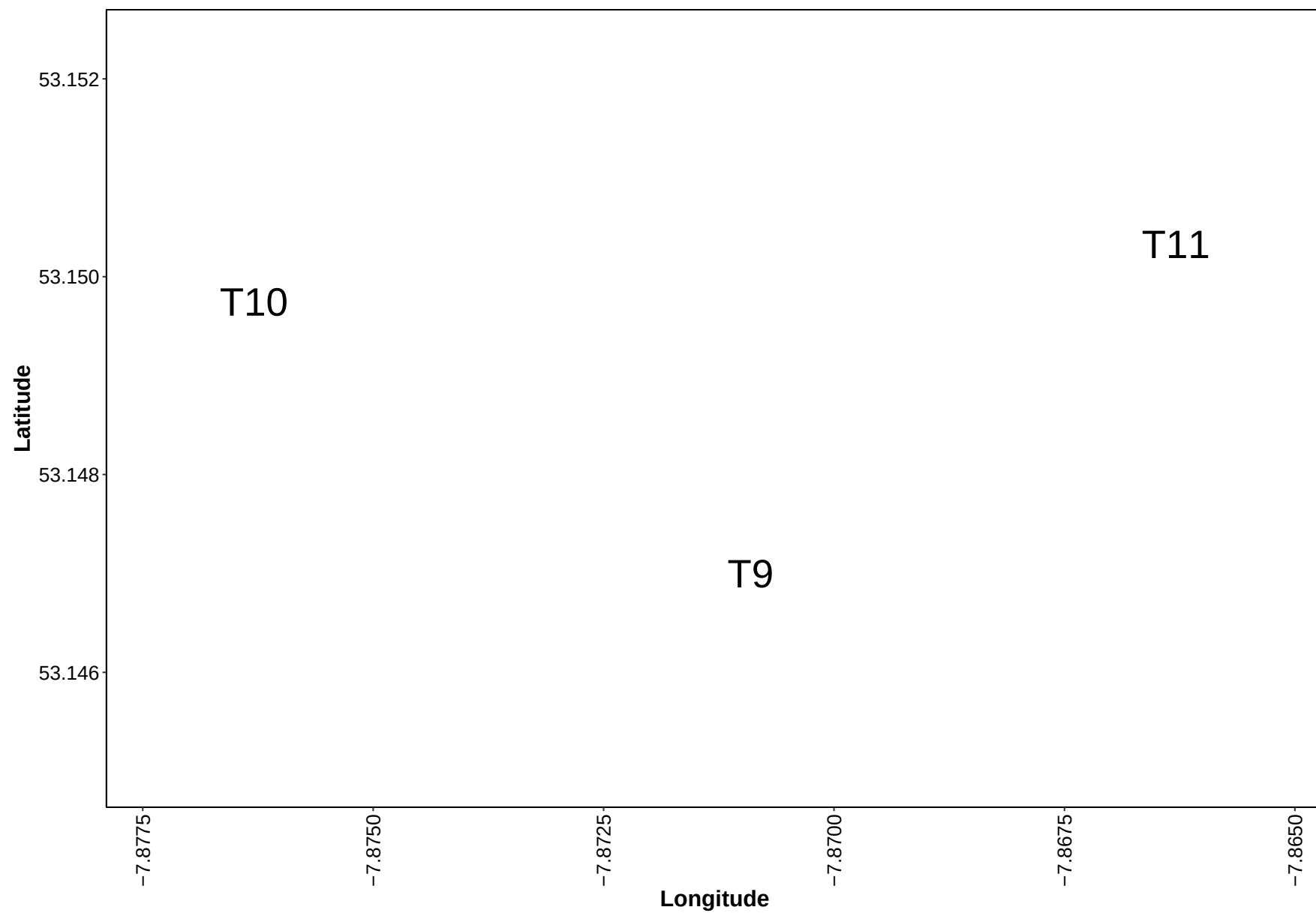
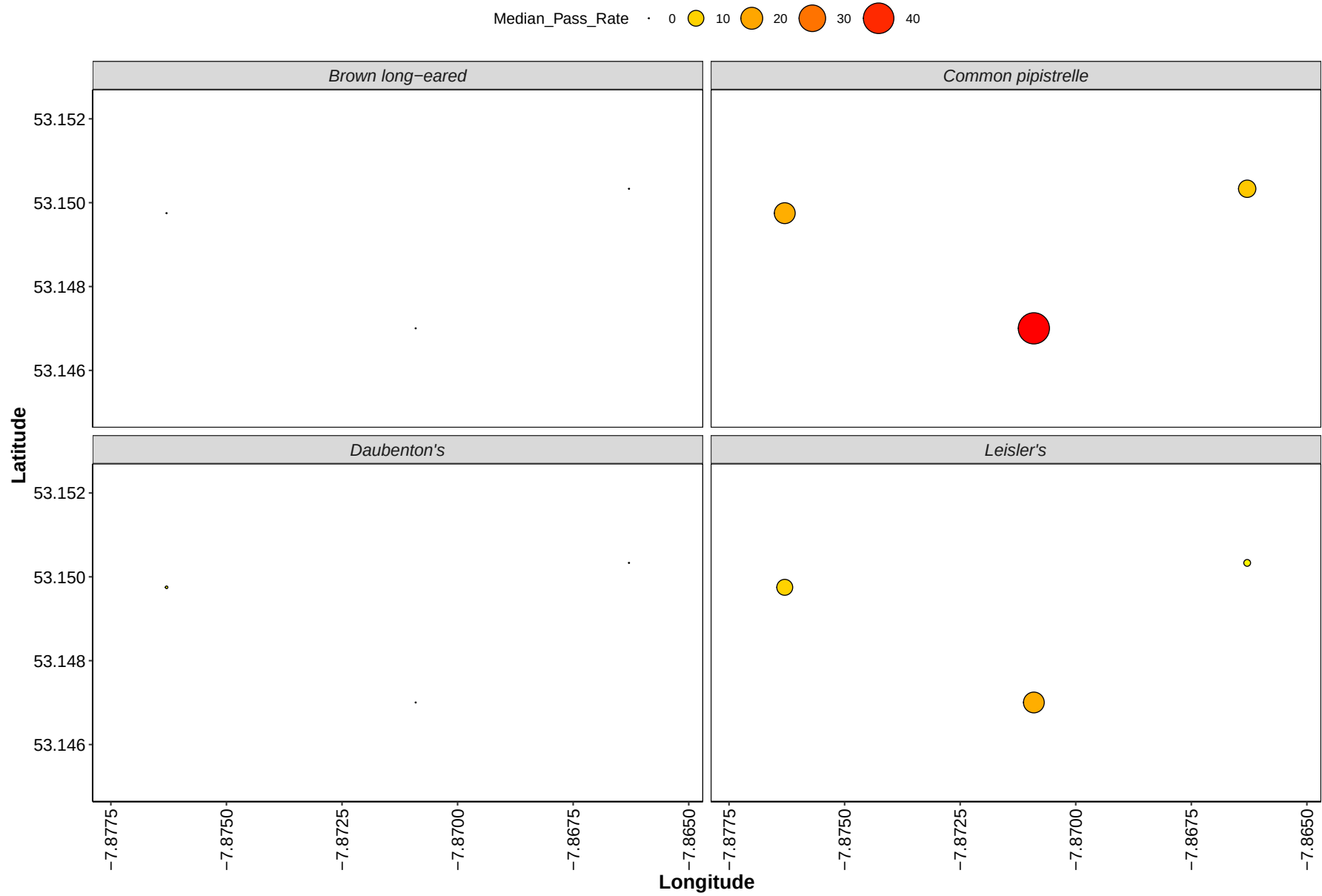


Figure 19. Median Nightly Pass Rate (bat passes/hr/night) throughout the survey period - represented by the size and colour of the point at each detector location.



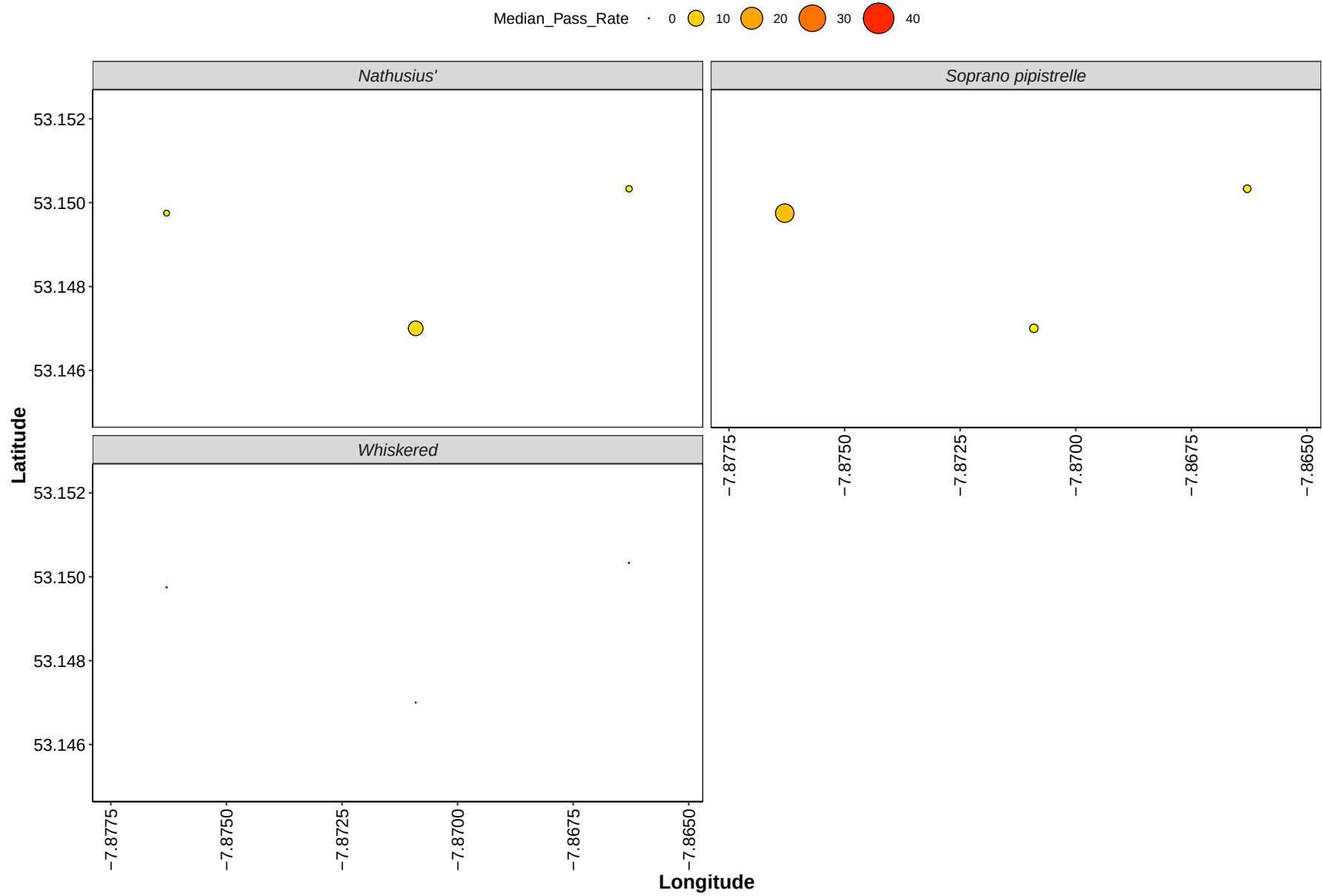
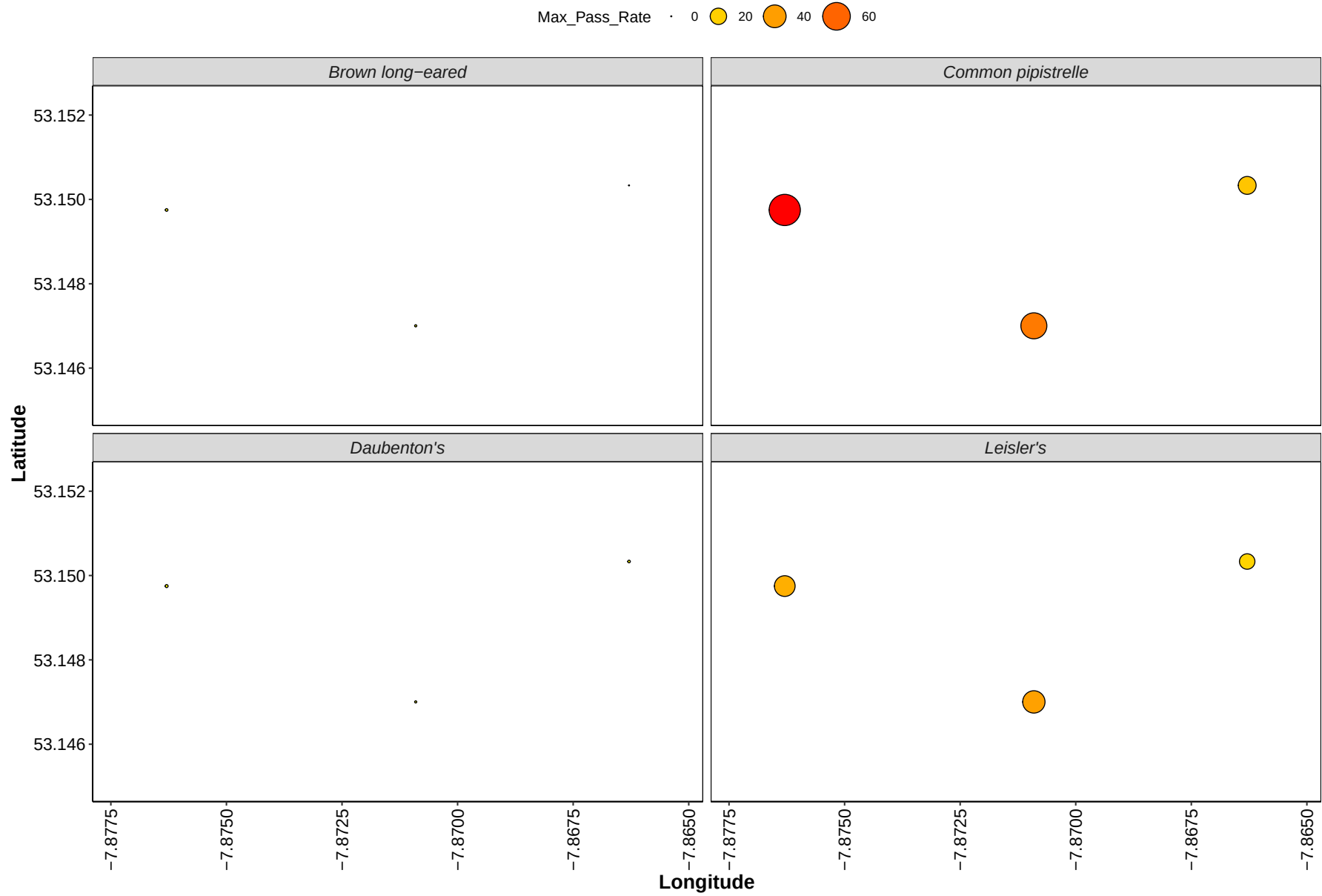
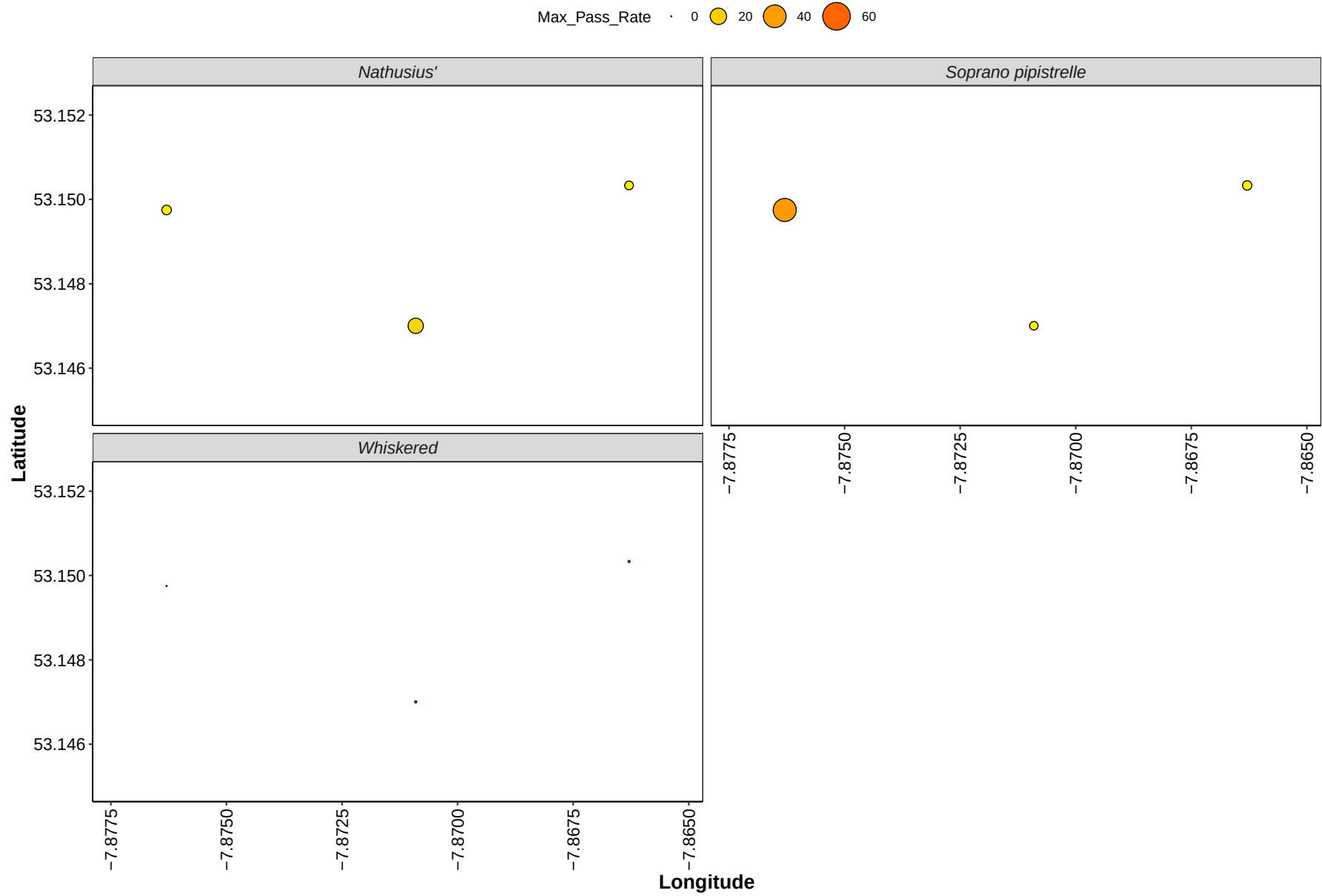


Figure 20. Maximum Nightly Pass Rate (bat passes/hr/night) recorded in a single night throughout the survey period - represented by the size and colour of the point at each detector location.





Thank you for using Ecobat!



Ecobat Report

2025-11-01

Geo filter: county, Time filter: +- 1 month

Summary

Bats were detected on **12** nights between **04/06/2025** and **15/06/2025**, using **3** static bat detectors. Throughout this period, **8** species were recorded. **Table 1.**
Detectors were placed at the following locations:

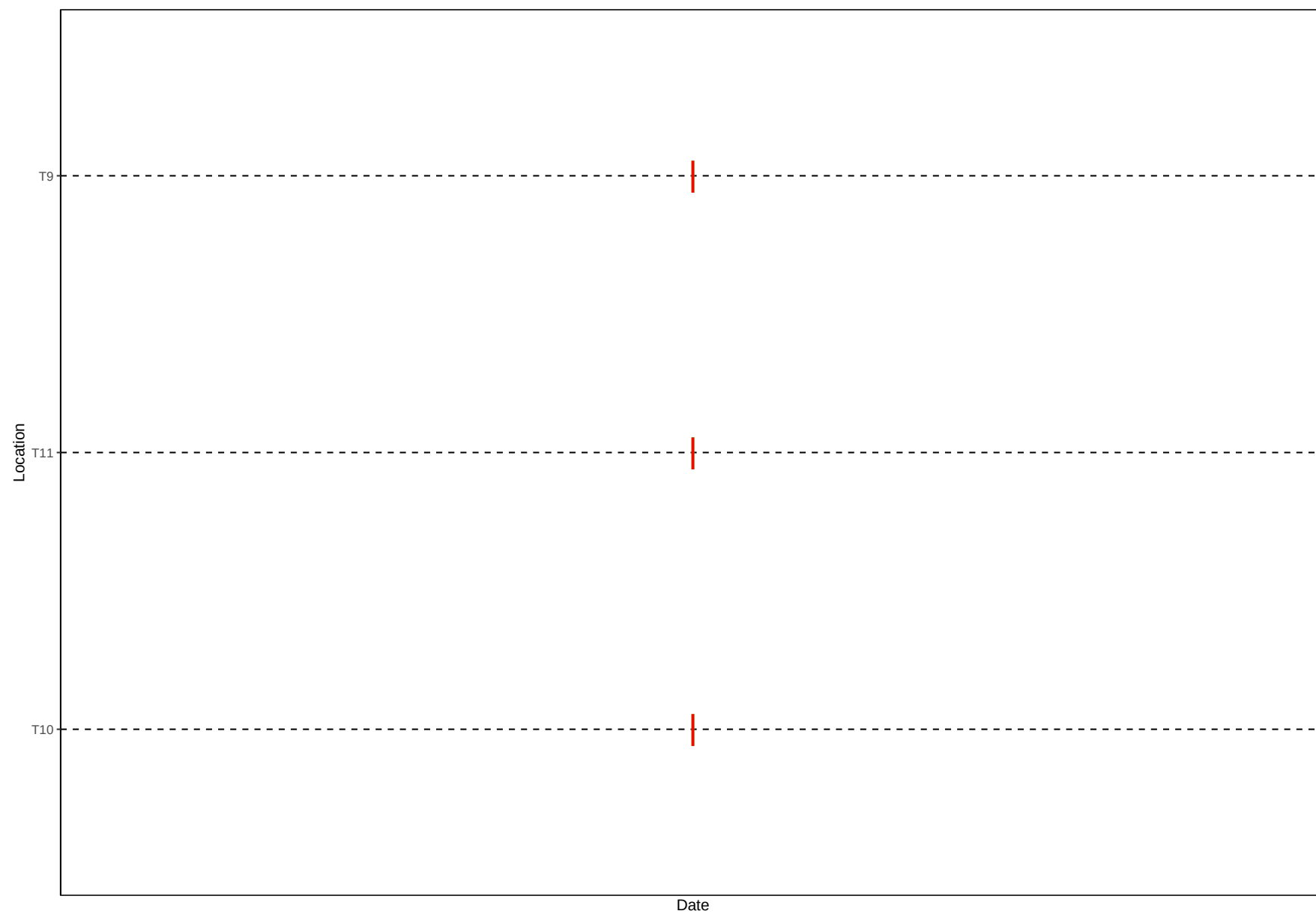
Detector ID	Latitude	Longitude
T9	53.14700	-7.870906
T10	53.14975	-7.876294
T10	53.15033	-7.866291
T11	53.15033	-7.866291

Survey Nights

Table 2. The number of nights that bats were detected on each recorder. This is not the same as the number of nights that detectors were active if there were nights when no bats were detected.

Detector ID	No. of Nights
T10	12
T11	12
T9	12

Figure 1. Horizontal bars show nights when acoustic detectors recorded bats.



Part 1: Percentile Analysis

This first part of the analysis looks at the relative activity levels of the bats you recorded. We take your value for the total bat passes each night for each species, and compare this to the values in our reference database. We tell you what percentile your data falls at, and therefore what the relative activity level is. For example, if the reference database has values of 5, 10, 15, 20 and you submit a value of 18, this will be the 80th percentile, and be classed as high activity.

Per Detector

Table 3. Summary table showing the number of nights recorded bat activity fell into each activity band for each species.

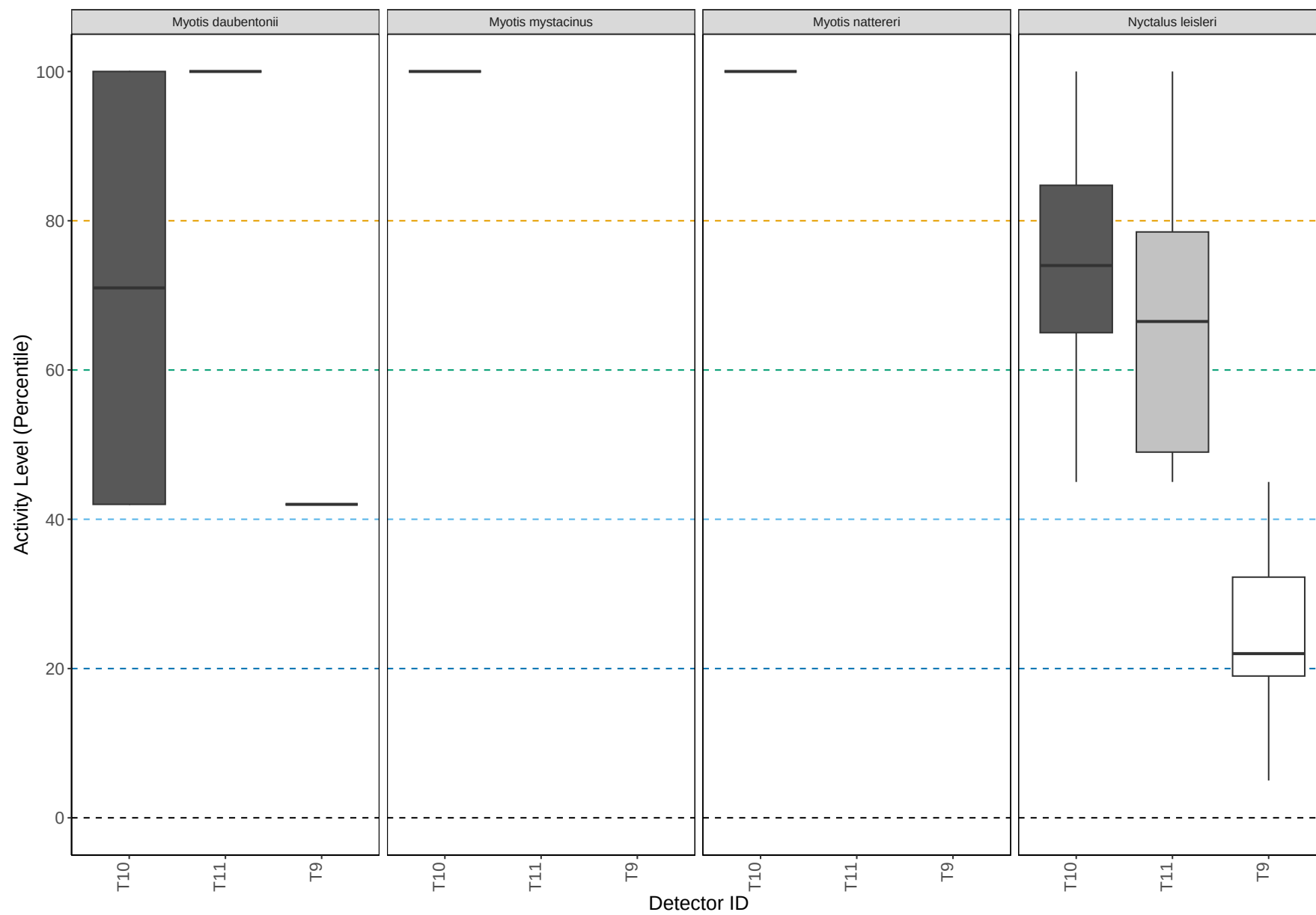
Detector ID	Species/Species Group	Nights of Exceptional Activity	Nights of High Activity	Nights of Moderate/High Activity	Nights of Moderate Activity	Nights of Low/Moderate Activity	Nights of Low Activity
T10	Myotis daubentonii	2	0	0	0	2	0
T10	Myotis mystacinus	1	0	0	0	0	0
T10	Myotis nattereri	1	0	0	0	0	0
T10	Nyctalus leisleri	1	4	5	2	0	0
T10	Pipistrellus nathusii	1	0	1	0	0	1
T10	Pipistrellus pipistrellus	2	3	0	3	0	3
T10	Pipistrellus pygmaeus	2	2	3	2	2	0
T11	Myotis daubentonii	2	0	0	0	0	0
T11	Nyctalus leisleri	1	2	5	4	0	0
T11	Pipistrellus nathusii	1	0	1	0	0	1
T11	Pipistrellus pipistrellus	2	3	0	2	1	3
T11	Pipistrellus pygmaeus	2	2	3	2	1	0
T9	Myotis daubentonii	0	0	0	0	1	0
T9	Nyctalus leisleri	0	0	0	3	3	6
T9	Pipistrellus nathusii	0	0	0	0	1	2
T9	Pipistrellus pipistrellus	0	0	0	0	5	6
T9	Pipistrellus pygmaeus	0	0	0	0	3	6

Detector ID	Species/Species Group	Nights of Exceptional Activity	Nights of High Activity	Nights of Moderate/High Activity	Nights of Moderate Activity	Nights of Low/Moderate Activity	Nights of Low Activity
T9	Plecotus auritus	1	0	0	0	0	0

Table 4. Summary table showing key metrics for each species recorded. The reference range is the number of nights for each species that your data were compared to. We recommend a Reference Range of 200+ to be confident in the relative activity level.

Detector ID	Species/Species Group	Median Percentile	95% CIs	Max Percentile	Nights Recorded	Reference Range
T10	Myotis daubentonii	71	42 - 100	100	4	7
T10	Myotis mystacinus	100	0	100	1	1
T10	Myotis nattereri	100	0	100	1	1
T10	Nyctalus leisleri	74	62 - 85.5	100	12	279
T10	Pipistrellus nathusii	64	20 - 100	100	3	34
T10	Pipistrellus pipistrellus	48	30 - 85	100	11	640
T10	Pipistrellus pygmaeus	65	47.5 - 84	100	11	156
T11	Myotis daubentonii	100	100 - 100	100	2	7
T11	Nyctalus leisleri	67	53.5 - 77	100	12	279
T11	Pipistrellus nathusii	64	20 - 100	100	3	34
T11	Pipistrellus pipistrellus	48	30 - 85	100	11	640
T11	Pipistrellus pygmaeus	70	52 - 87	100	10	156
T9	Myotis daubentonii	42	0	42	1	7
T9	Nyctalus leisleri	22	19 - 35	45	12	279
T9	Pipistrellus nathusii	8	8 - 8	29	3	34
T9	Pipistrellus pipistrellus	18	12 - 32	32	11	640
T9	Pipistrellus pygmaeus	15	9 - 30	30	9	156
T9	Plecotus auritus	100	0	100	1	1

Figure 2. The recorded activity of bats during the survey. The centre line indicates the median activity level whereas the box represents the interquartile range (the spread of the middle 50% of nights of activity).



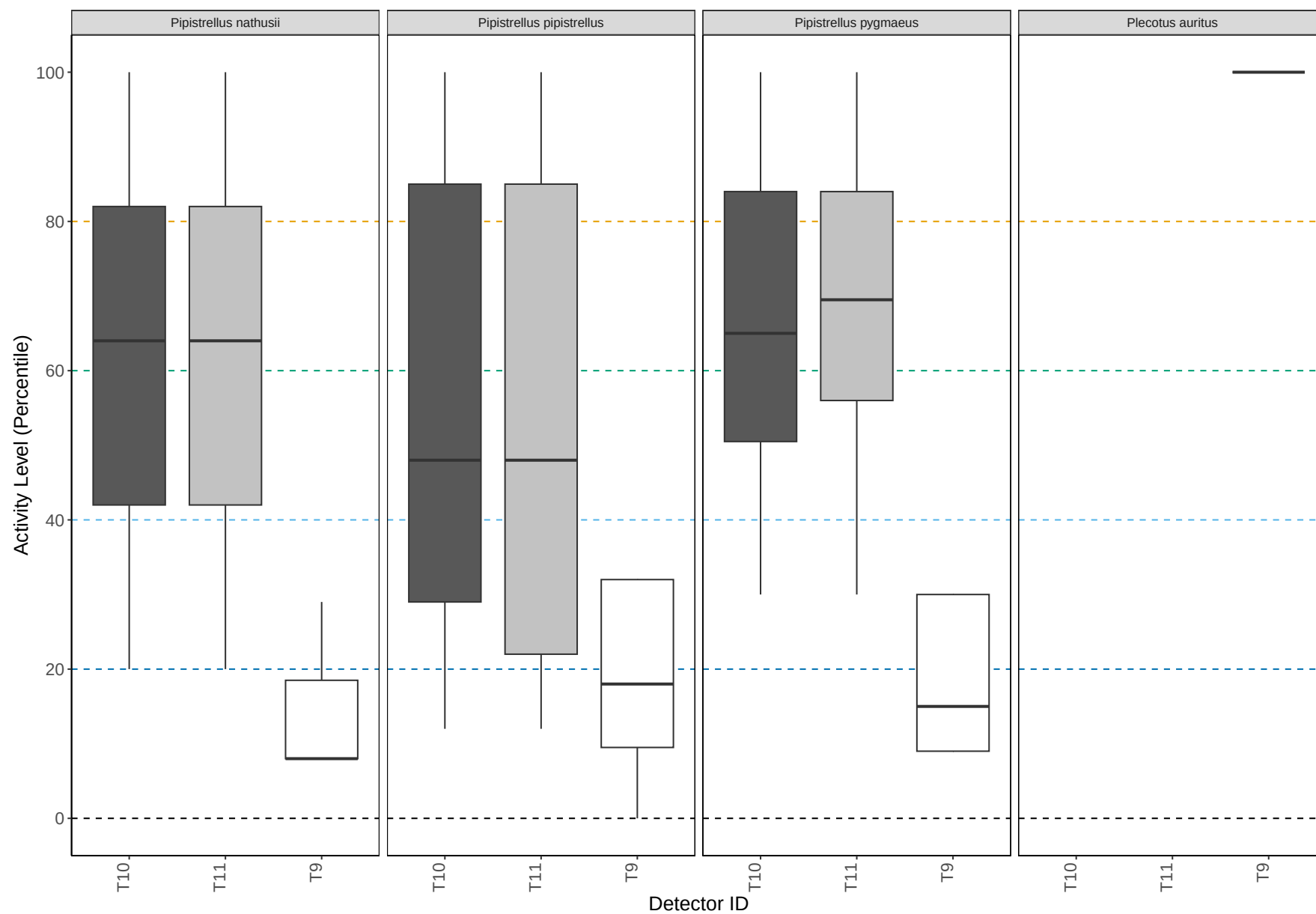
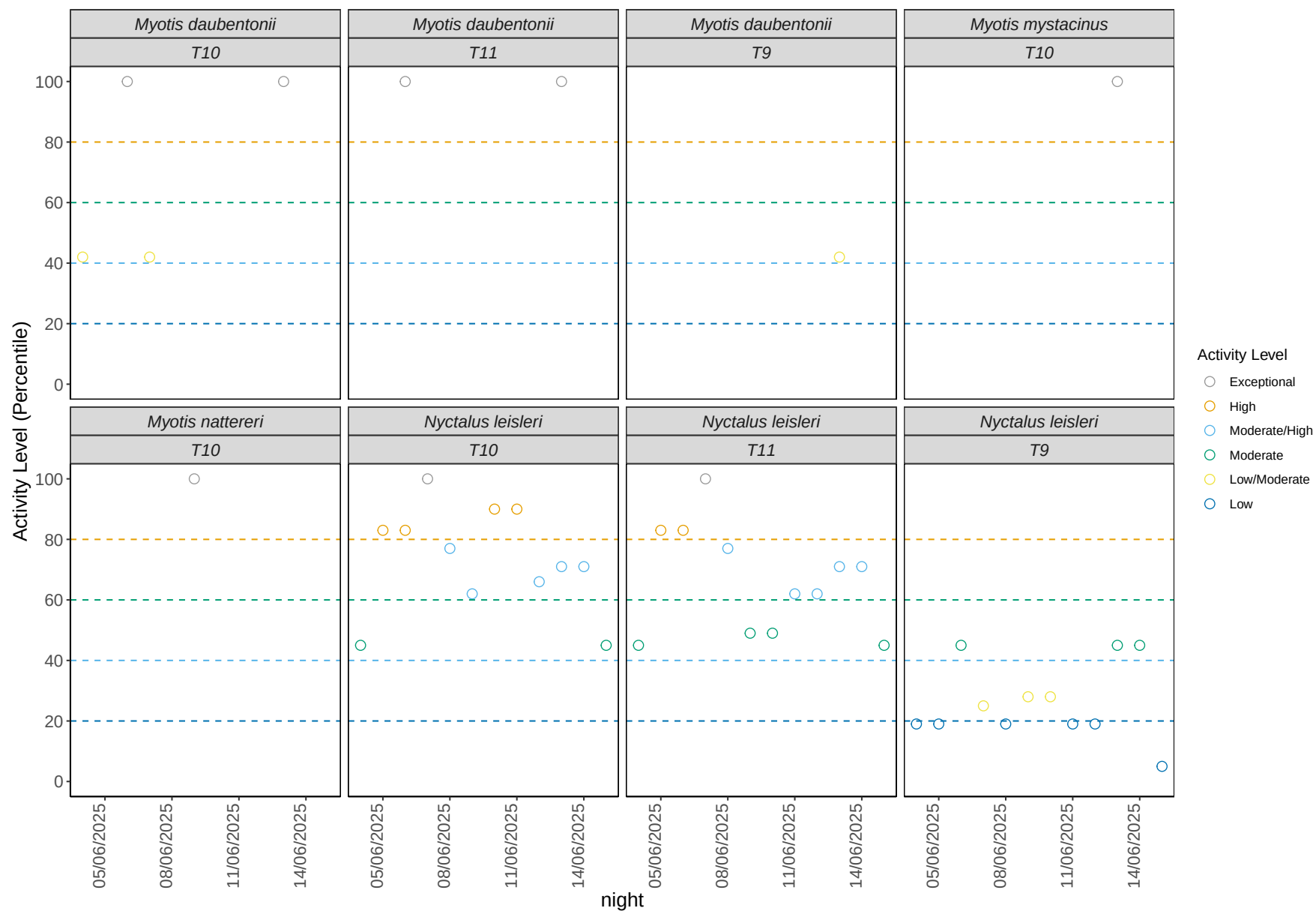
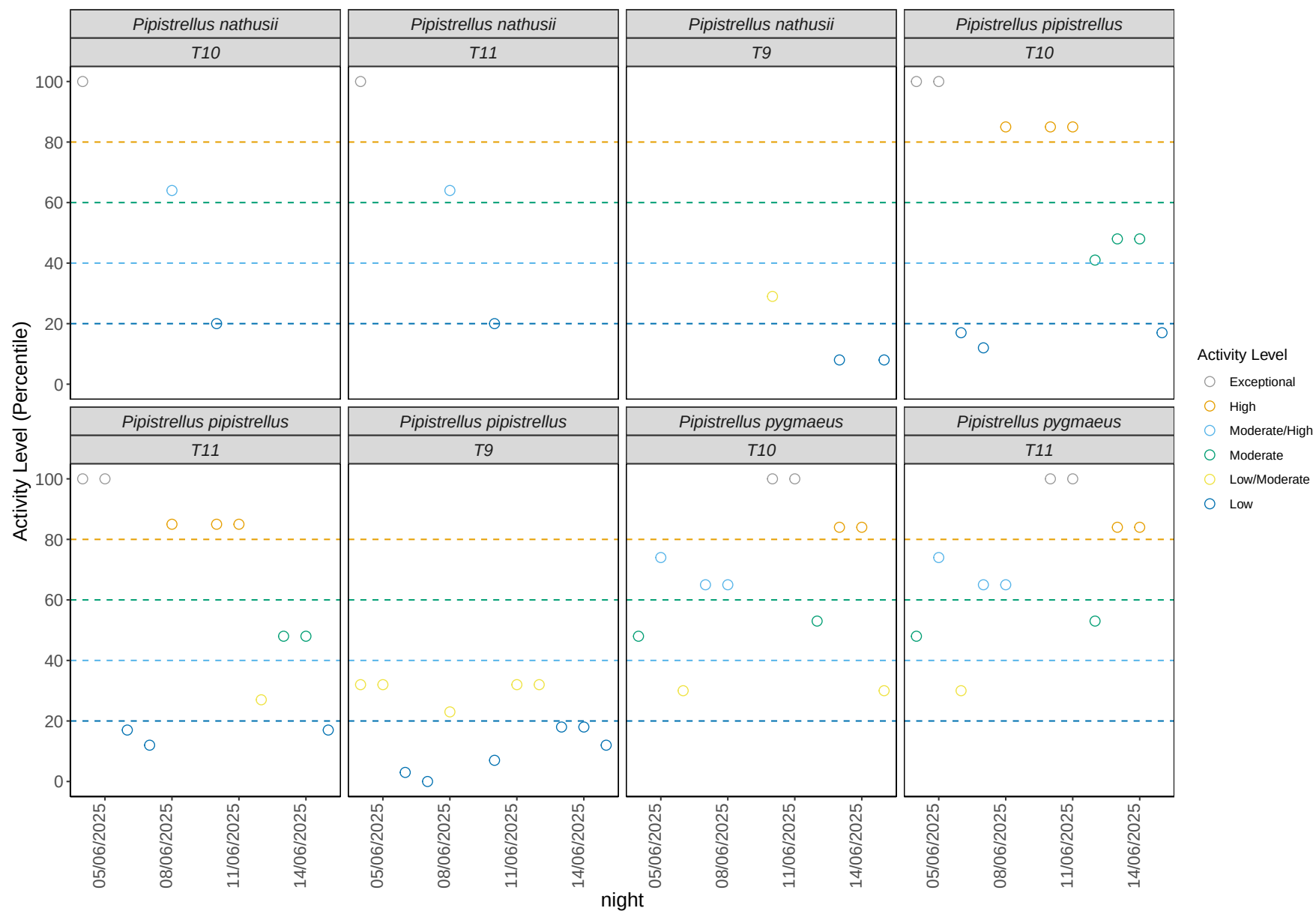
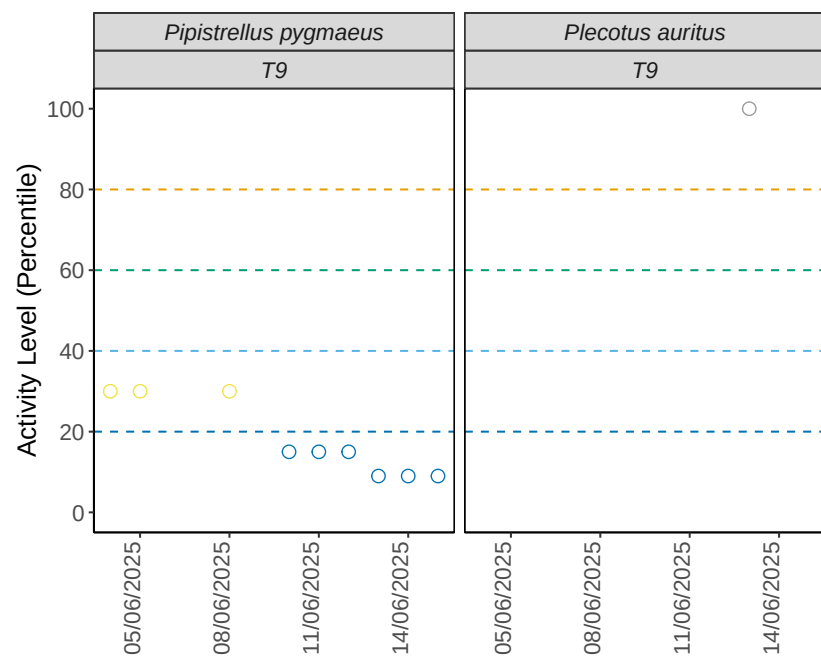


Figure 3. The activity level (percentile) of bats recorded across each night of the bat survey.







Activity Level

- Exceptional
- High
- Moderate/High
- Moderate
- Low/Moderate
- Low

night

Per Detector, Per Month

Table 5. Summary table showing the number of nights recorded bat activity fell into each activity band for each species at each detector during each month.

Detector ID	Species/Species Group	month	Nights of Exceptional Activity	Nights of High Activity	Nights of Moderate/High Activity	Nights of Moderate Activity	Nights of Low/Moderate Activity	Nights of Low Activity
T10	Myotis daubentonii	Jun	2	0	0	0	2	0
T10	Myotis mystacinus	Jun	1	0	0	0	0	0
T10	Myotis nattereri	Jun	1	0	0	0	0	0
T10	Nyctalus leisleri	Jun	1	4	5	2	0	0
T10	Pipistrellus nathusii	Jun	1	0	1	0	0	1
T10	Pipistrellus pipistrellus	Jun	2	3	0	3	0	3
T10	Pipistrellus pygmaeus	Jun	2	2	3	2	2	0
T11	Myotis daubentonii	Jun	2	0	0	0	0	0
T11	Nyctalus leisleri	Jun	1	2	5	4	0	0
T11	Pipistrellus nathusii	Jun	1	0	1	0	0	1
T11	Pipistrellus pipistrellus	Jun	2	3	0	2	1	3
T11	Pipistrellus pygmaeus	Jun	2	2	3	2	1	0
T9	Myotis daubentonii	Jun	0	0	0	0	1	0
T9	Nyctalus leisleri	Jun	0	0	0	3	3	6
T9	Pipistrellus nathusii	Jun	0	0	0	0	1	2
T9	Pipistrellus pipistrellus	Jun	0	0	0	0	5	6
T9	Pipistrellus pygmaeus	Jun	0	0	0	0	3	6

Detector ID	Species/Species Group	month	Nights of Exceptional Activity	Nights of High Activity	Nights of Moderate/High Activity	Nights of Moderate Activity	Nights of Low/Moderate Activity	Nights of Low Activity
T9	Plecotus auritus	Jun	1	0	0	0	0	0

Table 6. Summary table showing key metrics for each species recorded per month. Please note that we cannot split the reference range by month, hence this column is not shown in this table.

Detector ID	Species/Species Group	month	Median Percentile	95% CIs	Max. Percentile	Nights Recorded
T10	Myotis daubentonii	Jun	71	42 - 100	100	4
T10	Myotis mystacinus	Jun	100	0	100	1
T10	Myotis nattereri	Jun	100	0	100	1
T10	Nyctalus leisleri	Jun	74	62 - 85.5	100	12
T10	Pipistrellus nathusii	Jun	64	20 - 100	100	3
T10	Pipistrellus pipistrellus	Jun	48	30 - 85	100	11
T10	Pipistrellus pygmaeus	Jun	65	47.5 - 84	100	11
T11	Myotis daubentonii	Jun	100	100 - 100	100	2
T11	Nyctalus leisleri	Jun	67	53.5 - 77	100	12
T11	Pipistrellus nathusii	Jun	64	20 - 100	100	3
T11	Pipistrellus pipistrellus	Jun	48	30 - 85	100	11
T11	Pipistrellus pygmaeus	Jun	70	52 - 87	100	10
T9	Myotis daubentonii	Jun	42	0	42	1
T9	Nyctalus leisleri	Jun	22	19 - 35	45	12
T9	Pipistrellus nathusii	Jun	8	8 - 8	29	3
T9	Pipistrellus pipistrellus	Jun	18	12 - 32	32	11
T9	Pipistrellus pygmaeus	Jun	15	9 - 30	30	9
T9	Plecotus auritus	Jun	100	0	100	1

Per Site

In this 'Per Site' section of the analysis, all values are taken from across all of the detectors to provide site-wide averages/medians.

Table 7. Summary table showing the number of nights recorded bat activity fell into each activity band for each species.

Species/Species Group	Nights of Exceptional Activity	Nights of High Activity	Nights of Moderate/High Activity	Nights of Moderate Activity	Nights of Low/Moderate Activity	Nights of Low Activity
Myotis daubentonii	4	0	0	0	3	0
Myotis mystacinus	1	0	0	0	0	0
Myotis nattereri	1	0	0	0	0	0
Nyctalus leisleri	2	6	10	9	3	6
Pipistrellus nathusii	2	0	2	0	1	4
Pipistrellus pipistrellus	4	6	0	5	6	12
Pipistrellus pygmaeus	4	4	6	4	6	6
Plecotus auritus	1	0	0	0	0	0

Table 8. Summary table showing key metrics for each species recorded.

Species/Species Group	Median Percentile	95% CIs	Max. Percentile	Nights Recorded
Myotis daubentonii	100	42 - 100	100	7
Myotis mystacinus	100	0	100	1
Myotis nattereri	100	0	100	1
Nyctalus leisleri	56	62 - 85.5	100	36
Pipistrellus nathusii	29	8 - 8	100	9
Pipistrellus pipistrellus	32	30 - 85	100	33
Pipistrellus pygmaeus	53	9 - 30	100	30
Plecotus auritus	100	0	100	1

Figure 4. The activity level (percentile) of bats recorded across each night of the bat survey for the **entire site**.

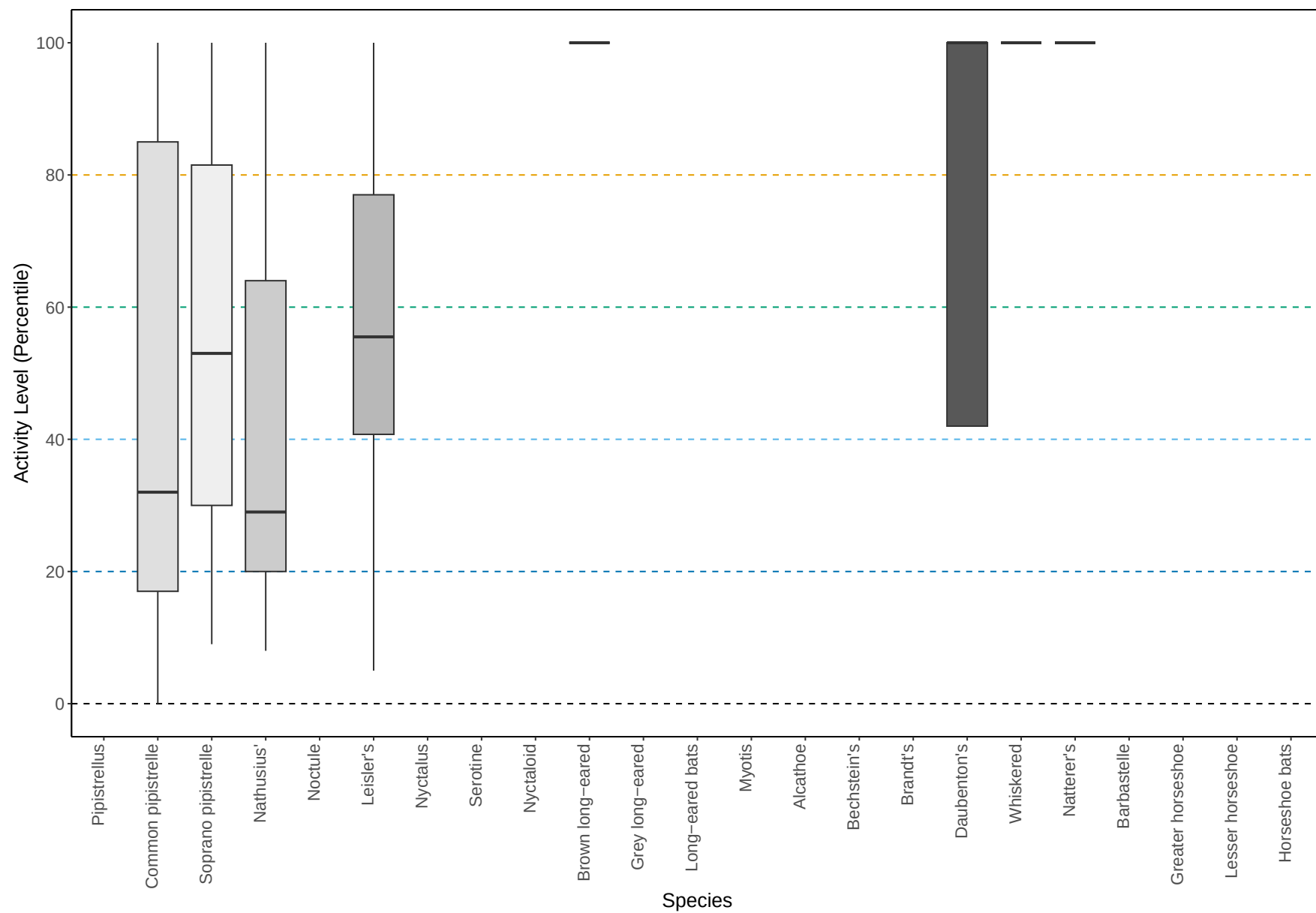


Figure 5. The median activity levels of bats recorded across all detectors each night.

Per Site, Per Month

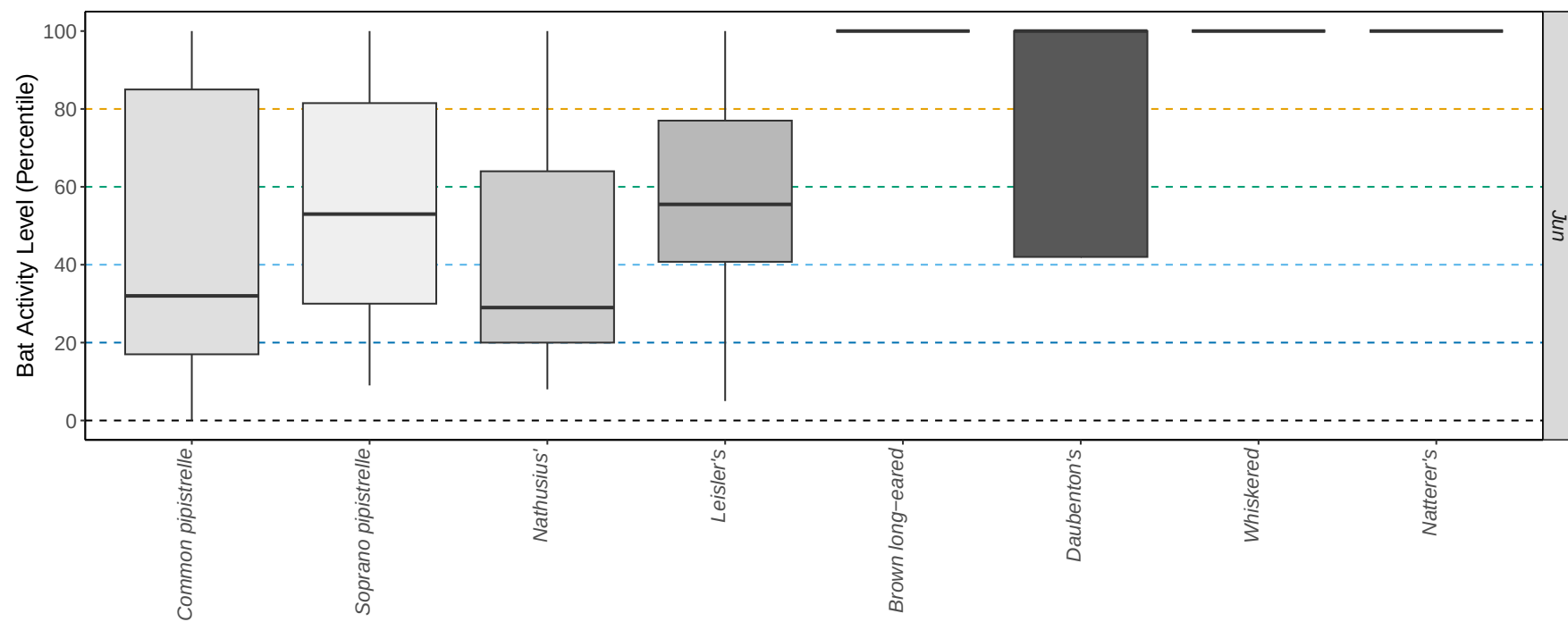
Table 9. Summary table showing the number of nights recorded bat activity fell into each activity band for each species during each month.

Species/Species Group	month	Nights of Exceptional Activity	Nights of High Activity	Nights of Moderate/High Activity	Nights of Moderate Activity	Nights of Low/Moderate Activity	Nights of Low Activity
Myotis daubentonii	Jun	4	0	0	0	3	0
Myotis mystacinus	Jun	1	0	0	0	0	0
Myotis nattereri	Jun	1	0	0	0	0	0
Nyctalus leisleri	Jun	2	6	10	9	3	6
Pipistrellus nathusii	Jun	2	0	2	0	1	4
Pipistrellus pipistrellus	Jun	4	6	0	5	6	12
Pipistrellus pygmaeus	Jun	4	4	6	4	6	6
Plecotus auritus	Jun	1	0	0	0	0	0

Table 10. Summary table showing key metrics for each species recorded per month.

Species/Species Group	month	Median Percentile	95% CIs	Max. Percentile	Nights Recorded
Myotis daubentonii	Jun	100	42 - 100	100	7
Myotis mystacinus	Jun	100	0	100	1
Myotis nattereri	Jun	100	0	100	1
Nyctalus leisleri	Jun	56	62 - 85.5	100	36
Pipistrellus nathusii	Jun	29	8 - 8	100	9
Pipistrellus pipistrellus	Jun	32	30 - 85	100	33
Pipistrellus pygmaeus	Jun	53	9 - 30	100	30
Plecotus auritus	Jun	100	0	100	1

Figure 6. The activity level (percentile) of bats recorded across each night of the bat survey for the entire site, split between months.



Species

Part 2: Nightly Analysis

Entire Survey Period

Sunrise and Sunset Times

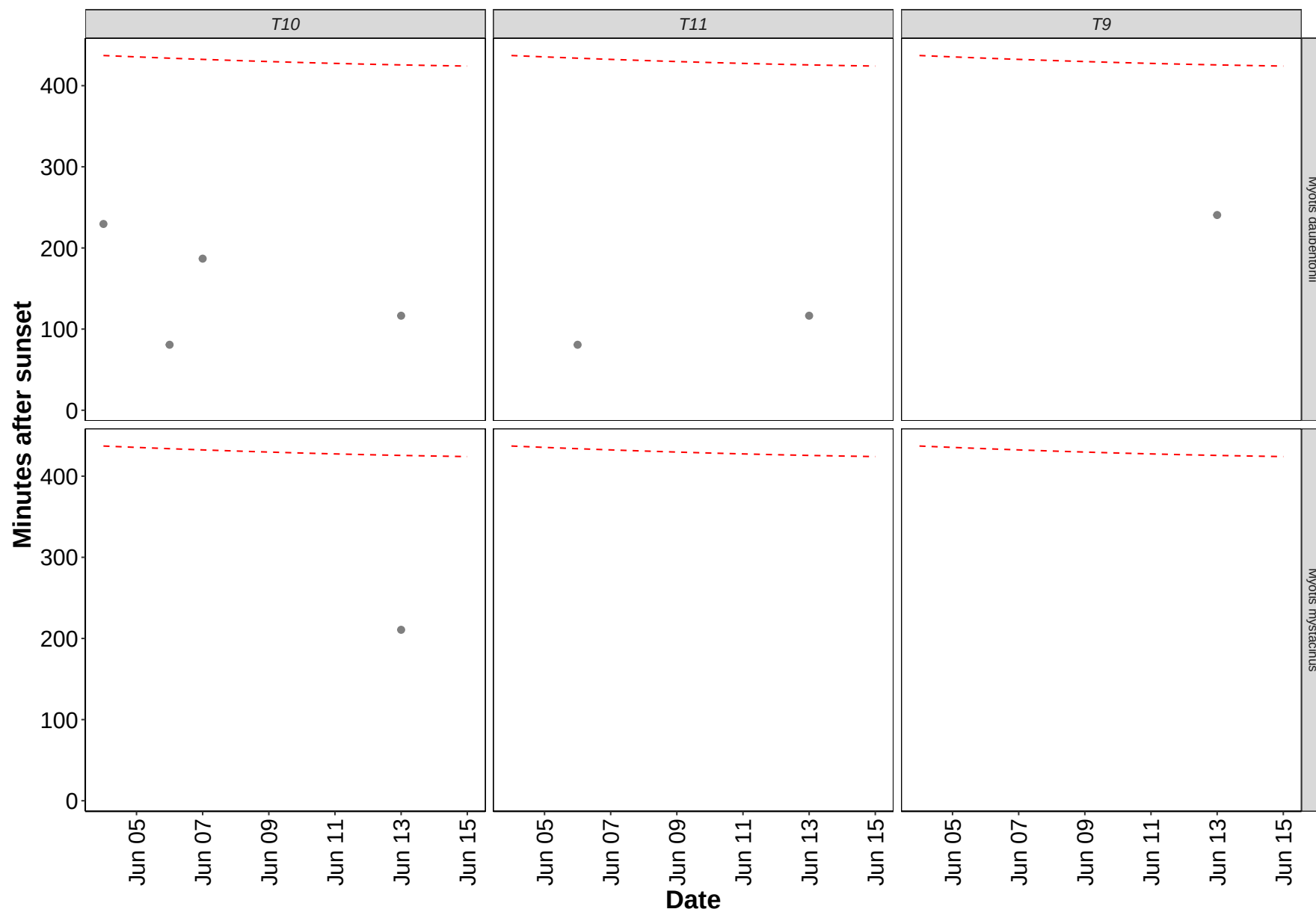
Table 11. The times of sunset and sunrise the following morning for surveys beginning on the date shown.

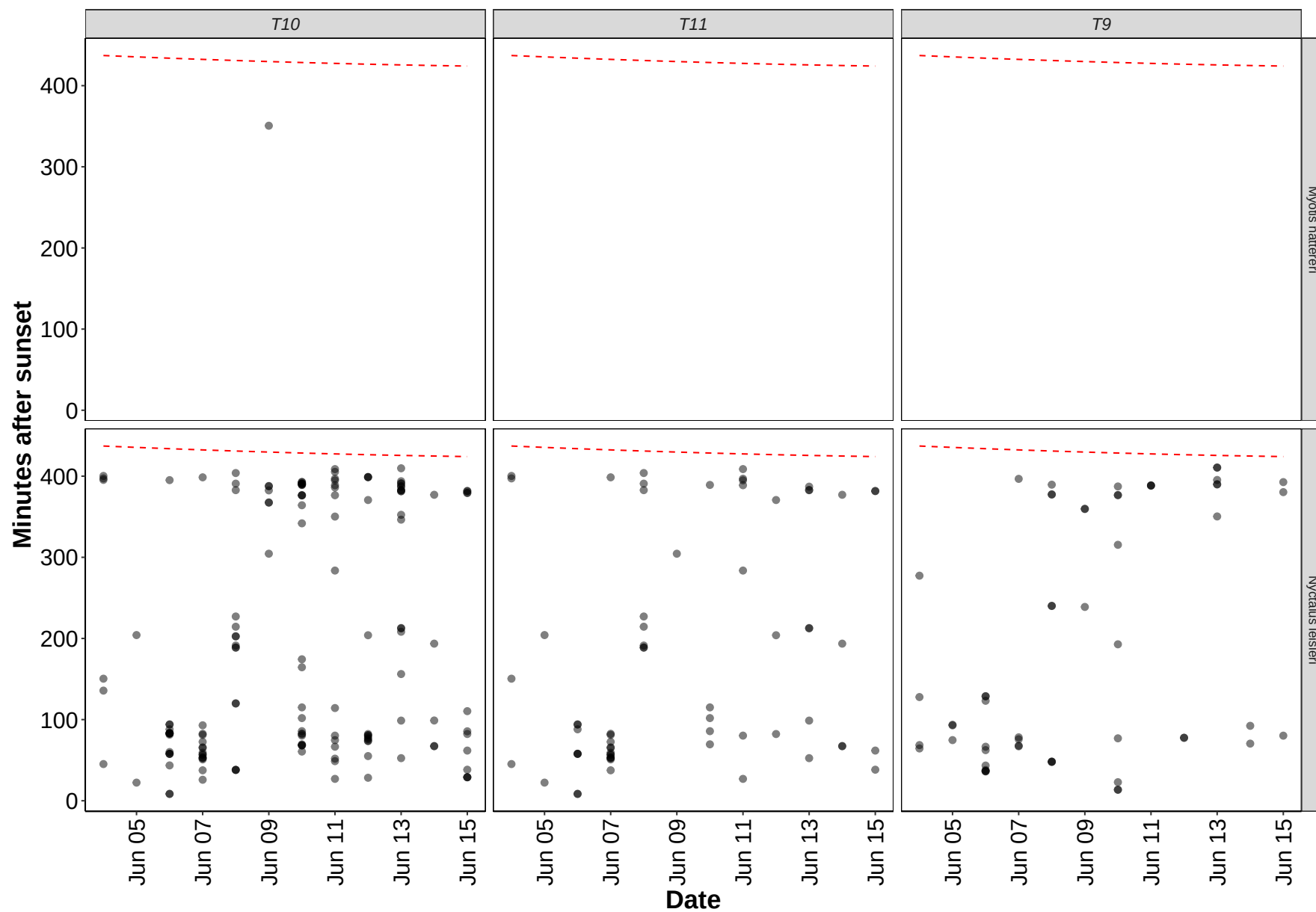
Night (y-m-d)	Sunset (h:m)	Sunrise (h:m)	Night Length (hours)
2025-06-04	21:52	05:09	7.3
2025-06-05	21:53	05:08	7.3
2025-06-06	21:54	05:08	7.2
2025-06-07	21:55	05:07	7.2
2025-06-08	21:56	05:07	7.2
2025-06-09	21:57	05:06	7.2
2025-06-10	21:57	05:06	7.1
2025-06-11	21:58	05:06	7.1
2025-06-12	21:59	05:05	7.1
2025-06-13	22:00	05:05	7.1
2025-06-14	22:00	05:05	7.1
2025-06-15	22:01	05:05	7.1

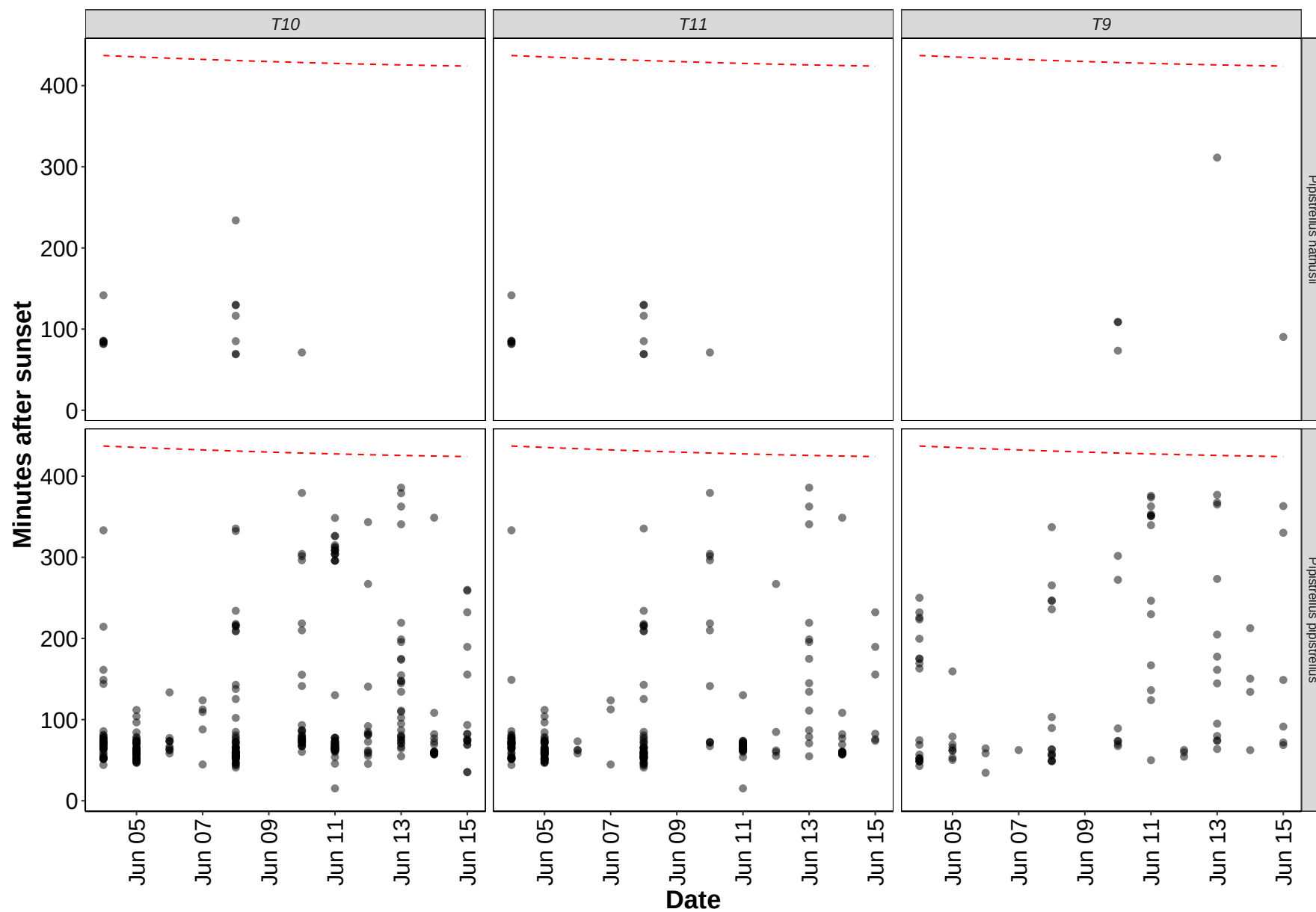
Distribution of Bat Activity Across the Night through Time

Per Detector

Figure 7. Timing of bat calls plotted as minutes before/after sunset, whereby 0 on the y axis represents sunset. Sunrise throughout the survey period is depicted as the red dashed line. Colours indicate kernel densities, with darkest colours showing peaks of activity. These colours are comparative only within each plot, and do not account for overall activity.







Roost Emergence Time and Bat Observation

Based on: Russ, Jon. 2012. British Bat Calls a Guide to species Identification. Pelagic Publishing.

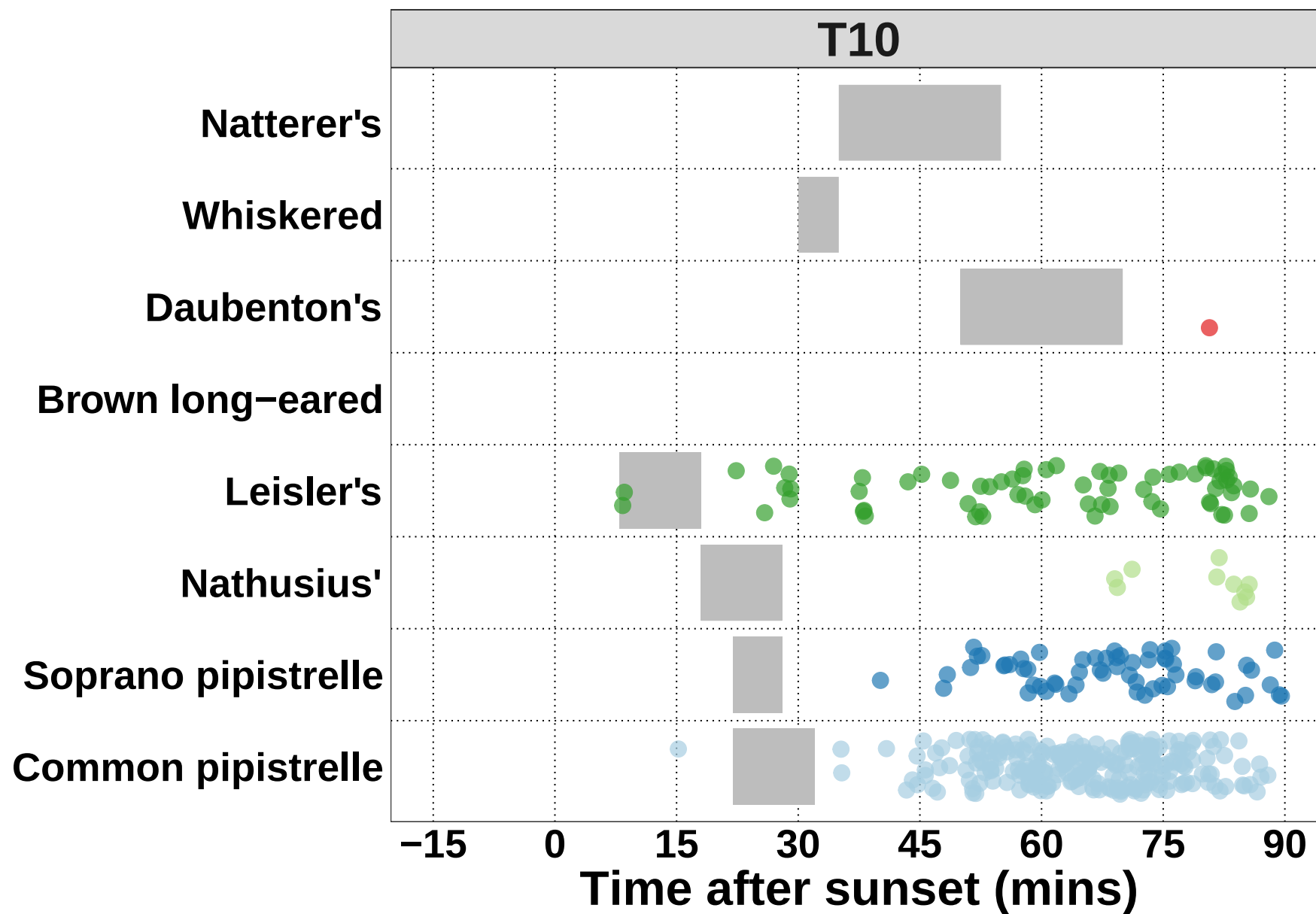
Bat Passes Potentially Indicating Close Proximity to a Roost (Russ 2012)

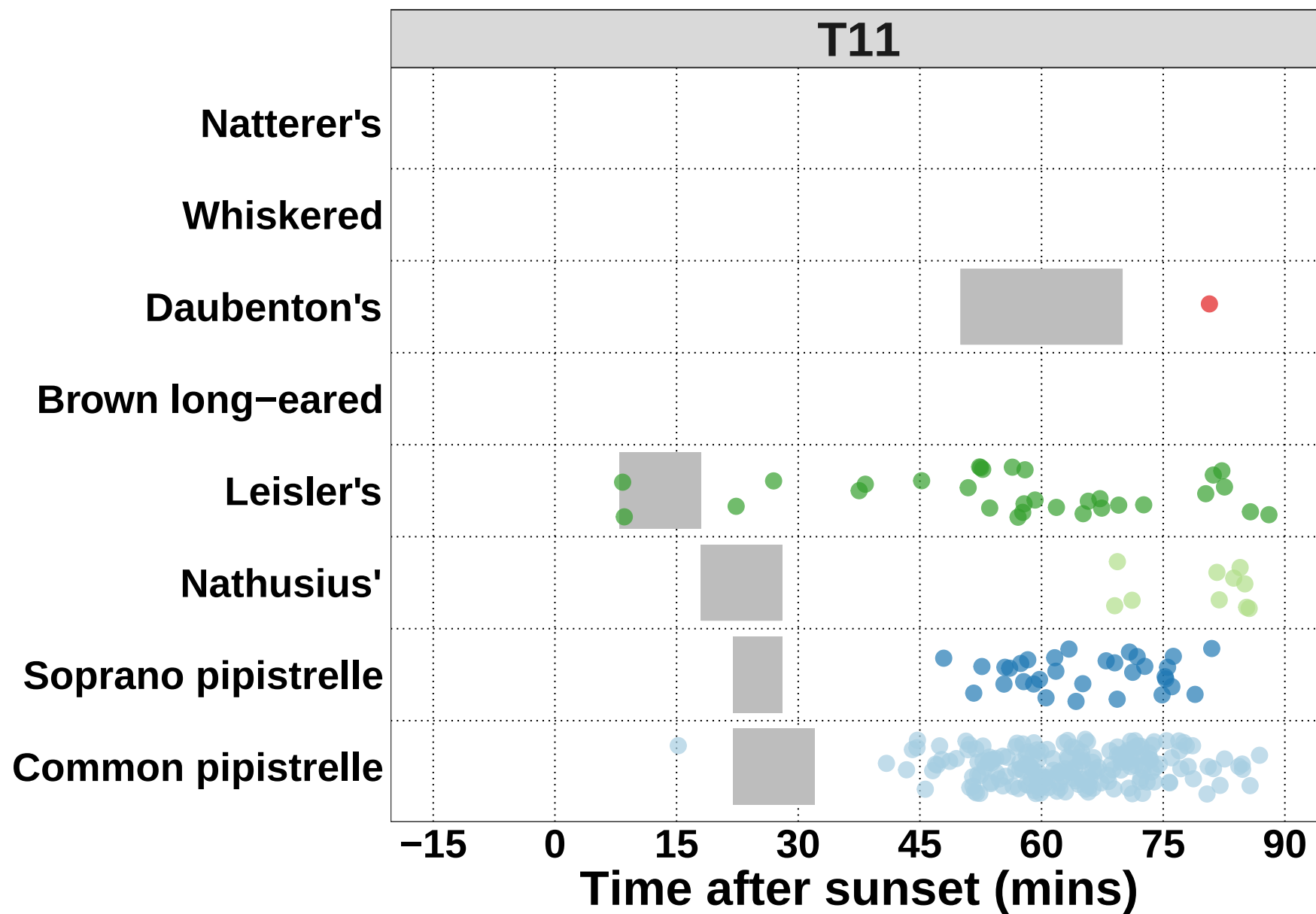
Table 12. Number of bat calls recorded before the upper time of the species-specific emergence time range, and which therefore may potentially indicate the presence of a nearby roost.

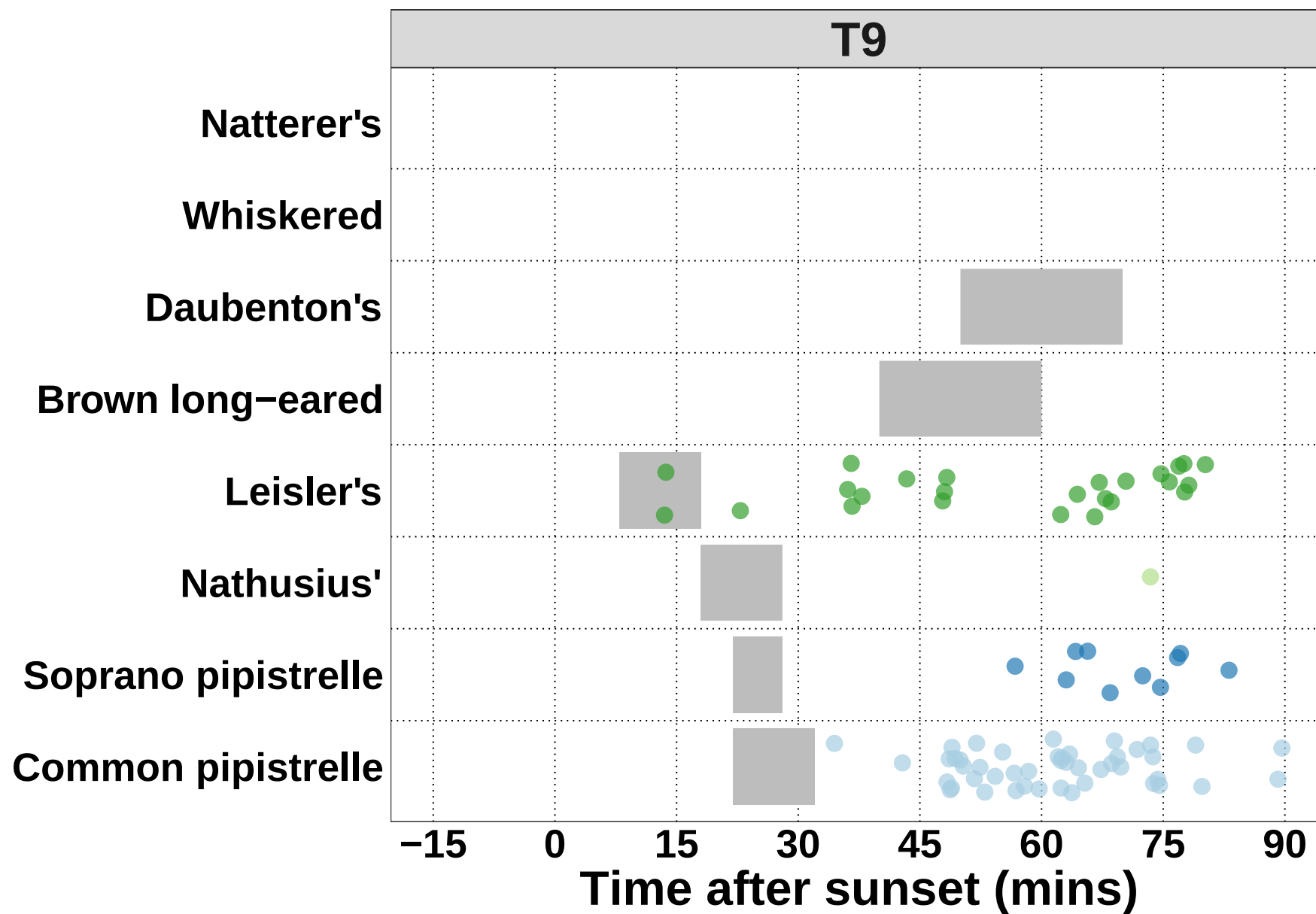
Species	Detector ID	2025-06-06	2025-06-10	2025-06-11
Common pipistrelle	T10	0	0	1
Common pipistrelle	T11	0	0	1
Leisler's	T10	2	0	0
Leisler's	T11	2	0	0
Leisler's	T9	0	2	0

Bat Passes Potentially Indicating Close Proximity to a Roost (Russ 2012)

Figure 8. Time from 15 minutes before to 90 minutes after sunset. Species-specific emergence time ranges are shown as grey bars. Bat passes overlapping species-specific grey bars, or occurring earlier than this time range, may potentially indicate the presence of a nearby roost.



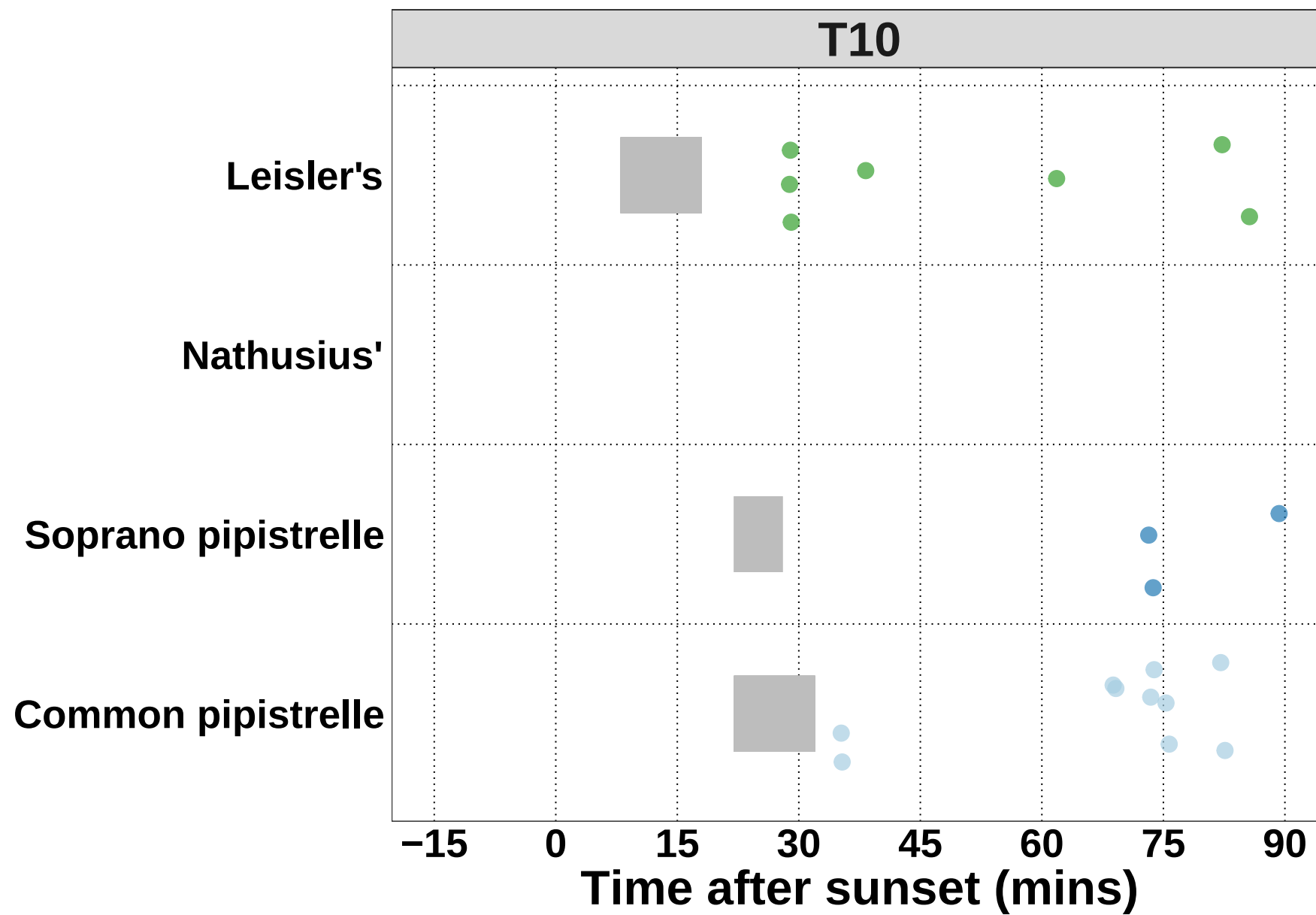


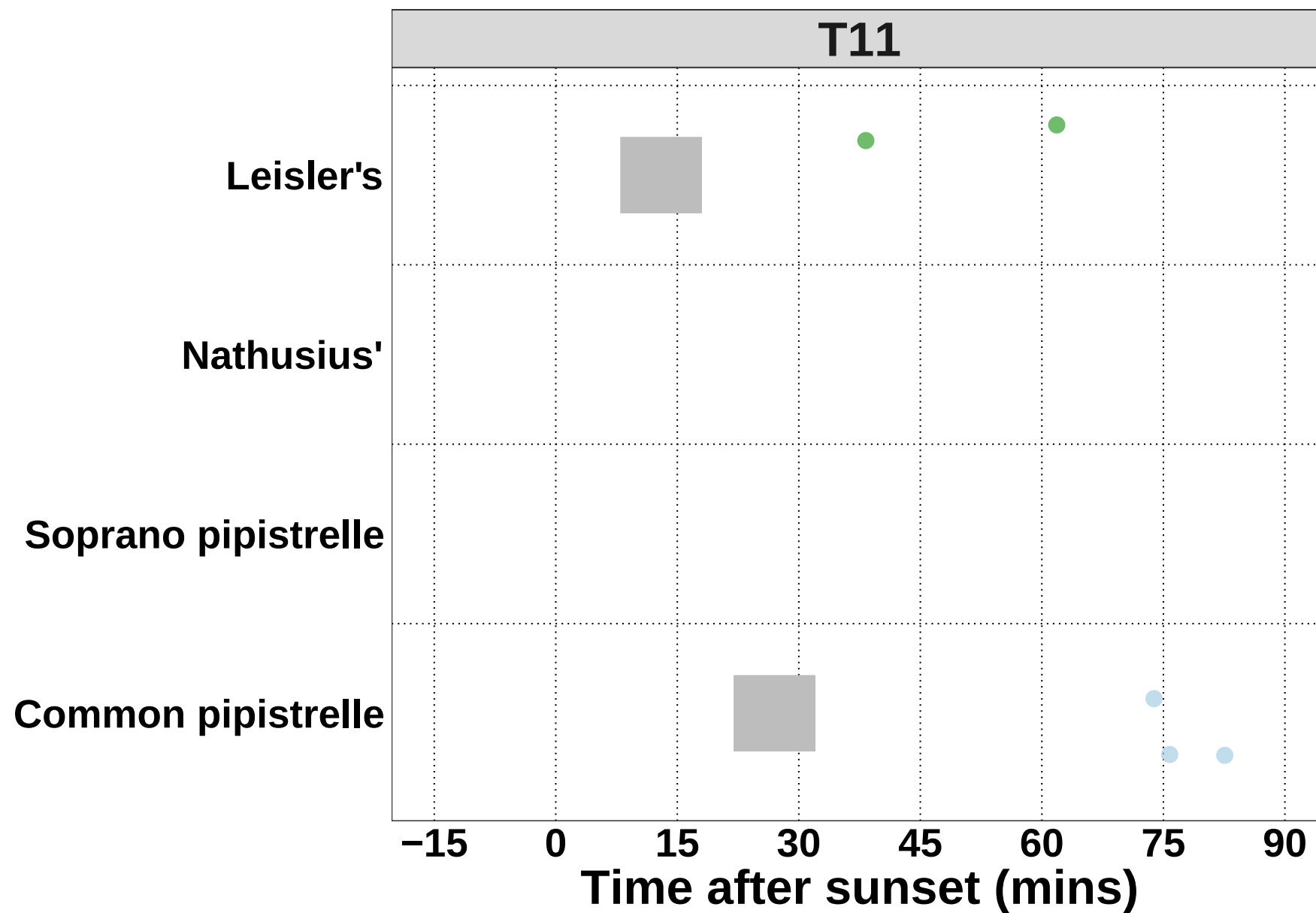


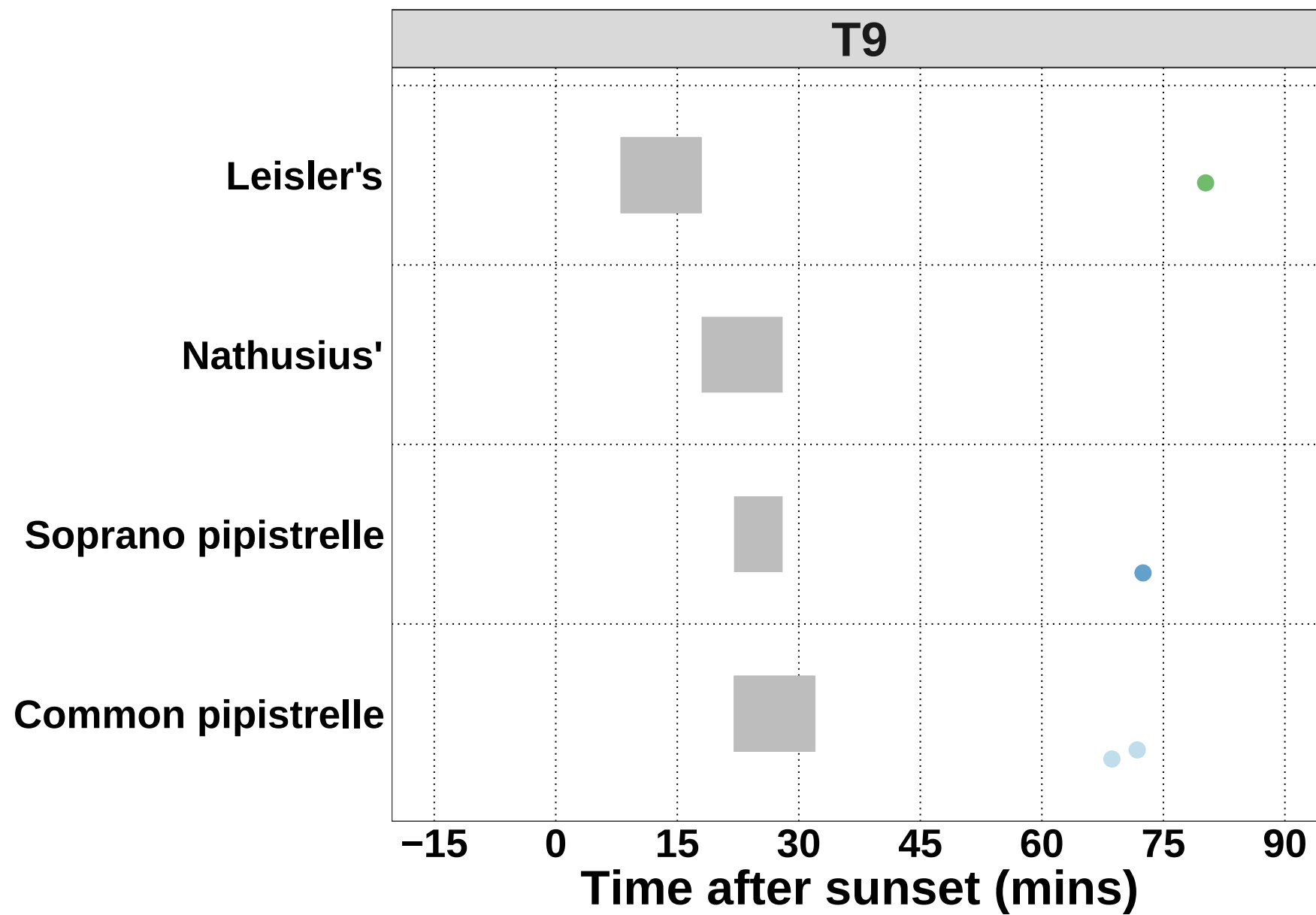
Bat Passes Potentially Indicating Close Proximity to a Roost (Maternity Period Only) - *Maternity period defined as 15th June - 30th July.

Species	Detector ID
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Bat Passes Potentially Indicating Close Proximity to a Roost (Maternity Period Only) - Maternity period defined as 15th June - 30th July.







Count of Bat Passes

All Detectors

Table 14. The total number of passes recorded for each species across all of the detectors.

The 'Total' percentage may not be exactly 100% due to rounding of the percentages per species.

Species	Passes (no.)	Percentage of Total (%)
Myotis daubentonii	7	0.6
Myotis mystacinus	1	0.1
Myotis nattereri	1	0.1
Nyctalus leisleri	279	24.9
Pipistrellus nathusii	34	3.0
Pipistrellus pipistrellus	640	57.2
Pipistrellus pygmaeus	156	13.9
Plecotus auritus	1	0.1
Total	1119	99.9

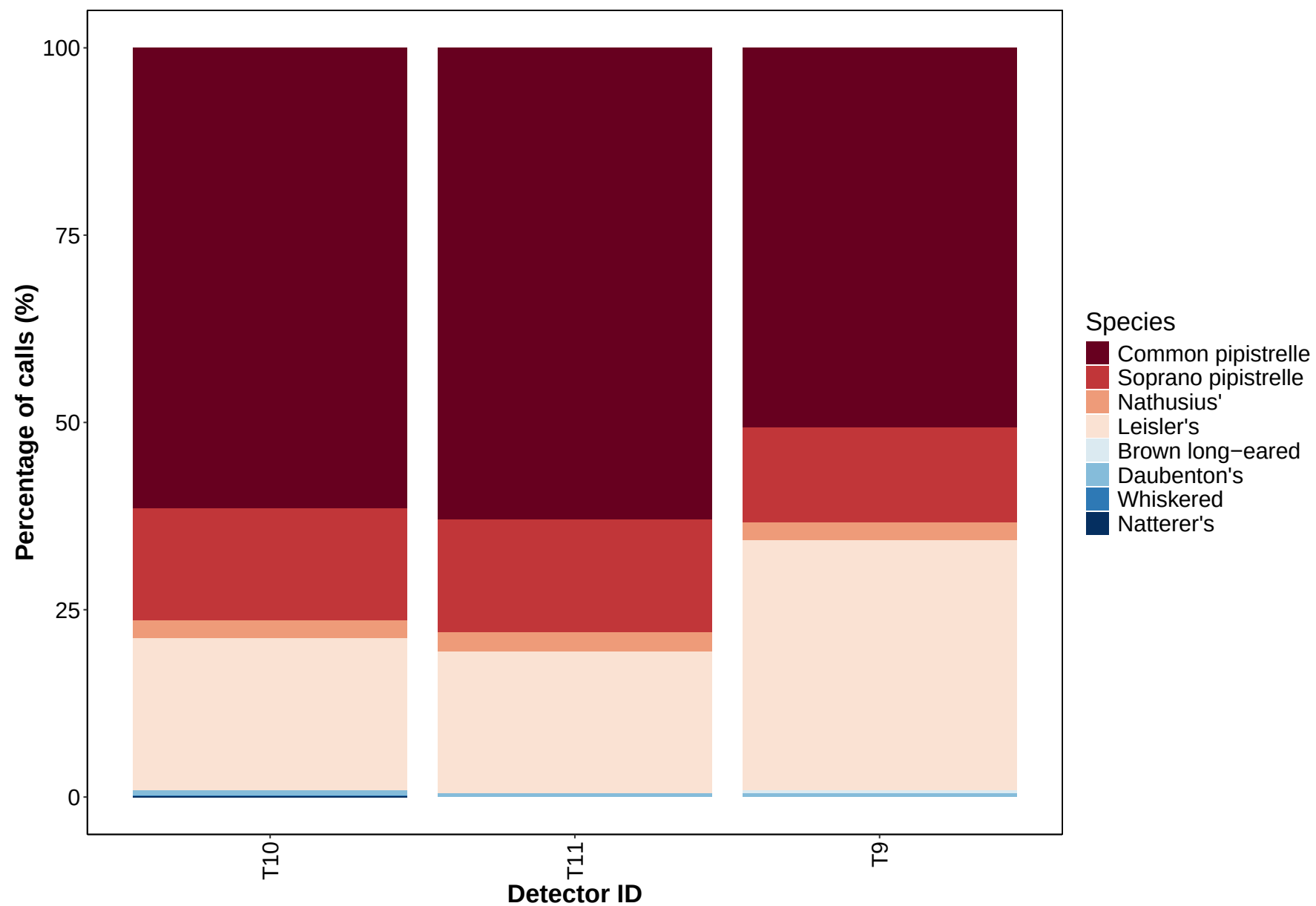
Per Detector

The number of passes recorded for each species at each detector.

Species	Detector ID	Count (no.)	Percentage by Detector (%)
Common pipistrelle	T10	320	54.7945205
Common pipistrelle	T11	227	63.7640449
Common pipistrelle	T9	93	51.9553073
Soprano pipistrelle	T10	89	15.2397260
Soprano pipistrelle	T11	46	12.9213483
Soprano pipistrelle	T9	21	11.7318436
Nathusius'	T10	15	2.5684932
Nathusius'	T11	14	3.9325843
Nathusius'	T9	5	2.7932961
Leisler's	T10	154	26.3698630
Leisler's	T11	67	18.8202247
Leisler's	T9	58	32.4022346
Brown long-eared	T9	1	0.5586592
Daubenton's	T10	4	0.6849315
Daubenton's	T11	2	0.5617978
Daubenton's	T9	1	0.5586592
Whiskered	T10	1	0.1712329
Natterer's	T10	1	0.1712329

Species Composition

Figure 10. Percentage species composition of passes at each detector.



Part 2a: Presence Only

THE NEXT SECTION OF THE REPORT FEATURES THE RAW DATA SUPPLIED TO ECOBAT AND ONLY TAKES INTO ACCOUNT THE PRESENCE, AND NOT THE ABSENCE, OF EACH BAT SPECIES. FOR EACH NIGHT, THERE IS NO 'ZERO DATA' FOR WHEN SPECIES WERE NOT DETECTED.

Nightly Bat Passes Per Hour

Median Per Detector

Table 16. The median Nightly Pass Rate (bat passes per hour, per night) of each species. If NA, then no bat passes.

Bat pass rates are often highly variable between nights, with some nights having few or no passes and other nights having high activity. In these circumstances, the median is likely to be a more useful summary of the 'average' activity than is the mean. For further information see: Lintott, P. R., & Mathews, F. (2018). Basic mathematical errors may make ecological assessments unreliable. *Biodiversity and Conservation*, 27(1), 265-267. <https://doi.org/10.1007/s10531-017-1418-5>

Species	Detector ID	Median Pass Rate
Common pipistrelle	T10	6.5
Common pipistrelle	T11	6.5
Common pipistrelle	T9	1.3
Soprano pipistrelle	T10	1.4
Soprano pipistrelle	T11	1.7
Soprano pipistrelle	T9	0.4
Nathusius'	T10	1.1
Nathusius'	T11	1.1
Nathusius'	T9	0.1
Leisler's	T10	2.1
Leisler's	T11	1.8
Leisler's	T9	0.8
Brown long-eared	T9	0.1
Daubenton's	T10	0.2
Daubenton's	T11	0.3
Daubenton's	T9	0.1
Whiskered	T10	0.1
Natterer's	T10	0.1

Mean Per Detector

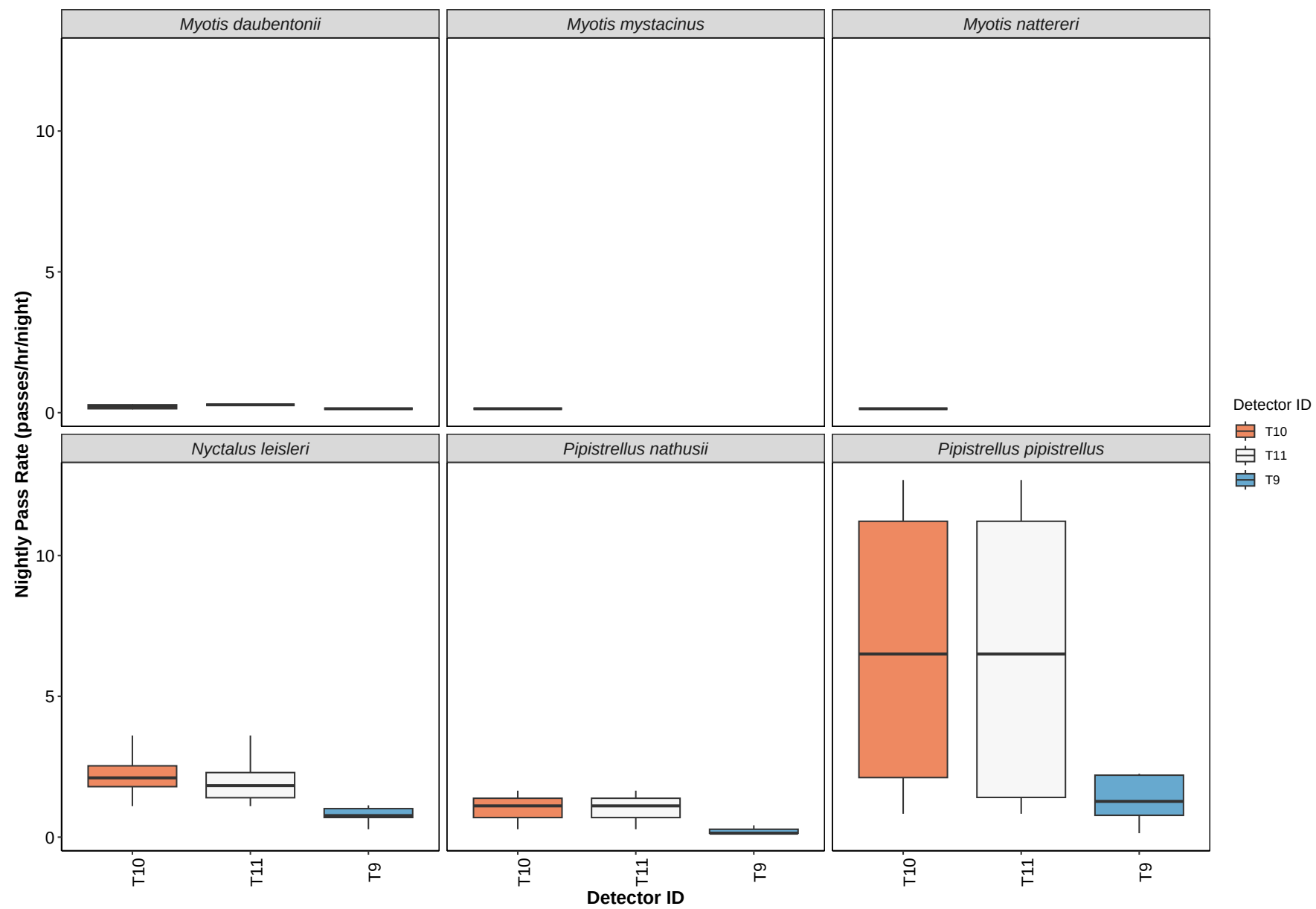
Table 17. The mean Nightly Pass Rate (bat passes per hour, per night) of each species at each detector. Values are given to 1 decimal place.

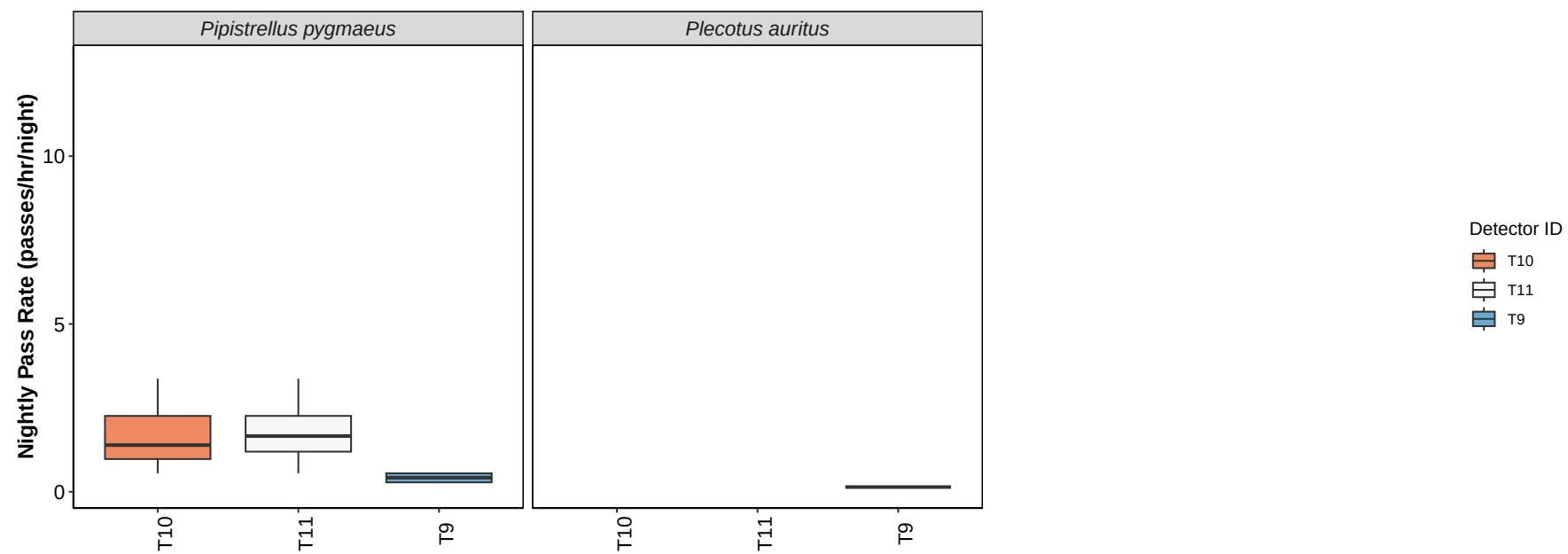
We recommend using the median values given above, for the reasons stated above, but provide the mean values in the table below.

Species	Detector ID	Mean Pass Rate
Common pipistrelle	T10	7.1
Common pipistrelle	T11	7.0
Common pipistrelle	T9	1.4
Soprano pipistrelle	T10	1.7
Soprano pipistrelle	T11	1.8
Soprano pipistrelle	T9	0.4
Nathusius'	T10	1.0
Nathusius'	T11	1.0
Nathusius'	T9	0.2
Leisler's	T10	2.2
Leisler's	T11	1.9
Leisler's	T9	0.8
Brown long-eared	T9	0.1
Daubenton's	T10	0.2
Daubenton's	T11	0.3
Daubenton's	T9	0.1
Whiskered	T10	0.1
Natterer's	T10	0.1

Per Detector

Figure 11. Boxplots for the number of bat passes per hour each night, for each detector. The 'box' shows the interquartile range, which is where the middle 50% of the data lie. The line dividing the box is the median, the mid-point of the data. The 'whiskers' extend from the box and represent the ranges for the bottom 25% and the top 25% of the data values, excluding outliers. An outlier is any extreme value that lies further away from the box than 1.5 times the interquartile range. Outliers are shown as dots. Where very few passes are recorded it is not possible to produce the box, so the data are shown as a line.





Detector ID

Split by Month

Total Bat Passes per Detector each Month

Table 18. The total number of bat passes of each species in each month at each detector.

This table simply tells you how many bats of each species were recorded passing each detector during each month. These numbers are not standardised by the night length, or how many nights each detector was active for during each month.

Species	Detector ID	Jun
Common pipistrelle	T10	560
Common pipistrelle	T11	550
Common pipistrelle	T9	108
Soprano pipistrelle	T10	136
Soprano pipistrelle	T11	132
Soprano pipistrelle	T9	27
Nathusius'	T10	22
Nathusius'	T11	22
Nathusius'	T9	5
Leisler's	T10	185
Leisler's	T11	166
Leisler's	T9	71
Brown long-eared	T9	1
Daubenton's	T10	6
Daubenton's	T11	4
Daubenton's	T9	1
Whiskered	T10	1
Natterer's	T10	1

Survey Effort

Table 19. The number of survey nights per month per detector.

month	Detector ID	No. of Survey Nights
Jun	T10	12
Jun	T11	12
Jun	T9	12

Nightly Bat Passes for Each Month

Median Per Detector

Table 20. The median Nightly Pass Rate (bat passes per hour, per night) of each species throughout each month. If NA, then no bat passes.

Bat pass rates are often highly variable between nights, with some nights having few or no passes and other nights having high activity. In these circumstances, the median is likely to be a more useful summary of the 'average' activity than is the mean. For further information see: Lintott, P. R., & Mathews, F. (2018). Basic mathematical errors may make ecological assessments unreliable. *Biodiversity and Conservation*, 27(1), 265-267. <https://doi.org/10.1007/s10531-017-1418-5>

Species	Detector ID	Jun
Common pipistrelle	T10	6.5
Common pipistrelle	T11	6.5
Common pipistrelle	T9	1.3
Soprano pipistrelle	T10	1.4
Soprano pipistrelle	T11	1.7
Soprano pipistrelle	T9	0.4
Nathusius'	T10	1.1
Nathusius'	T11	1.1
Nathusius'	T9	0.1
Leisler's	T10	2.1
Leisler's	T11	1.8
Leisler's	T9	0.8
Brown long-eared	T9	0.1
Daubenton's	T10	0.2
Daubenton's	T11	0.3
Daubenton's	T9	0.1
Whiskered	T10	0.1
Natterer's	T10	0.1

Mean Per Detector

Table 21: The mean Nightly Pass Rate (bat passes per hour, per night) of each species throughout each month. Values are given to 1 decimal place.

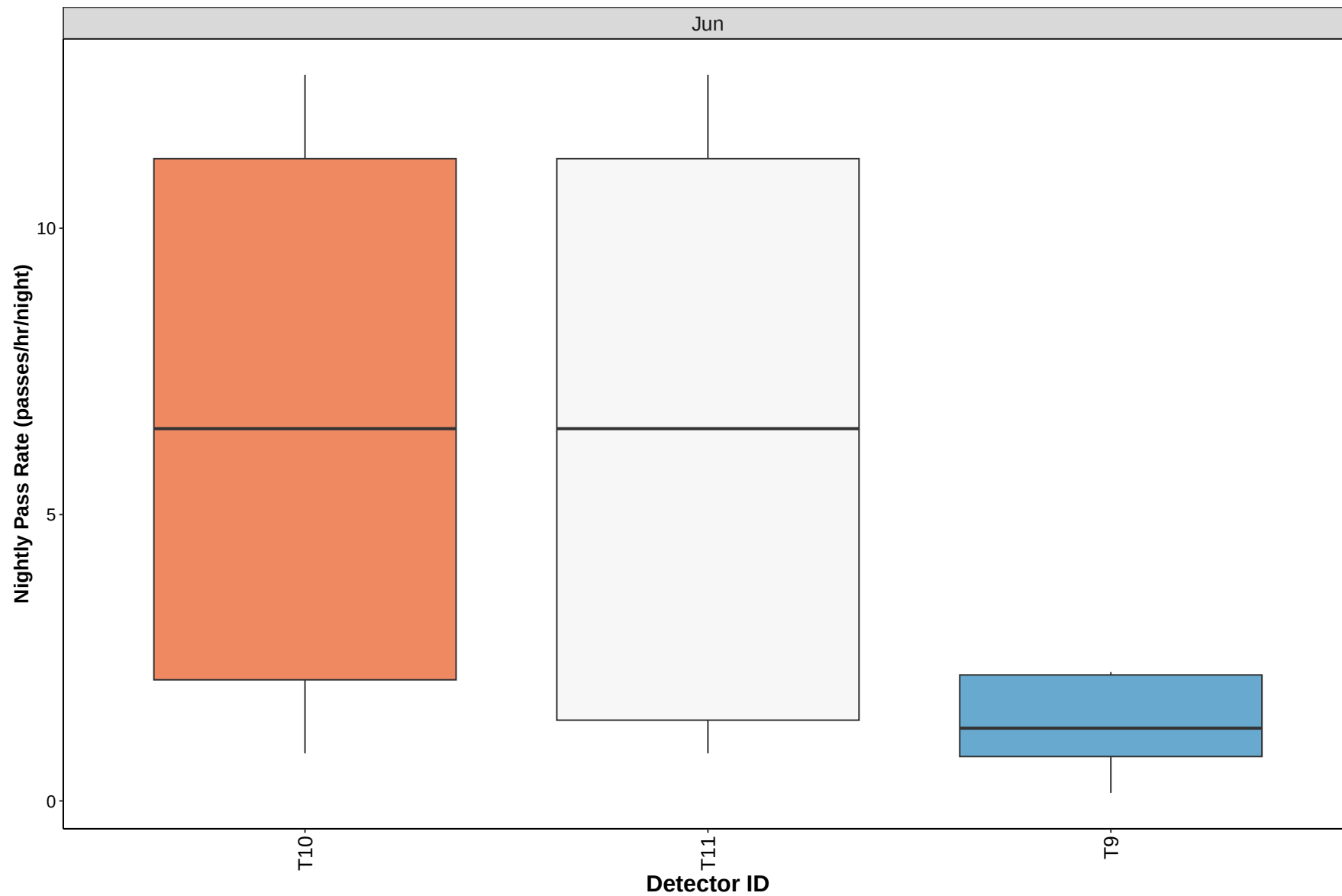
We recommend using the median values given above, for the reasons stated above, but provide the mean values in the table below.

Species	Detector ID	Jun
Common pipistrelle	T10	7.1
Common pipistrelle	T11	7.0
Common pipistrelle	T9	1.4
Soprano pipistrelle	T10	1.7
Soprano pipistrelle	T11	1.8
Soprano pipistrelle	T9	0.4
Nathusius'	T10	1.0
Nathusius'	T11	1.0
Nathusius'	T9	0.2
Leisler's	T10	2.2
Leisler's	T11	1.9
Leisler's	T9	0.8
Brown long-eared	T9	0.1
Daubenton's	T10	0.2
Daubenton's	T11	0.3
Daubenton's	T9	0.1
Whiskered	T10	0.1
Natterer's	T10	0.1

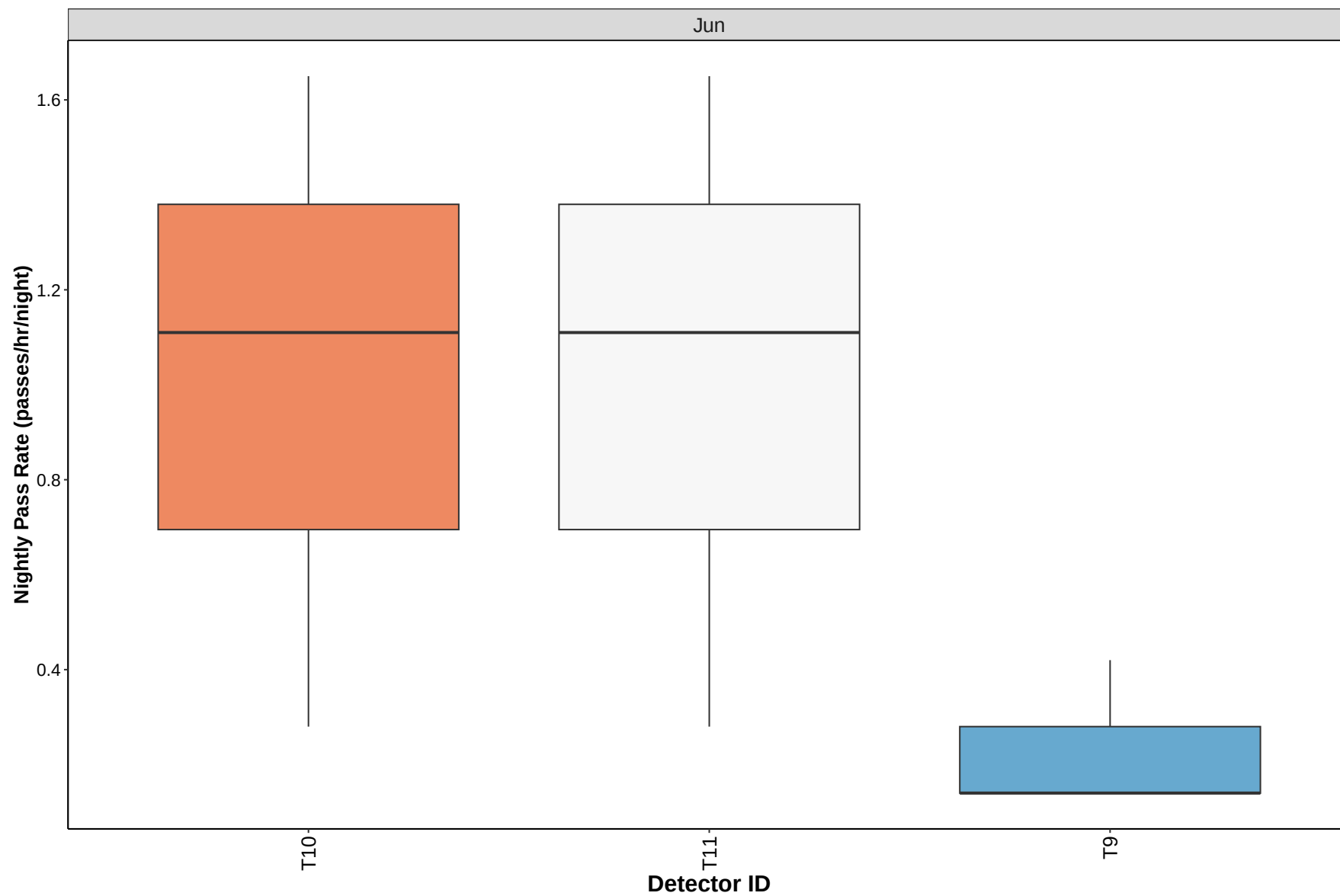
Per Detector

Figure 12. Figures show boxplots for the number of bat passes per hour by detector, for each month. The 'box' shows the interquartile range, which is where the middle 50% of the data lie. The line dividing the box is the median, the mid-point of the data. The 'whiskers' extend from the box and represent the ranges for the bottom 25% and the top 25% of the data values, excluding outliers. An outlier is any extreme value that lies further away from the box than 1.5 times the interquartile range. Outliers are shown as dots. Where very few passes are recorded it is not possible to produce the box, so the data are shown as a line.

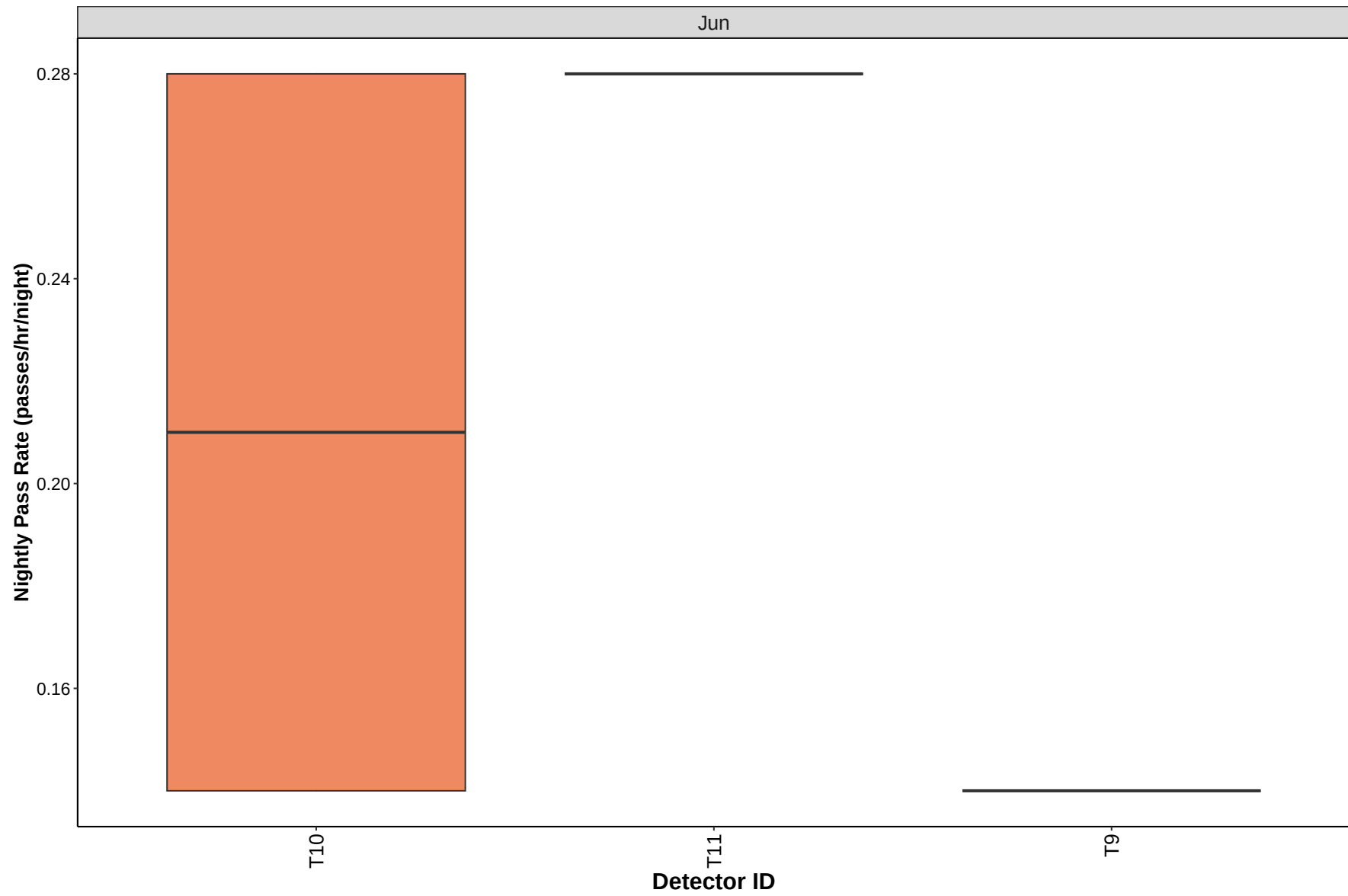
Common pipistrelle



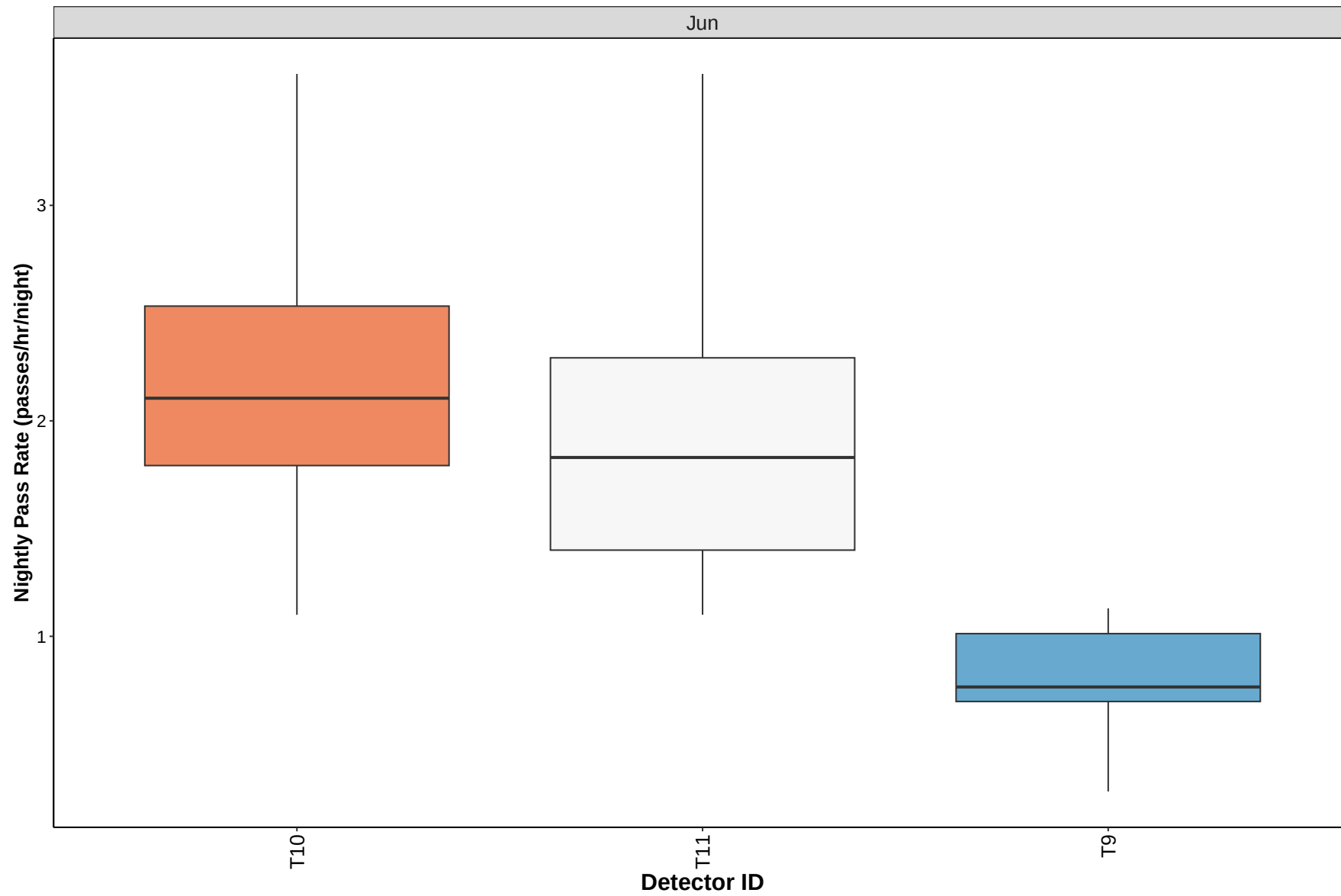
Nathusius'



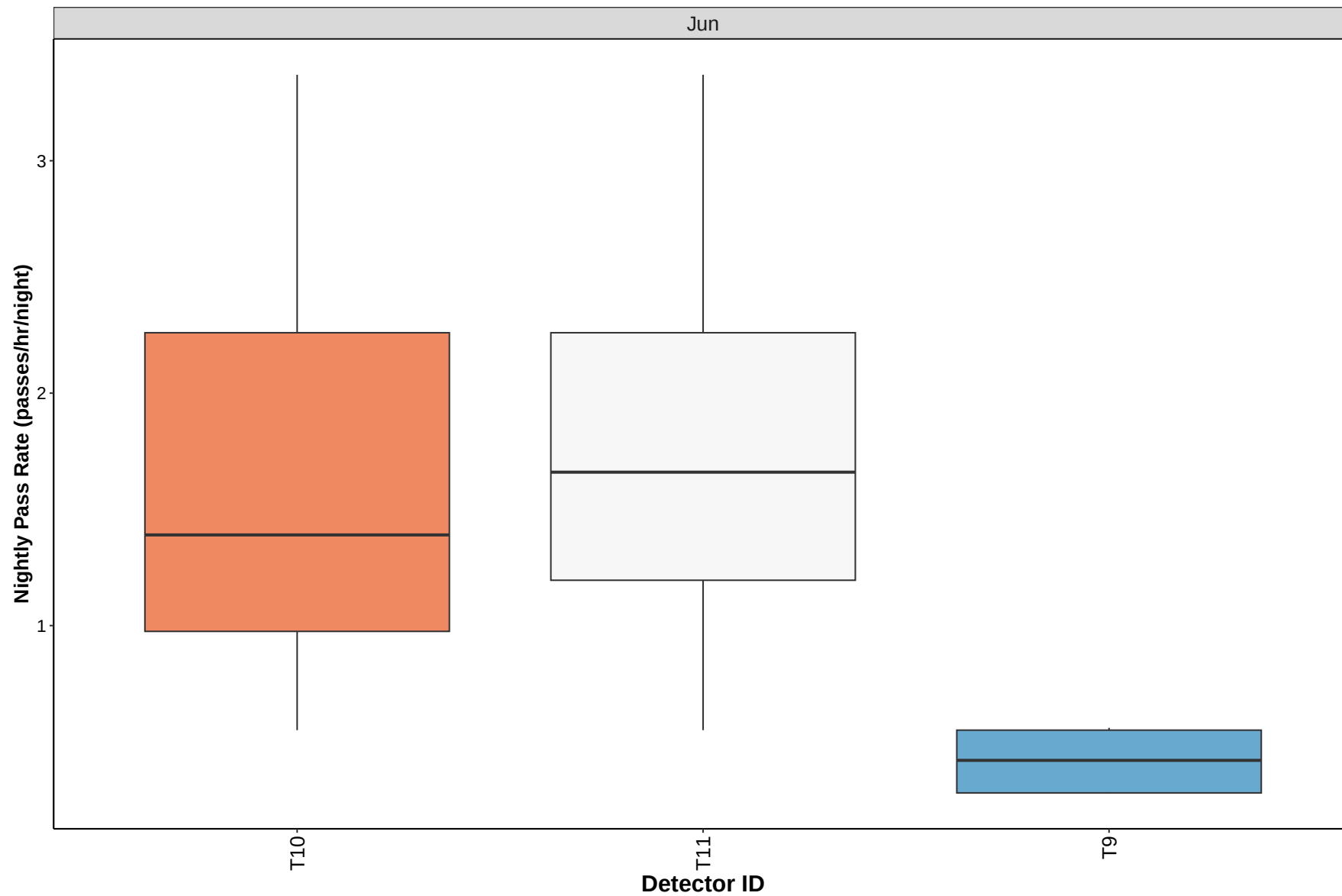
Daubenton's

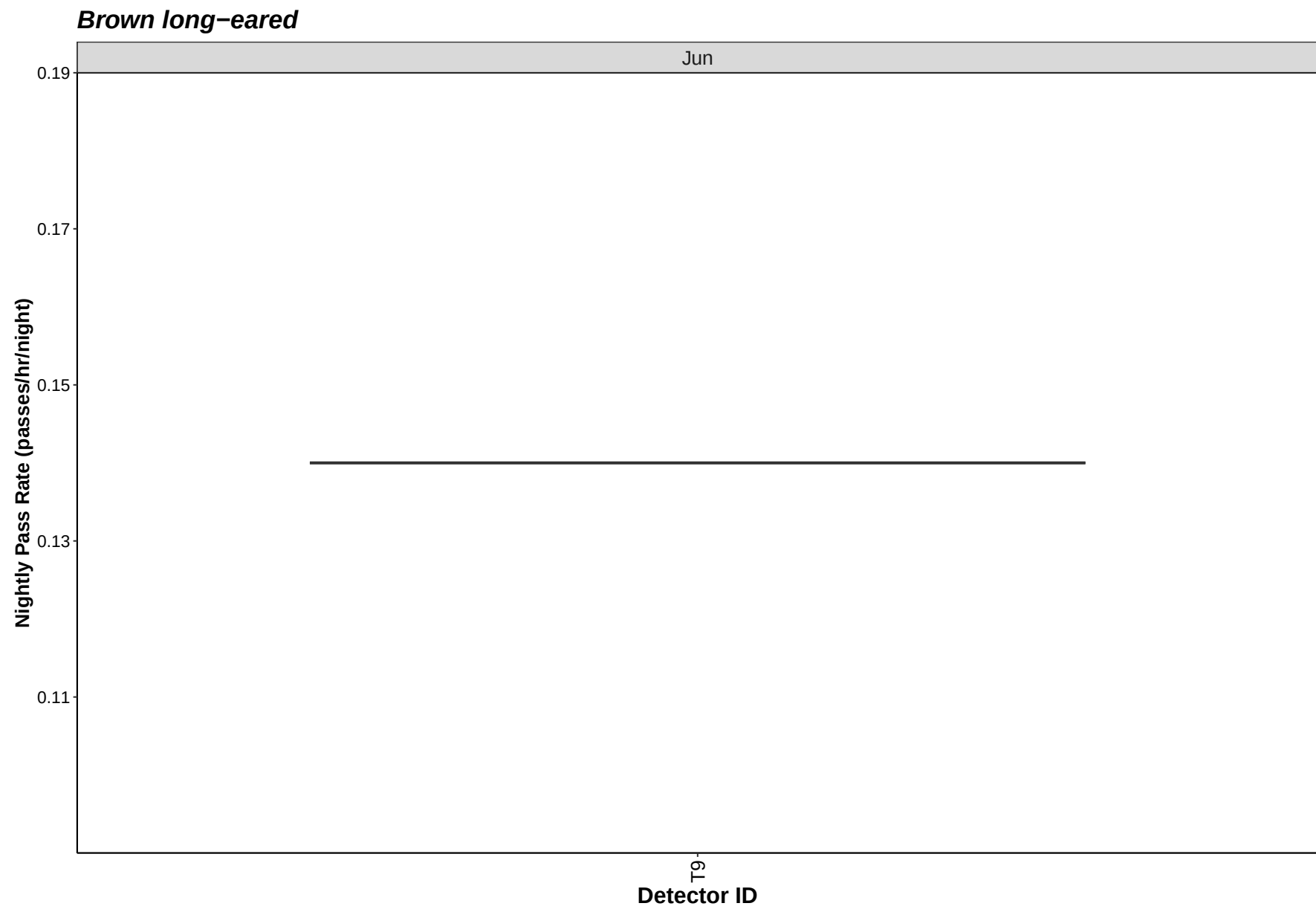


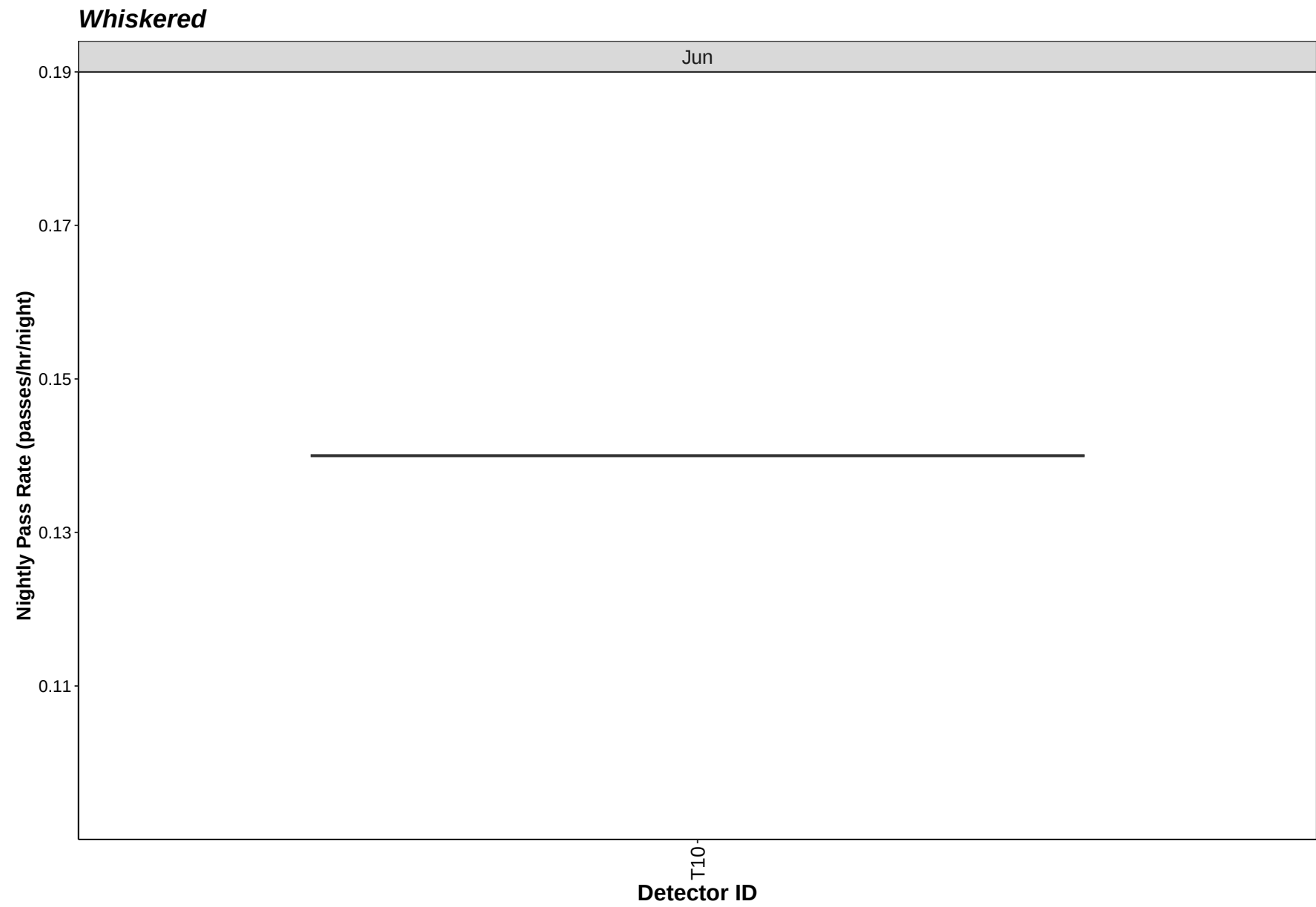
Leisler's

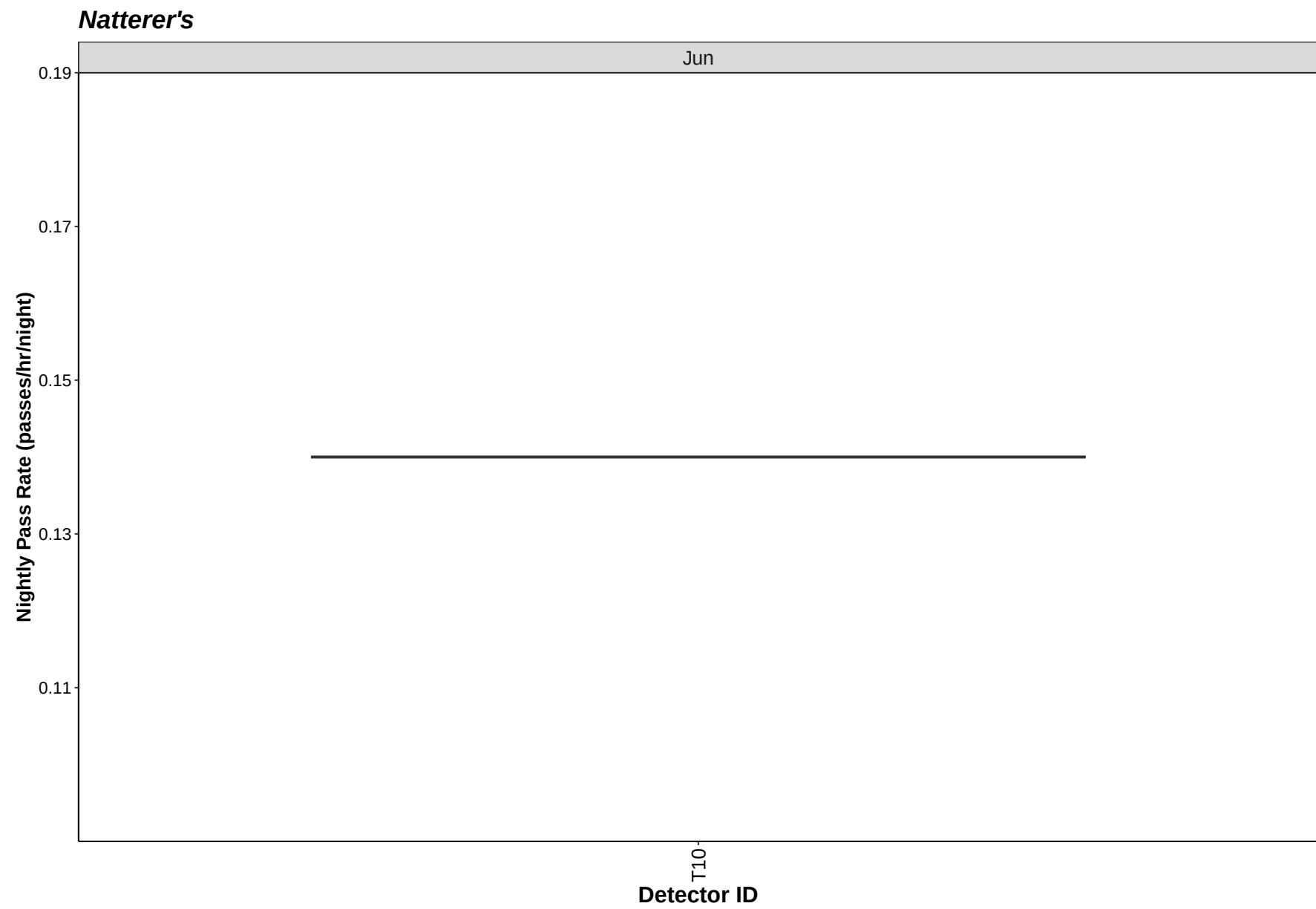


Soprano pipistrelle









Bat Activity per Detector Location

Figure 13. Detector ID reference:

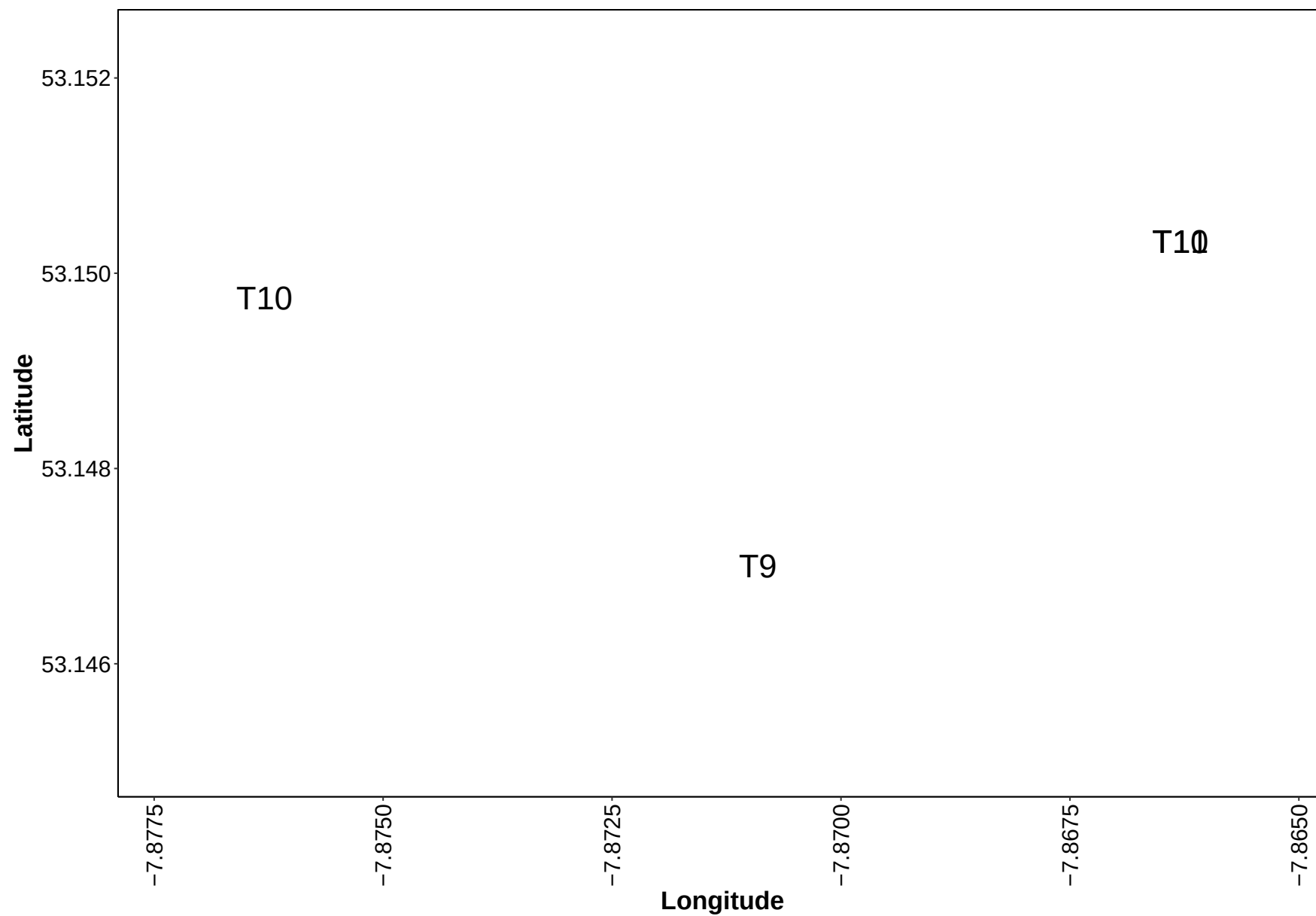
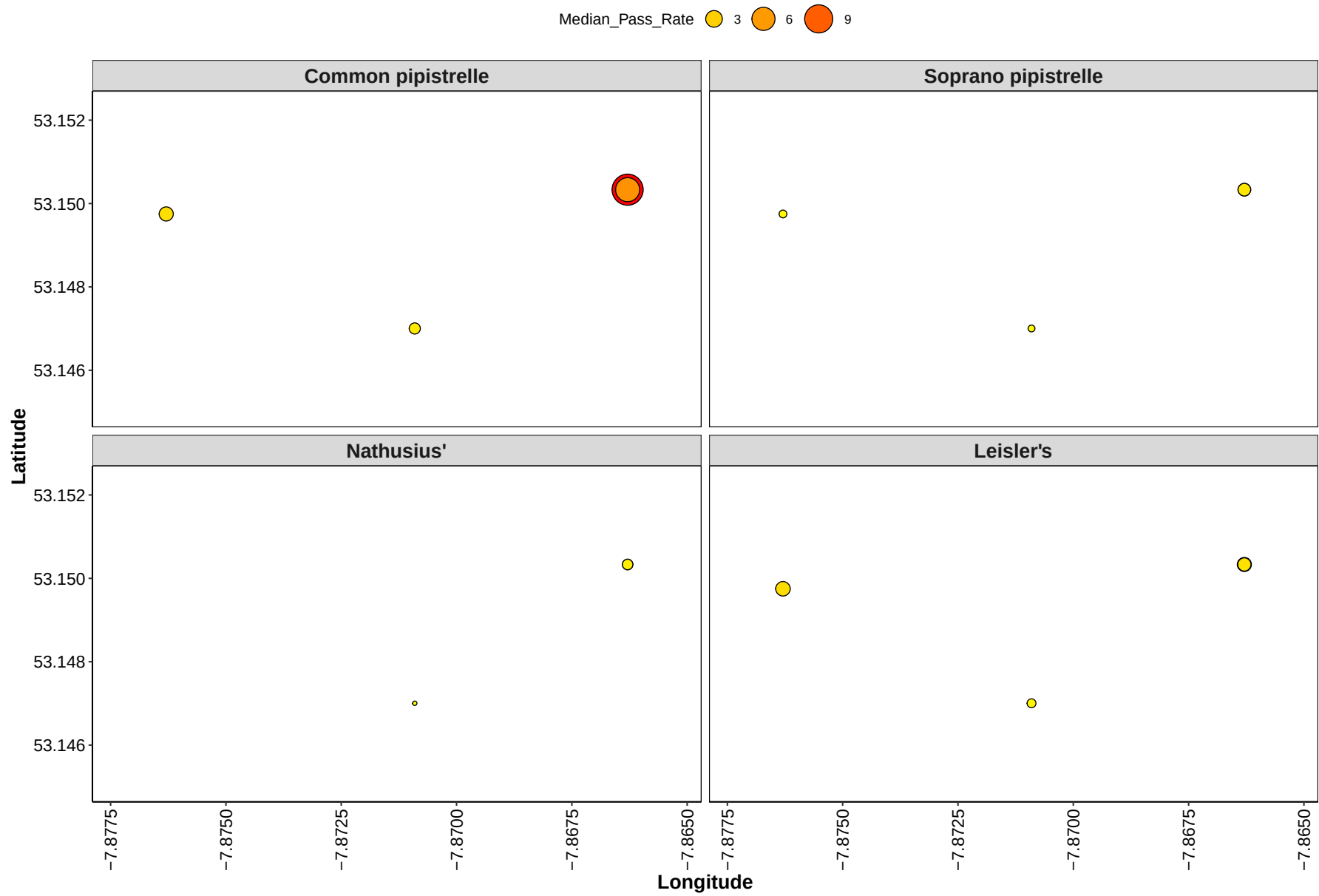


Figure 14. Median Nightly Pass Rate (bat passes/hr/night) throughout the survey period - represented by the size and colour of the point at each detector location.



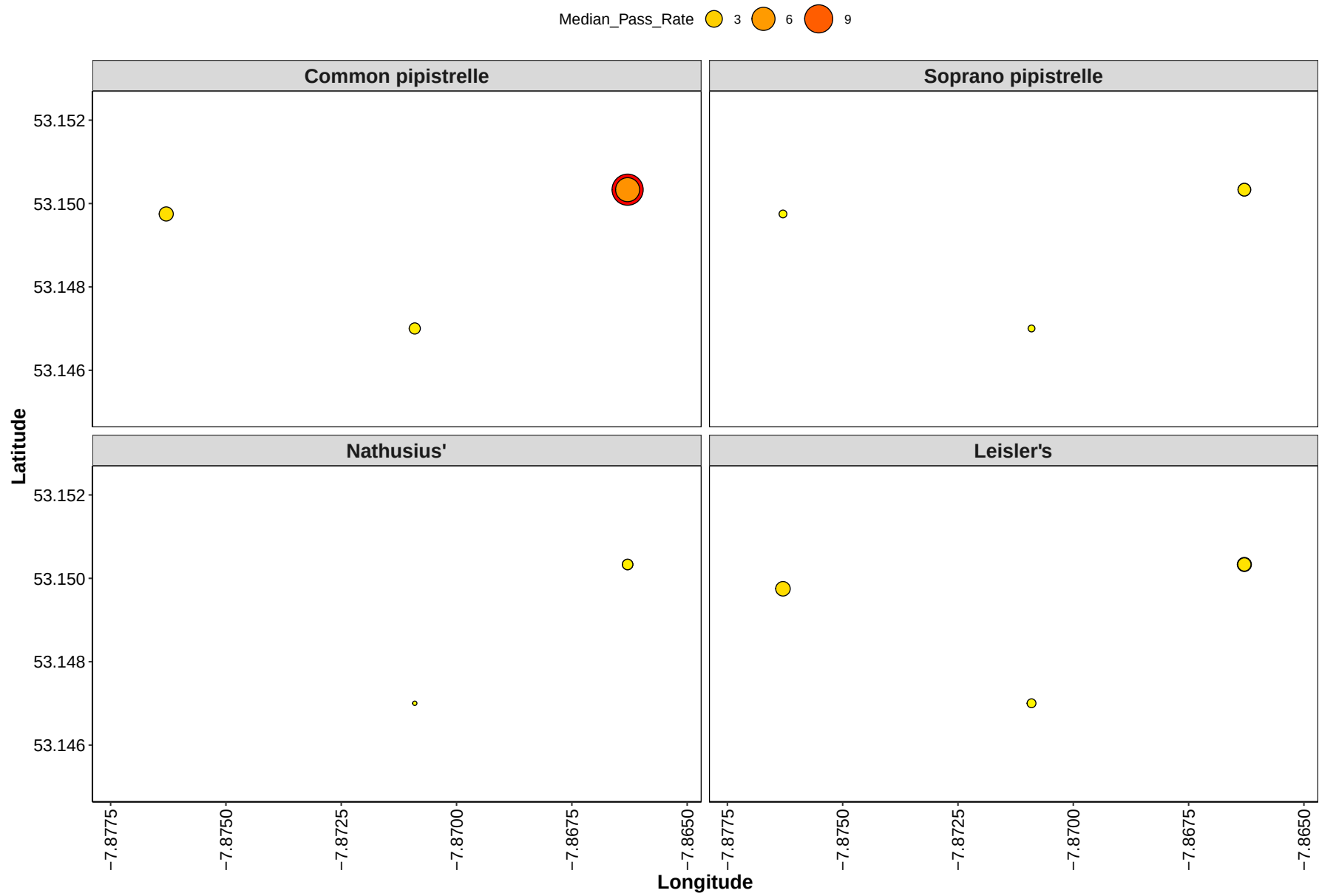
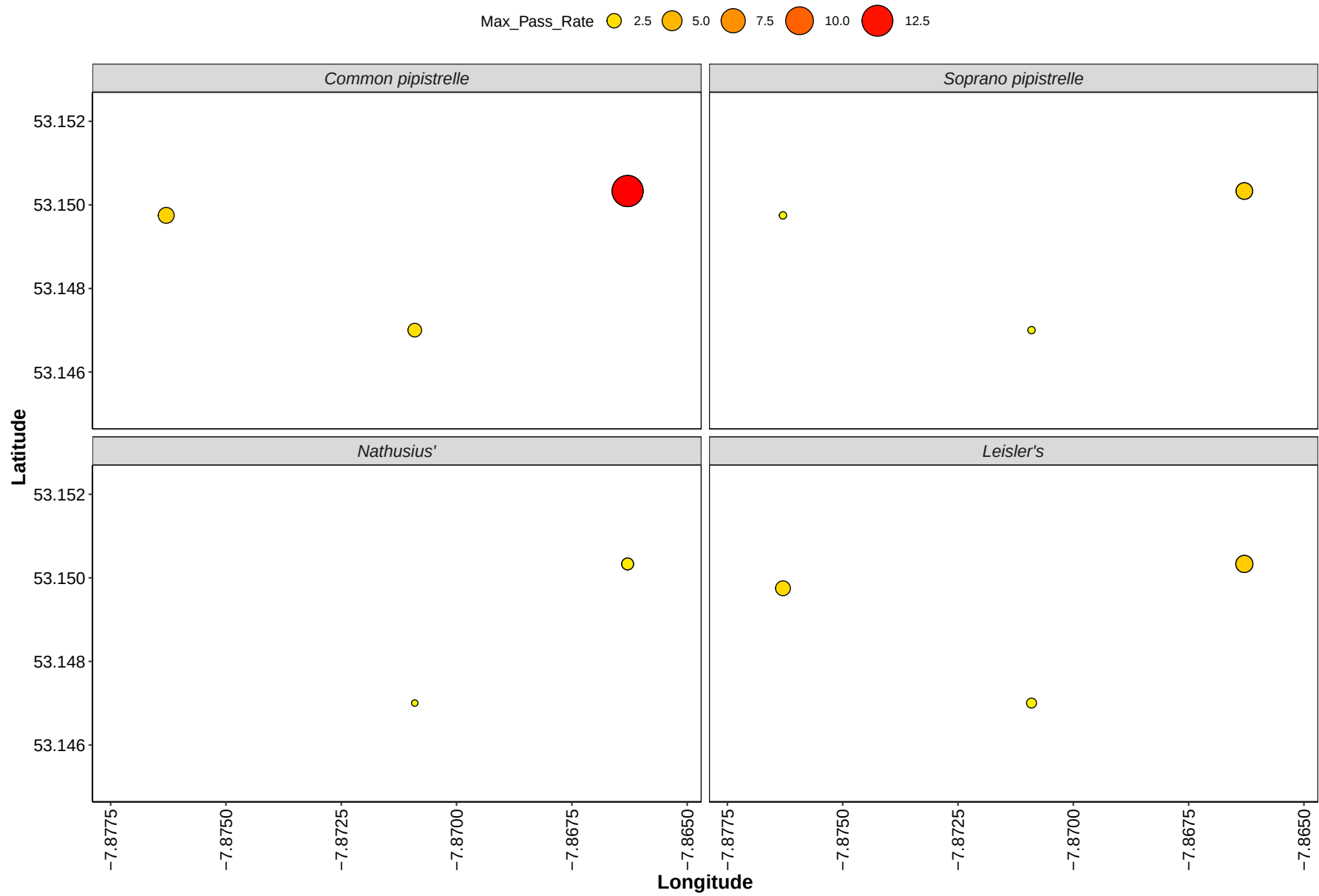
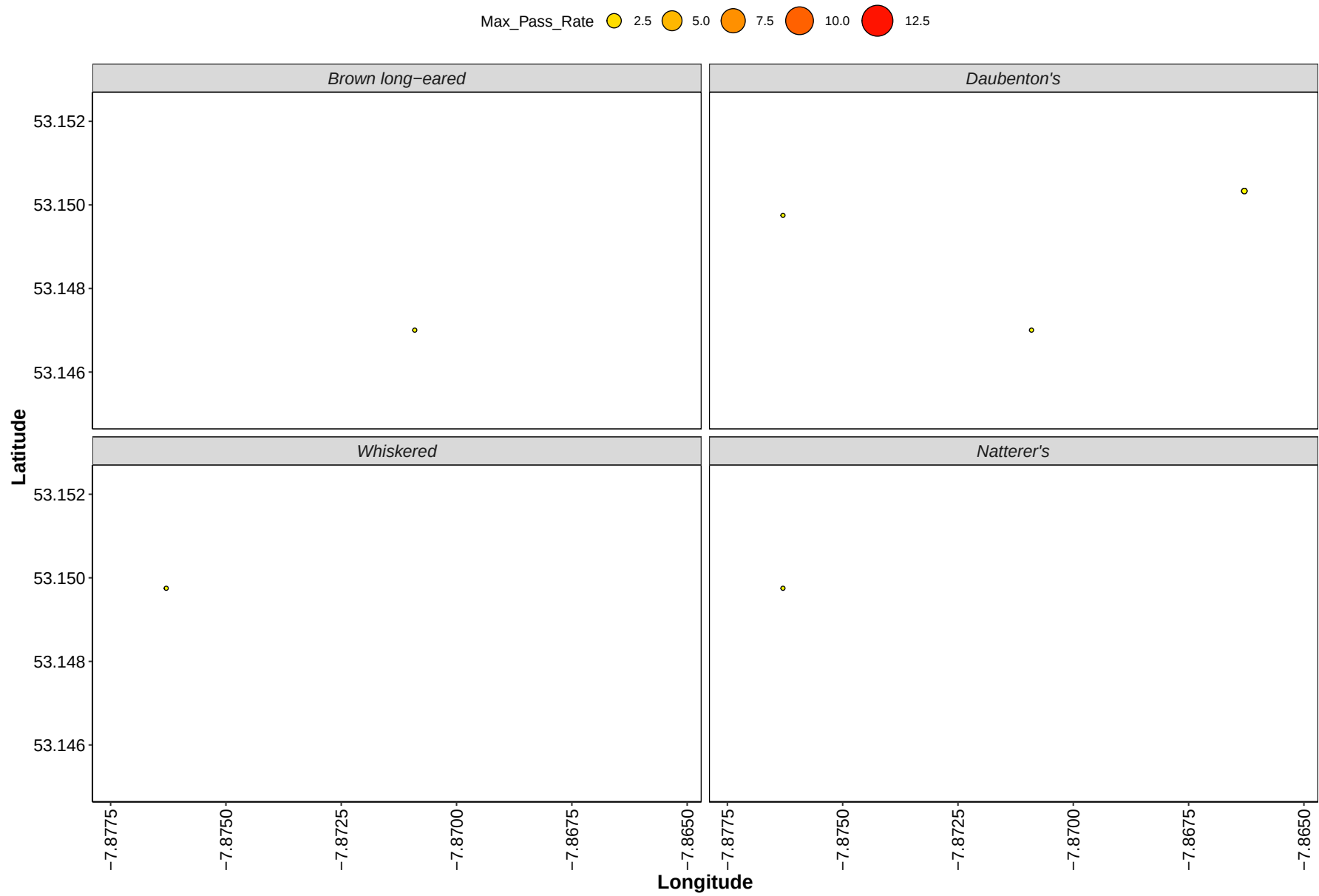


Figure 15. Maximum Nightly Pass Rate (bat passes/hr/night) recorded in a single night throughout the survey period - represented by the size and colour of the point at each detector location.





Part 2b: Includes Absences

THE NEXT SECTION OF THE REPORT FEATURES THE DATA SUPPLIED TO ECOBAT BUT TAKES INTO ACCOUNT SPECIES ABSENCES, AND THEREFORE INCLUDES 'ZERO DATA' FOR WHEN SPECIES WERE NOT DETECTED AT EACH DETECTOR ON A NIGHT. THIS DRAMATICALLY LOWERS THE MEANS AND MEDIANS OF THE DATA PRESENTED.

Nightly Bat Pass Rate

Median per Detector

Table 22. The median Nightly Pass Rate (bat passes per hour, per night) of each species. If NA, then no bat passes.

Bat pass rates are often highly variable between nights, with some nights having few or no passes and other nights having high activity. In these circumstances, the median is likely to be a more useful summary of the 'average' activity than is the mean. For further information see: Lintott, P. R., & Mathews, F. (2018). Basic mathematical errors may make ecological assessments unreliable. *Biodiversity and Conservation*, 27(1), 265-267. <https://doi.org/10.1007/s10531-017-1418-5>

Species	Detector ID	Median Pass Rate
Brown long-eared	T10	0.0
Brown long-eared	T11	0.0
Brown long-eared	T9	0.0
Common pipistrelle	T10	1.1
Common pipistrelle	T11	6.5
Common pipistrelle	T9	1.3
Daubenton's	T10	0.0
Daubenton's	T11	0.0
Daubenton's	T9	0.0
Leisler's	T10	1.7
Leisler's	T11	1.8
Leisler's	T9	0.8
Nathusius'	T10	0.0
Nathusius'	T11	0.0
Nathusius'	T9	0.0
Natterer's	T10	0.0
Natterer's	T11	0.0
Natterer's	T9	0.0
Soprano pipistrelle	T10	0.6
Soprano pipistrelle	T11	1.4
Soprano pipistrelle	T9	0.3
Whiskered	T10	0.0
Whiskered	T11	0.0
Whiskered	T9	0.0

Mean per Detector

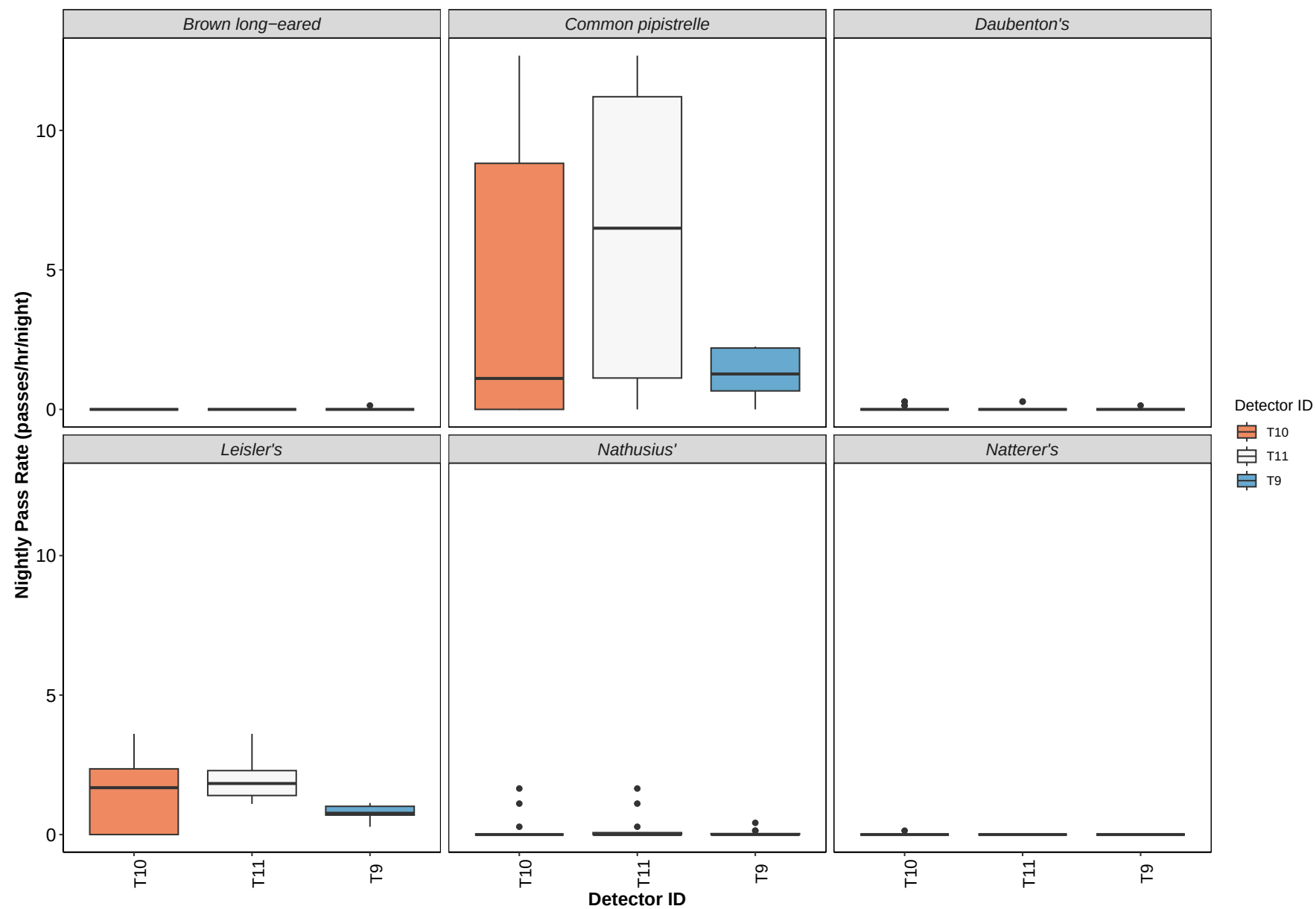
Table 23. The mean Nightly Pass Rate (bat passes per hour, per night) of each species at each detector. Values are given to 1 decimal place.

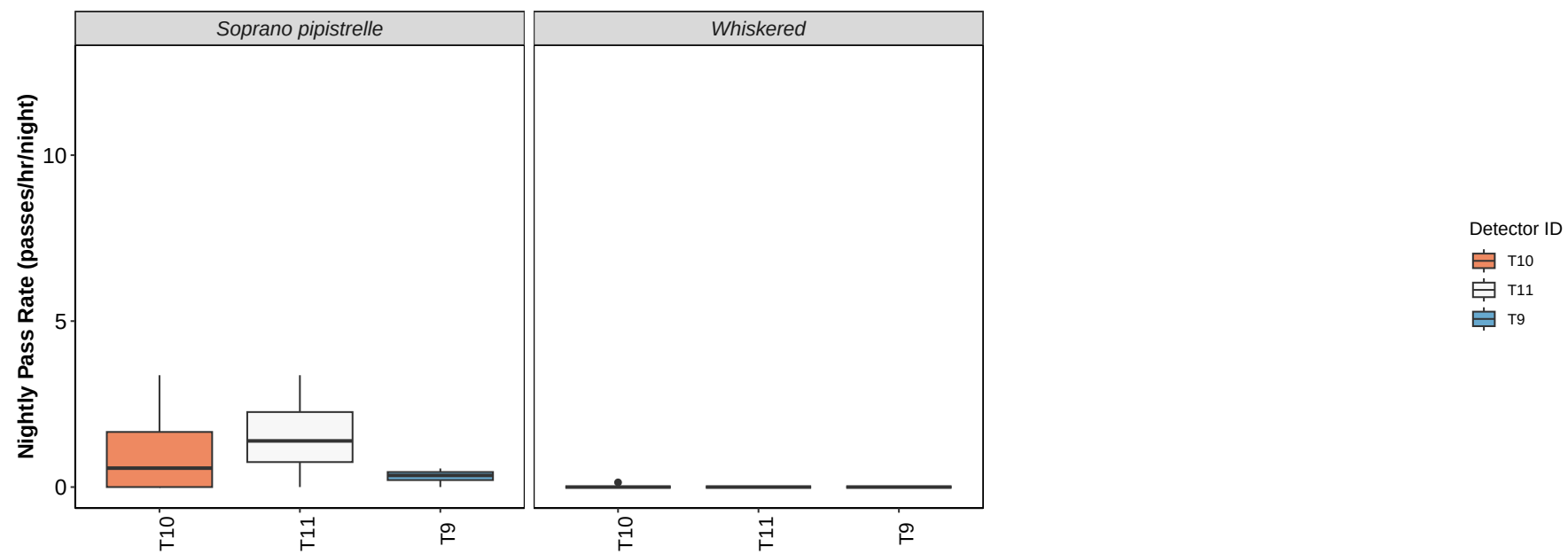
We recommend using the median values given above, for the reasons stated above, but provide the mean values in the table below.

Species	Detector ID	Mean Pass Rate
Brown long-eared	T10	0.0
Brown long-eared	T11	0.0
Brown long-eared	T9	0.0
Common pipistrelle	T10	4.1
Common pipistrelle	T11	6.4
Common pipistrelle	T9	1.3
Daubenton's	T10	0.0
Daubenton's	T11	0.0
Daubenton's	T9	0.0
Leisler's	T10	1.4
Leisler's	T11	1.9
Leisler's	T9	0.8
Nathusius'	T10	0.2
Nathusius'	T11	0.3
Nathusius'	T9	0.1
Natterer's	T10	0.0
Natterer's	T11	0.0
Natterer's	T9	0.0
Soprano pipistrelle	T10	1.0
Soprano pipistrelle	T11	1.5
Soprano pipistrelle	T9	0.3
Whiskered	T10	0.0
Whiskered	T11	0.0
Whiskered	T9	0.0

Per Detector

Figure 16. Figures show boxplots for the number of bat passes per hour each night, for each detector. The 'box' shows the interquartile range, which is where the middle 50% of the data lie. The line dividing the box is the median, the mid-point of the data. The 'whiskers' extend from the box and represent the ranges for the bottom 25% and the top 25% of the data values, excluding outliers. An outlier is any extreme value that lies further away from the box than 1.5 times the interquartile range. Outliers are shown as dots. Where very few passes are recorded it is not possible to produce the box, so the data are shown as a line.





Detector ID

Survey Effort

Table 24. The number of nights bats were detected per month per detector.

month	Detector ID	No. of Survey Nights
Jun	T10	12
Jun	T11	12
Jun	T9	12

Nightly Bat Pass Rate for Each Month

Median per Detector

Table 25. The median Nightly Pass Rate (bat passes per hour, per night) of each species throughout each month. If NA, then no bat passes.

Bat pass rates are often highly variable between nights, with some nights having few or no passes and other nights having high activity. In these circumstances, the median is likely to be a more useful summary of the 'average' activity than is the mean. For further information see: Lintott, P. R., & Mathews, F. (2018). Basic mathematical errors may make ecological assessments unreliable. *Biodiversity and Conservation*, 27(1), 265-267. <https://doi.org/10.1007/s10531-017-1418-5>

Species	Detector ID	Jun
Brown long-eared	T10	0.0
Brown long-eared	T11	0.0
Brown long-eared	T9	0.0
Common pipistrelle	T10	1.1
Common pipistrelle	T11	6.5
Common pipistrelle	T9	1.3
Daubenton's	T10	0.0
Daubenton's	T11	0.0
Daubenton's	T9	0.0
Leisler's	T10	1.7
Leisler's	T11	1.8
Leisler's	T9	0.8
Nathusius'	T10	0.0
Nathusius'	T11	0.0
Nathusius'	T9	0.0
Natterer's	T10	0.0
Natterer's	T11	0.0
Natterer's	T9	0.0
Soprano pipistrelle	T10	0.6
Soprano pipistrelle	T11	1.4
Soprano pipistrelle	T9	0.3
Whiskered	T10	0.0
Whiskered	T11	0.0
Whiskered	T9	0.0

Mean per Detector

Table 26. The mean Nightly Pass Rate (bat passes per hour, per night) of each species throughout each month. Values are given to 1 decimal place.

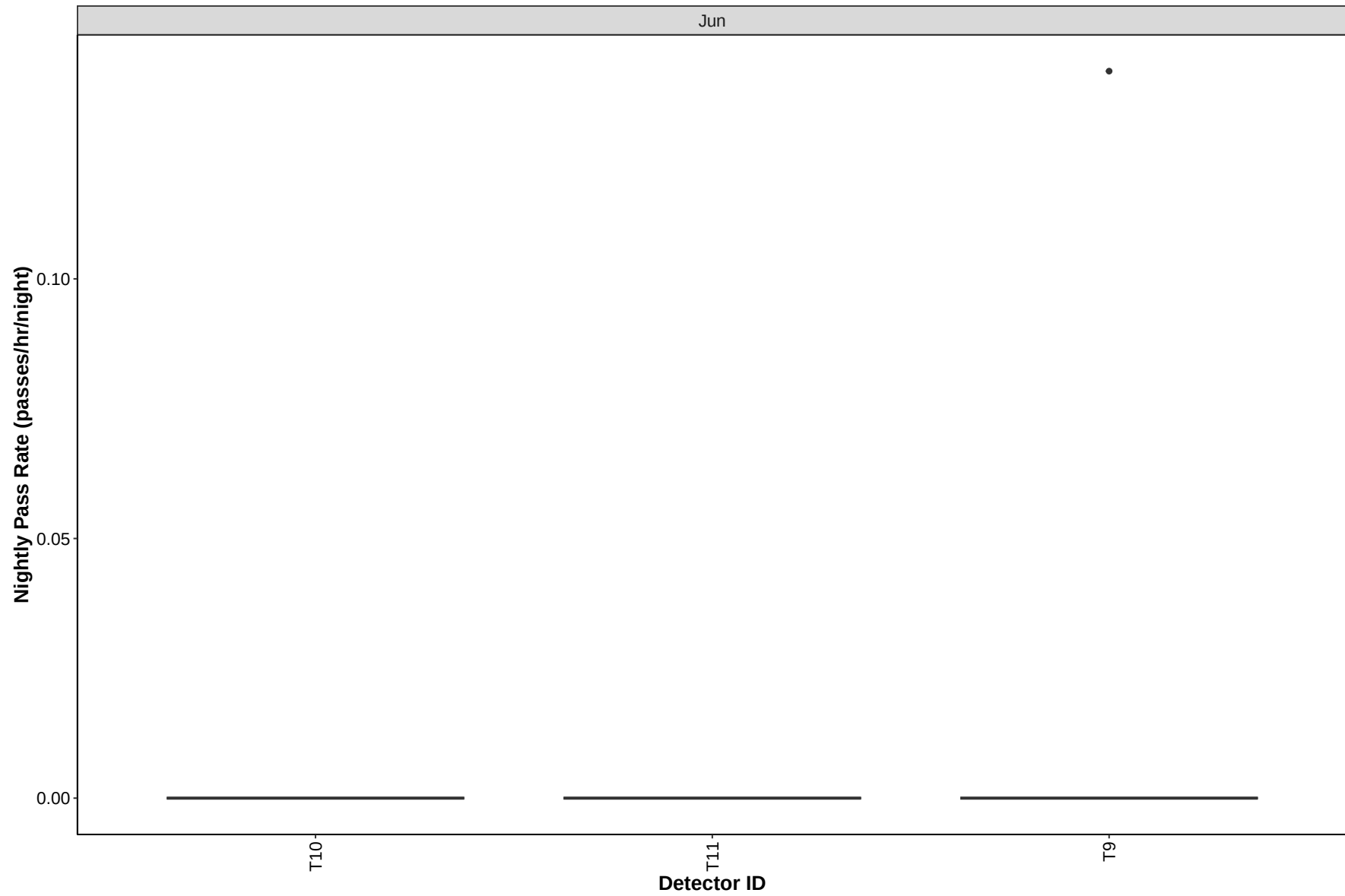
We recommend using the median values given above, for the reasons stated above, but provide the mean values in the table below.

Species	Detector ID	Jun
Brown long-eared	T10	0.0
Brown long-eared	T11	0.0
Brown long-eared	T9	0.0
Common pipistrelle	T10	4.1
Common pipistrelle	T11	6.4
Common pipistrelle	T9	1.3
Daubenton's	T10	0.0
Daubenton's	T11	0.0
Daubenton's	T9	0.0
Leisler's	T10	1.4
Leisler's	T11	1.9
Leisler's	T9	0.8
Nathusius'	T10	0.2
Nathusius'	T11	0.3
Nathusius'	T9	0.1
Natterer's	T10	0.0
Natterer's	T11	0.0
Natterer's	T9	0.0
Soprano pipistrelle	T10	1.0
Soprano pipistrelle	T11	1.5
Soprano pipistrelle	T9	0.3
Whiskered	T10	0.0
Whiskered	T11	0.0
Whiskered	T9	0.0

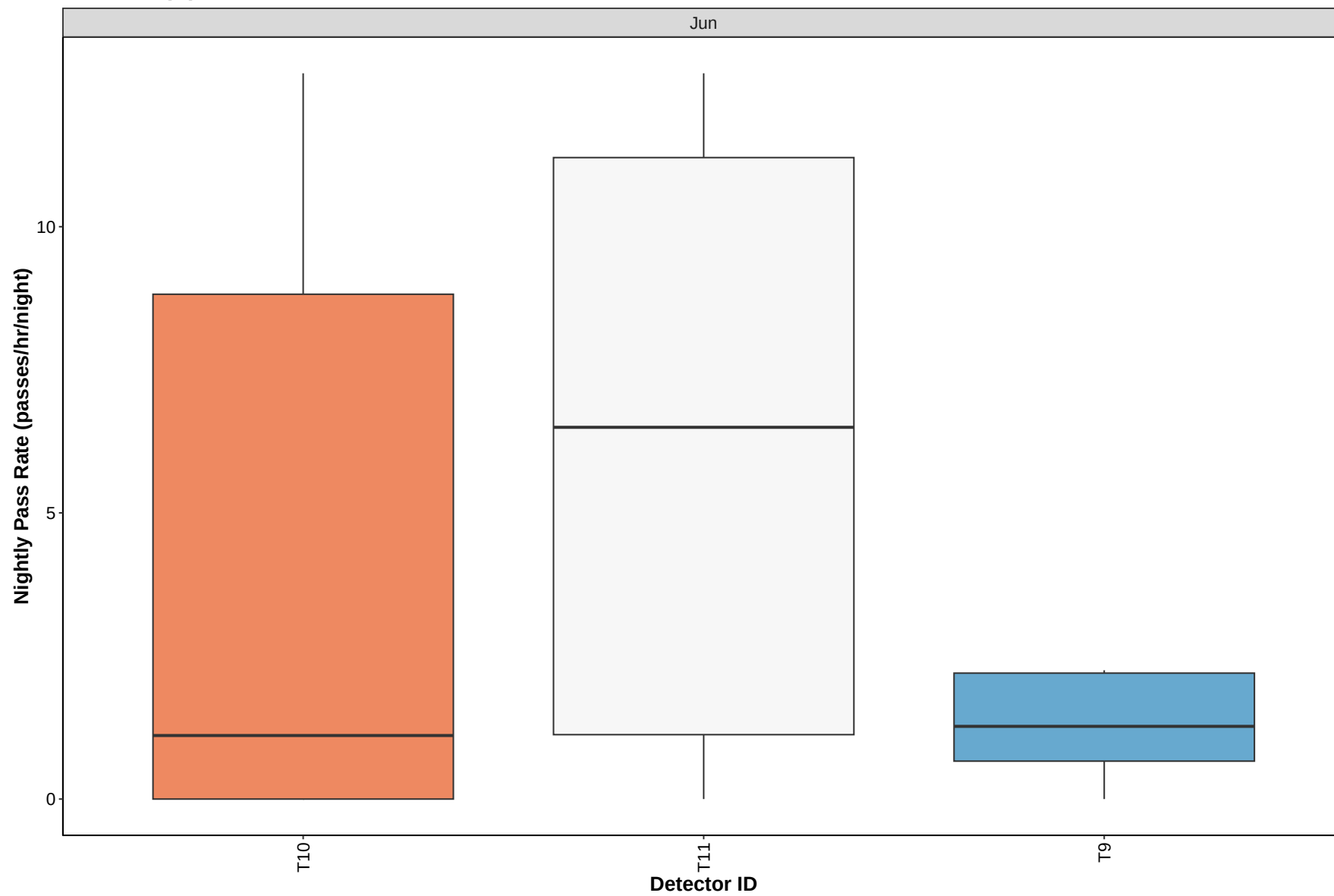
Per Detector

Figure 17. Figures show boxplots for the number of bat passes per hour by detector, for each month. The 'box' shows the interquartile range, which is where the middle 50% of the data lie. The line dividing the box is the median, the mid-point of the data. The 'whiskers' extend from the box and represent the ranges for the bottom 25% and the top 25% of the data values, excluding outliers. An outlier is any extreme value that lies further away from the box than 1.5 times the interquartile range. Outliers are shown as dots. Where very few passes are recorded it is not possible to produce the box, so the data are shown as a line.

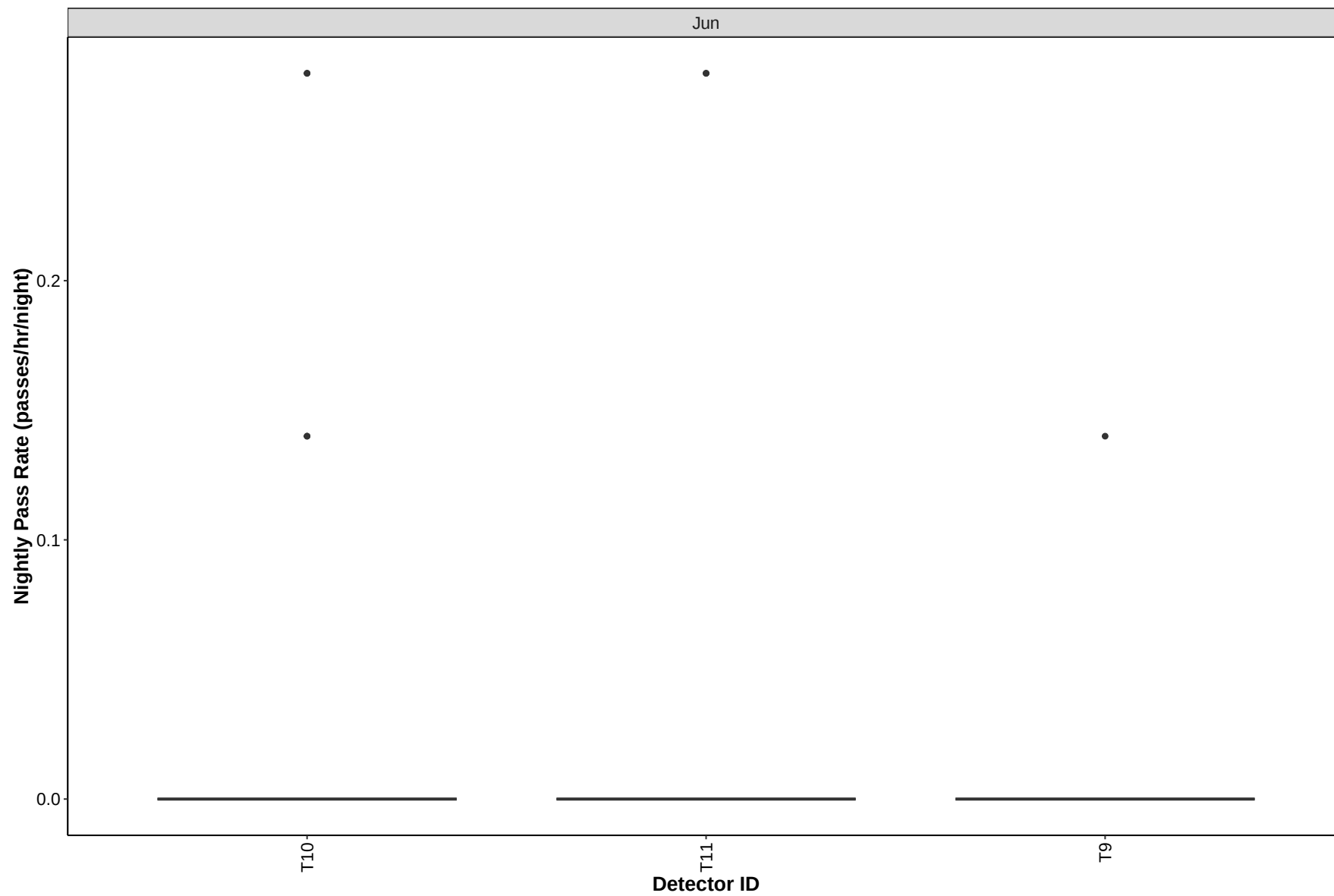
Brown long-eared



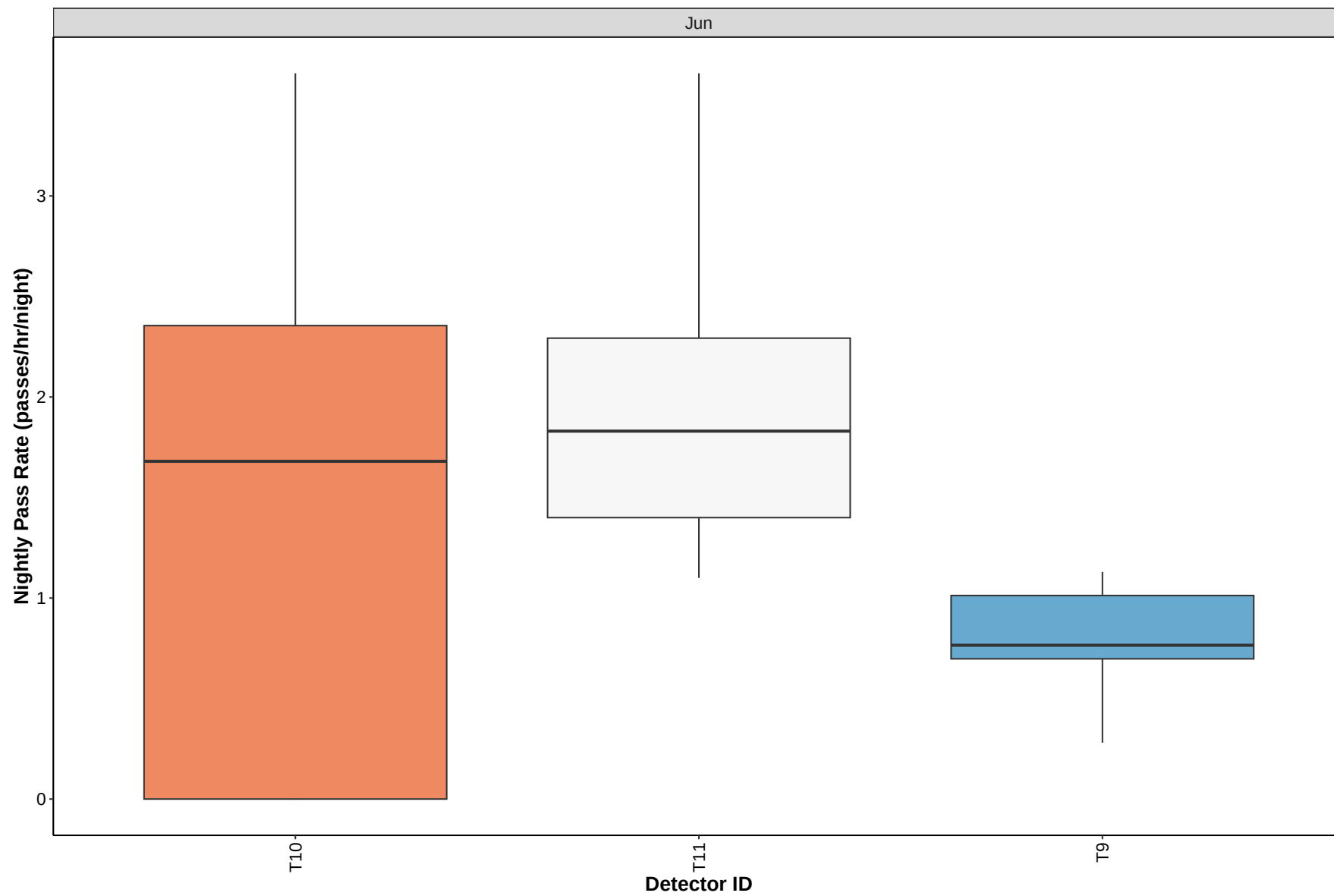
Common pipistrelle



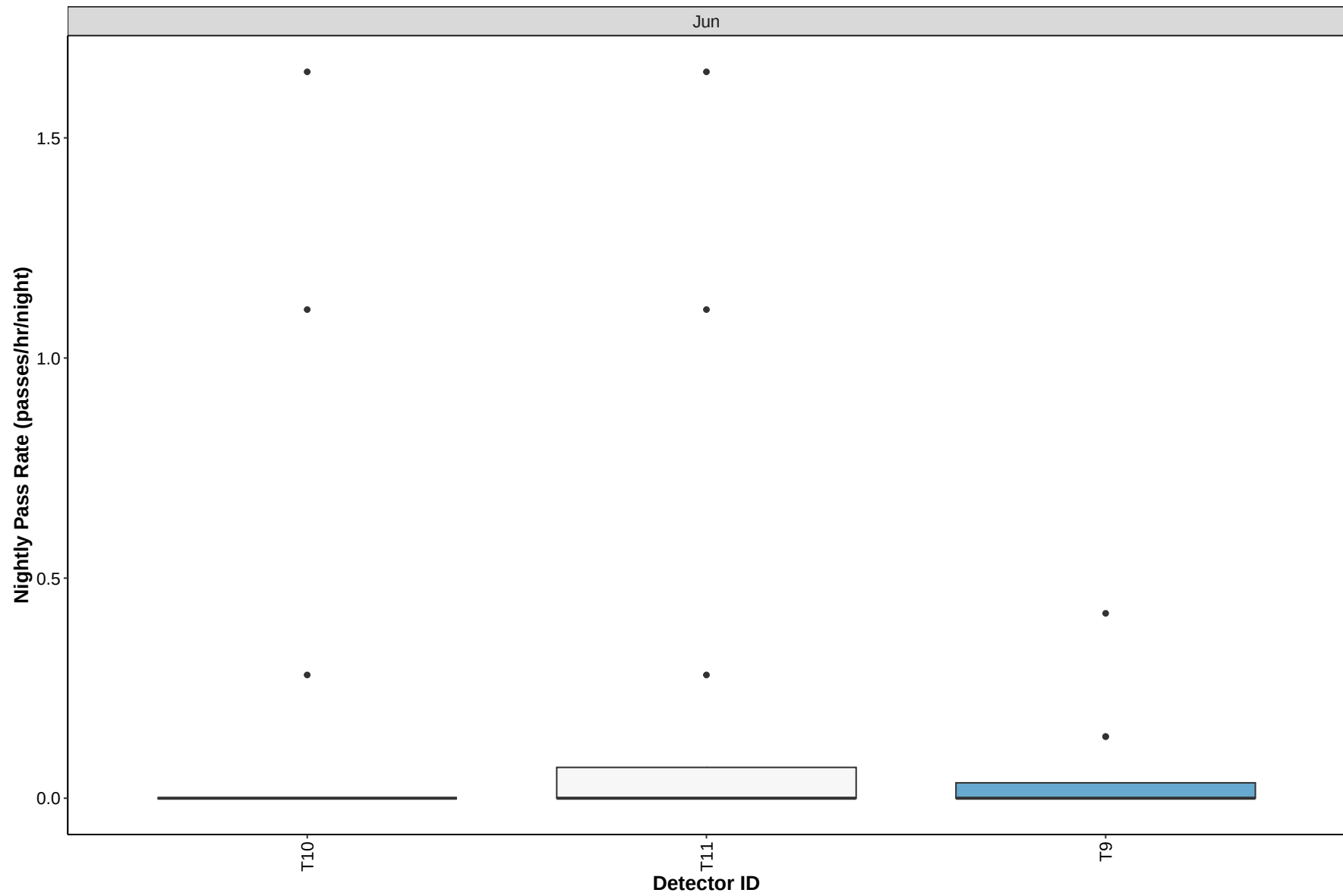
Daubenton's



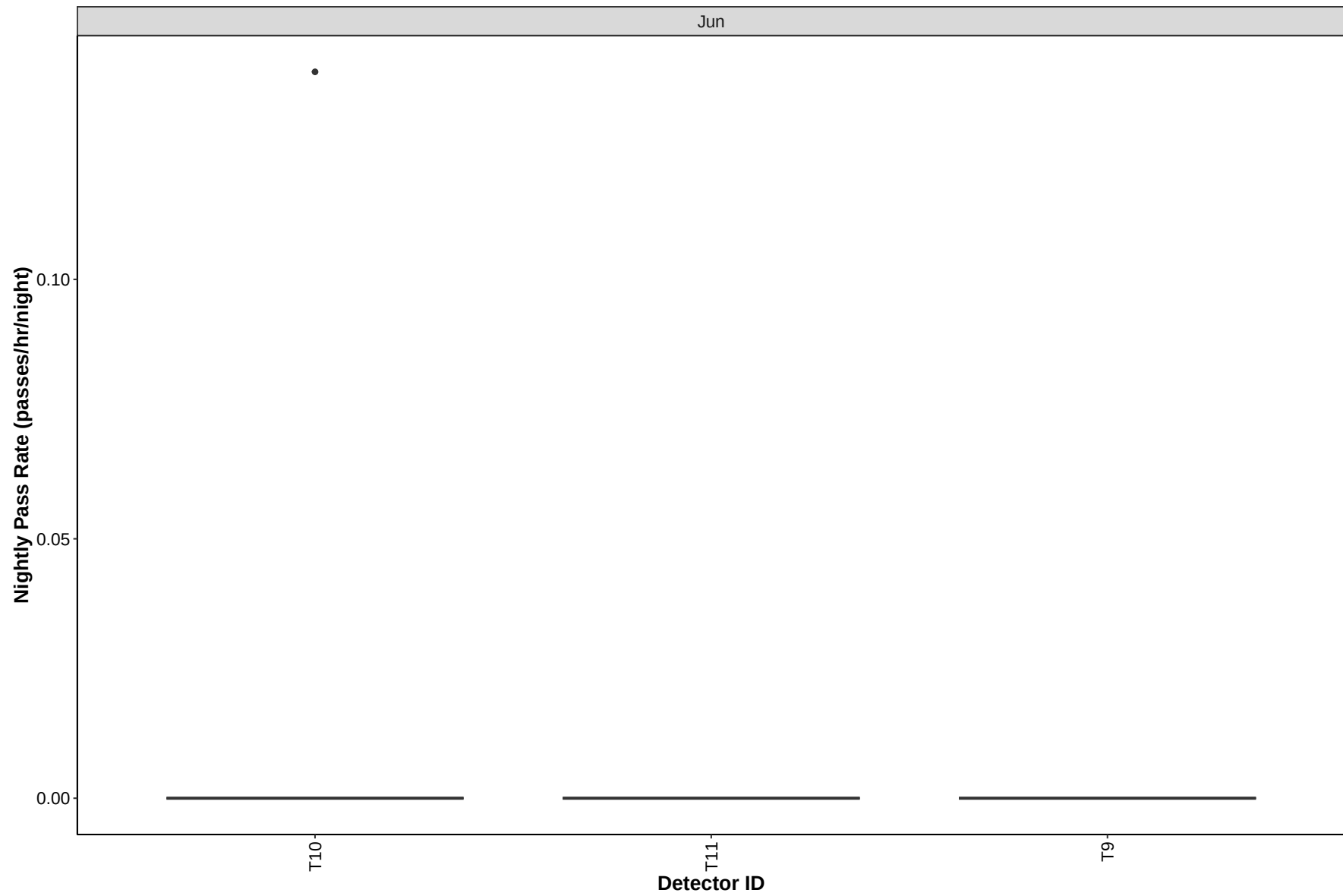
Leisler's



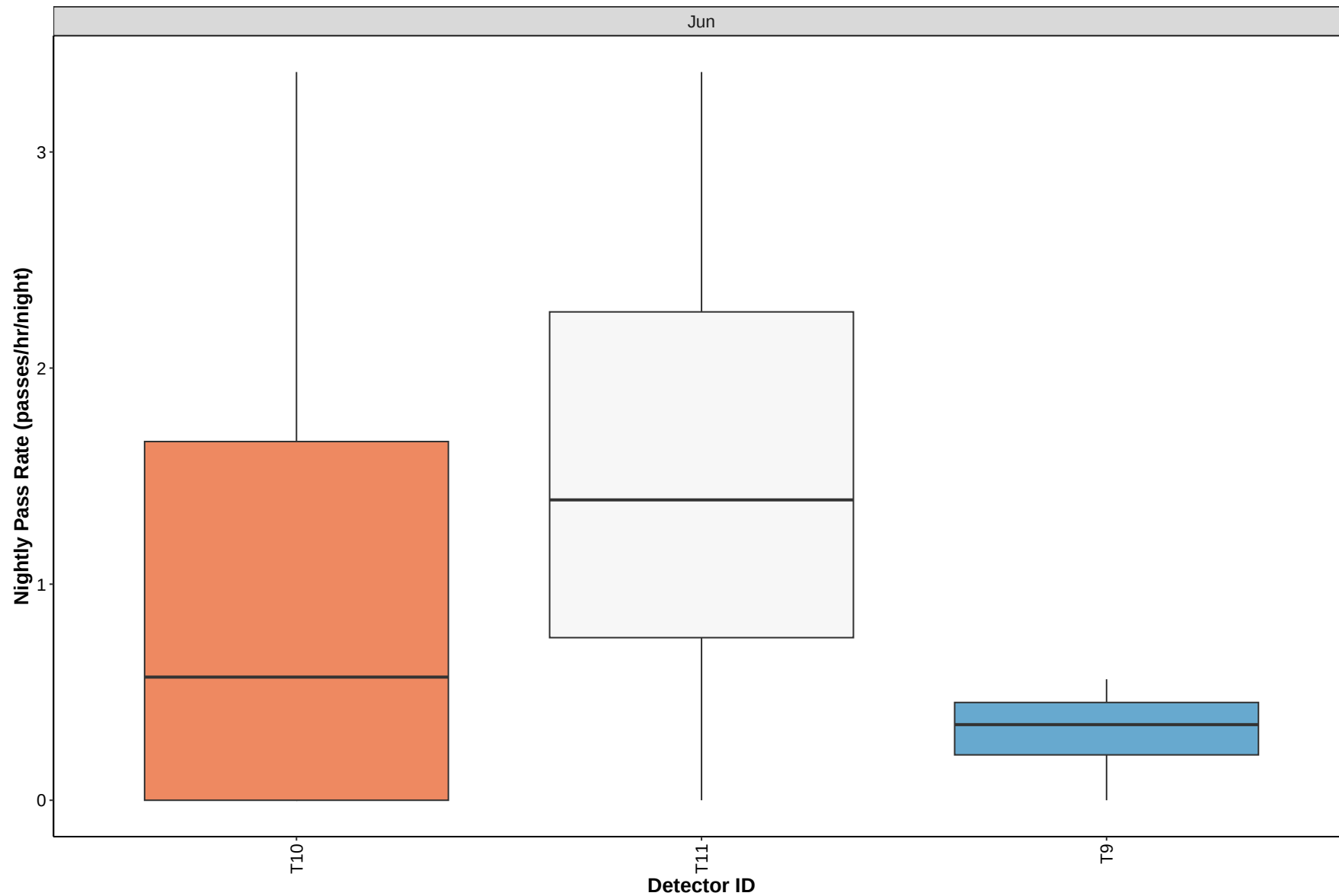
Nathusius'

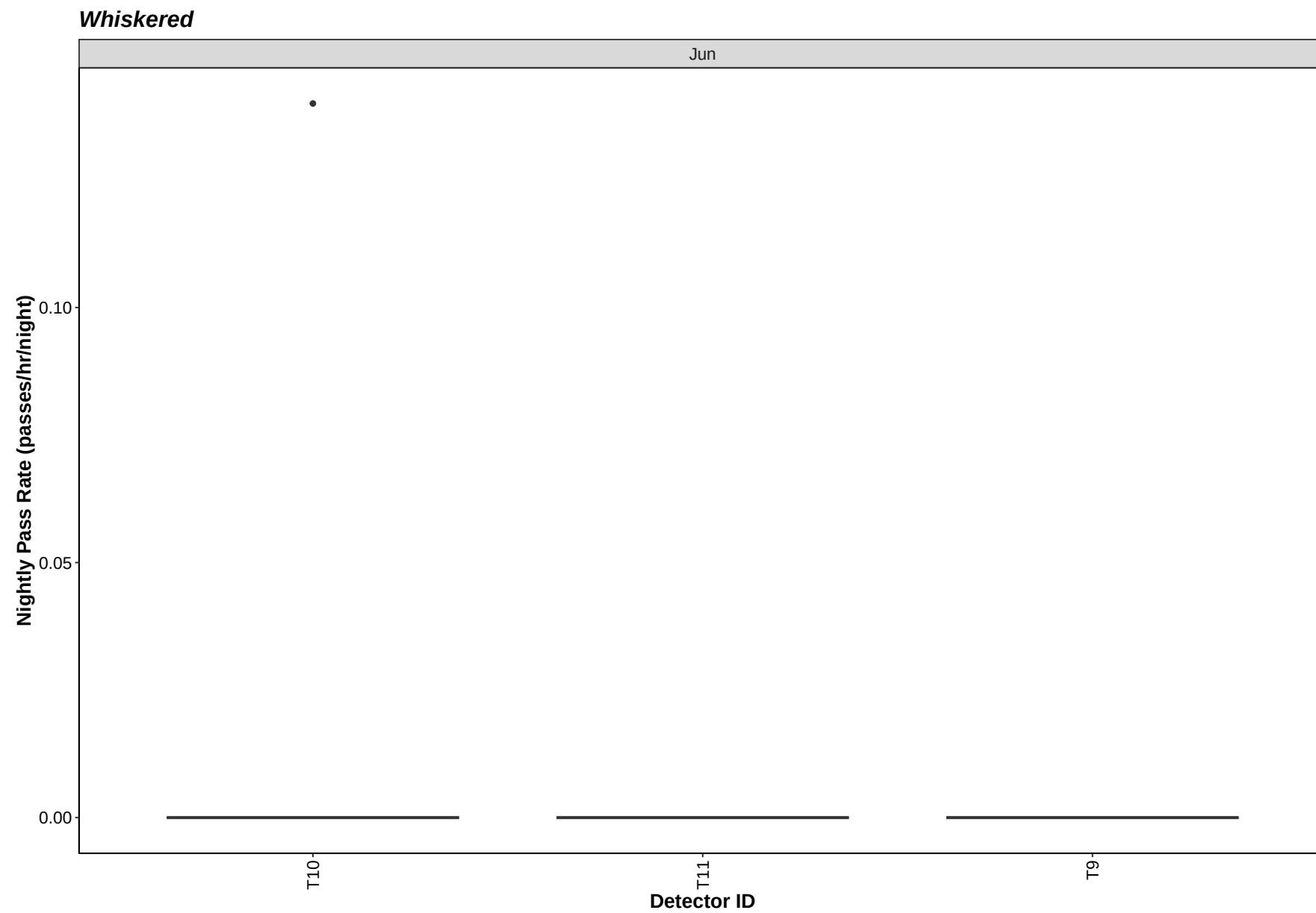


Natterer's



Soprano pipistrelle





Bat Activity per Detector Location

Figure 18. Detector ID reference:

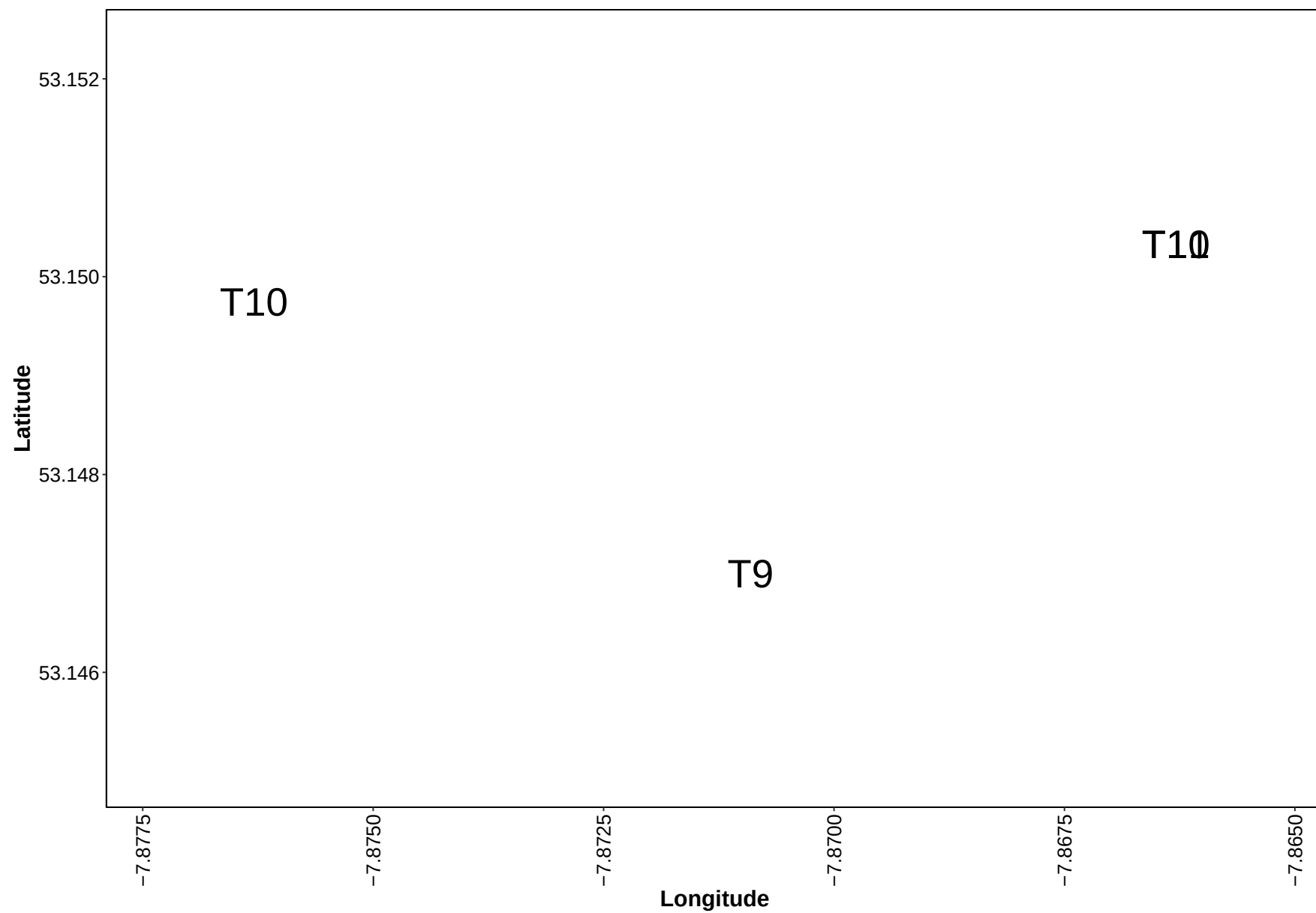
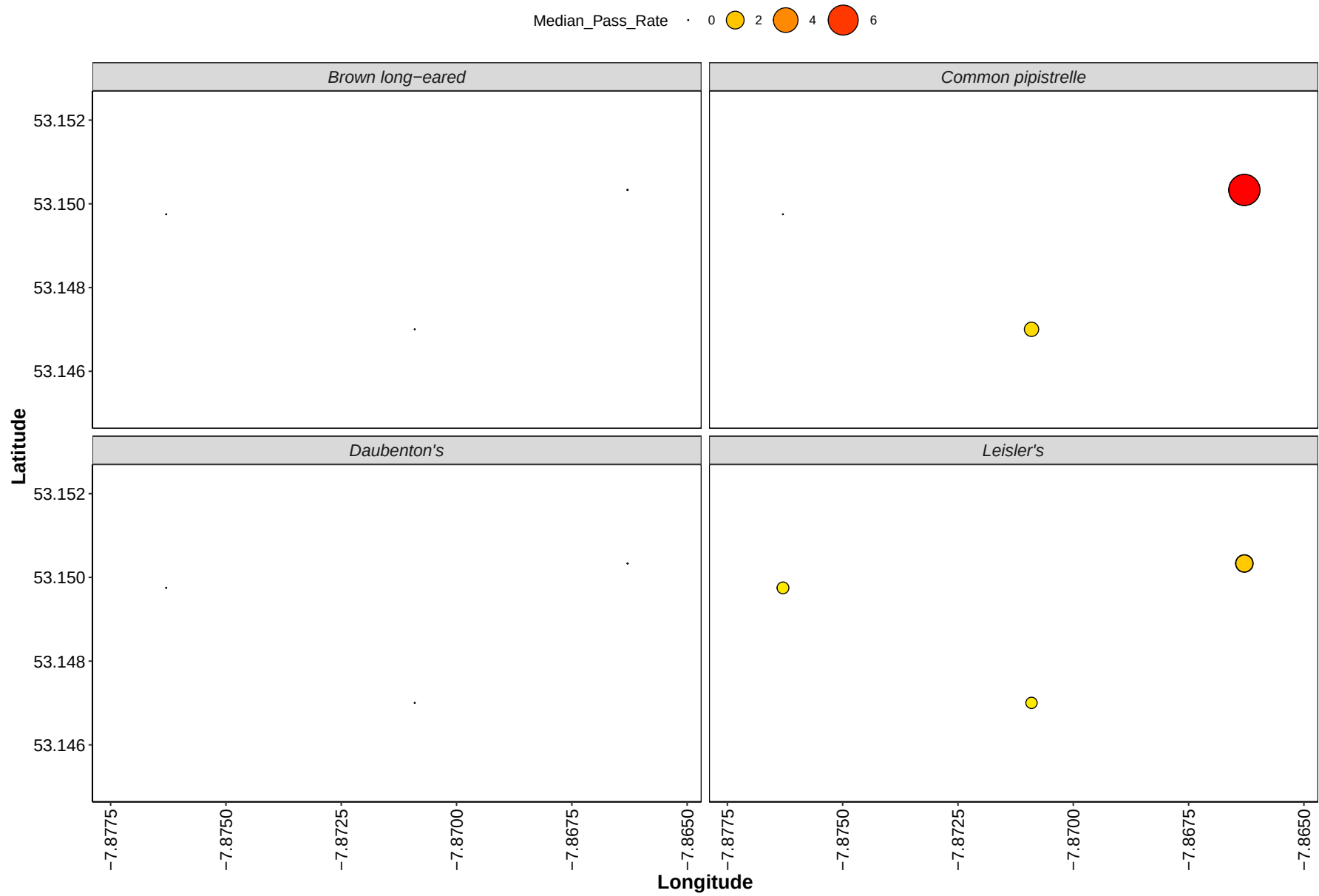


Figure 19. Median Nightly Pass Rate (bat passes/hr/night) throughout the survey period - represented by the size and colour of the point at each detector location.



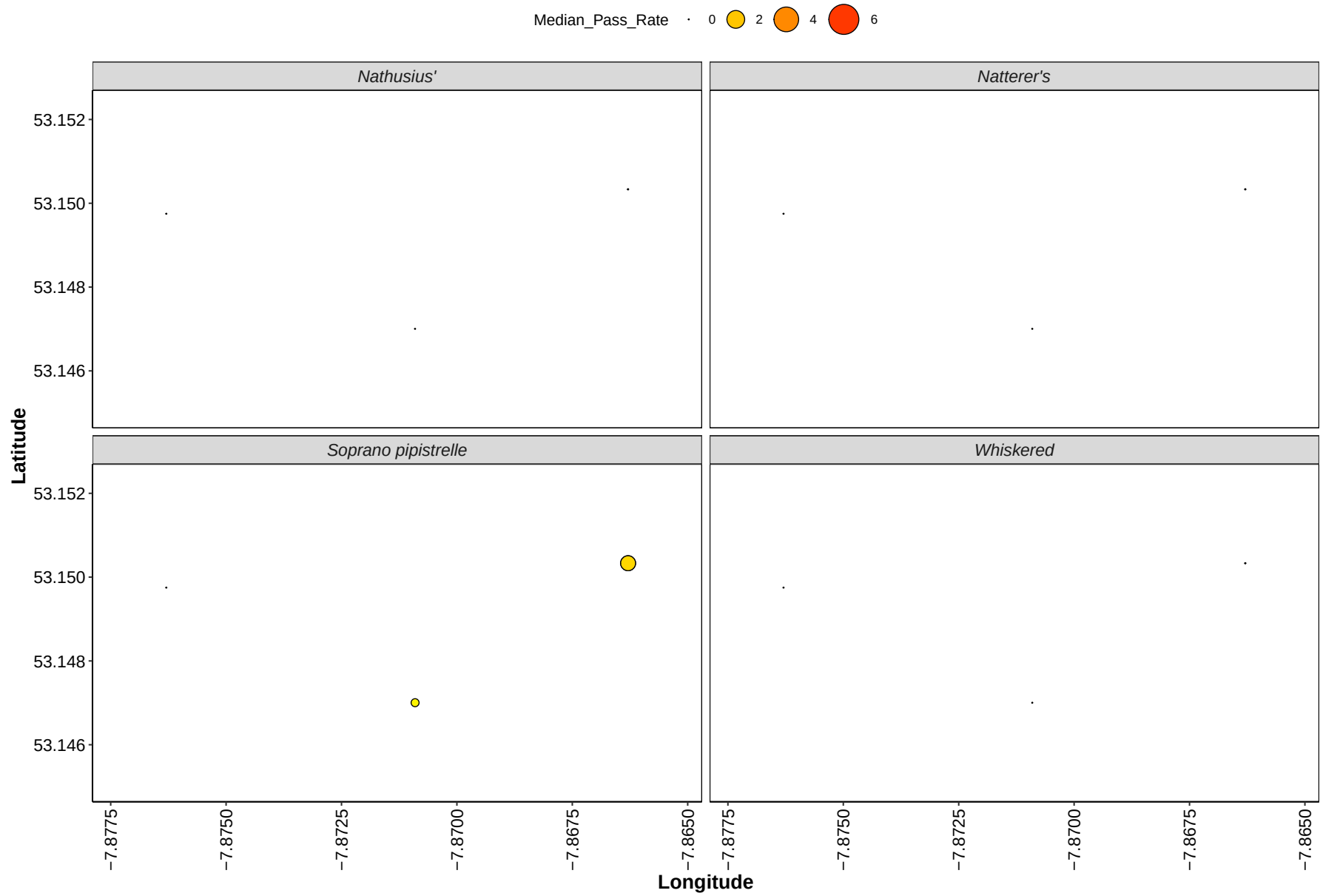
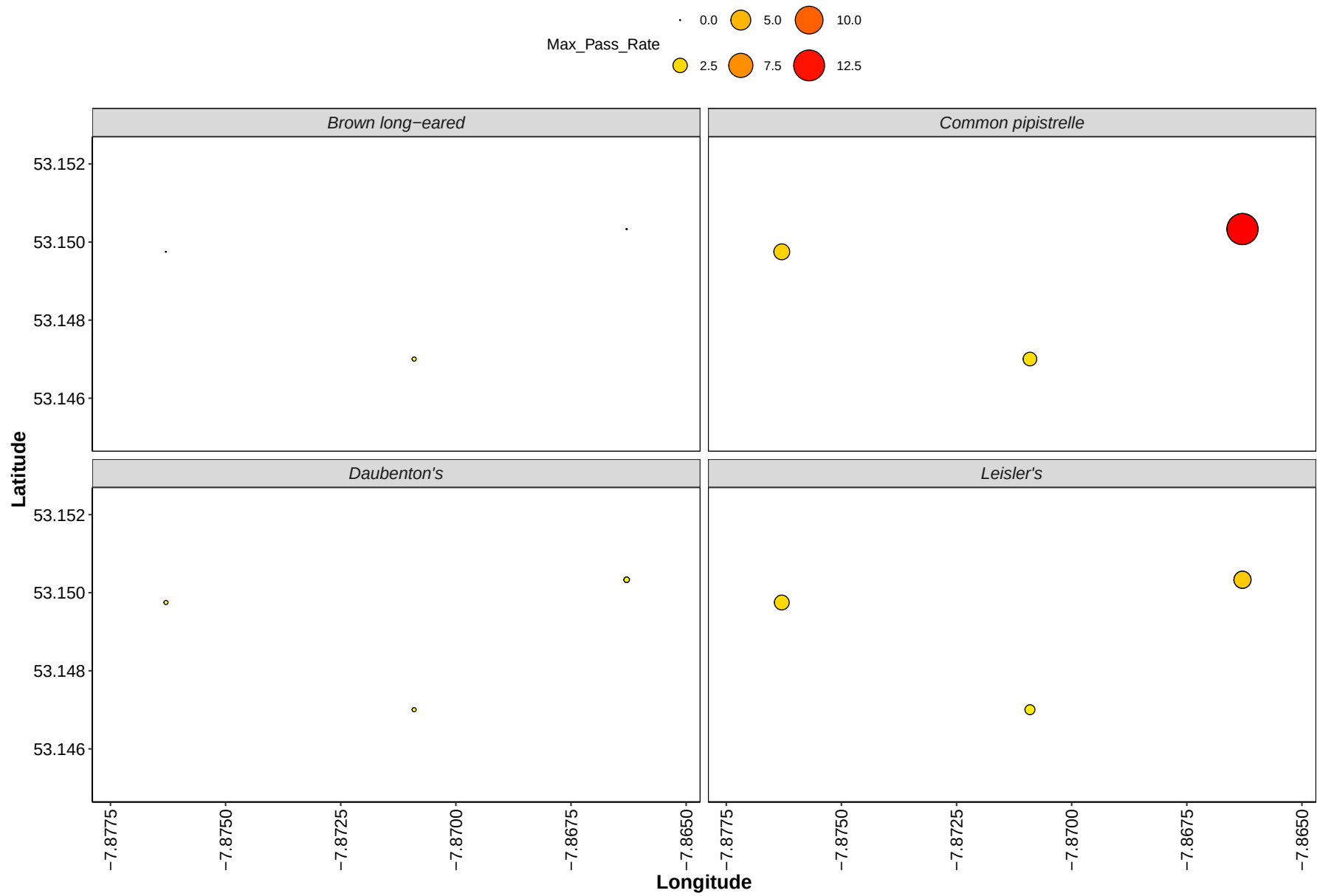
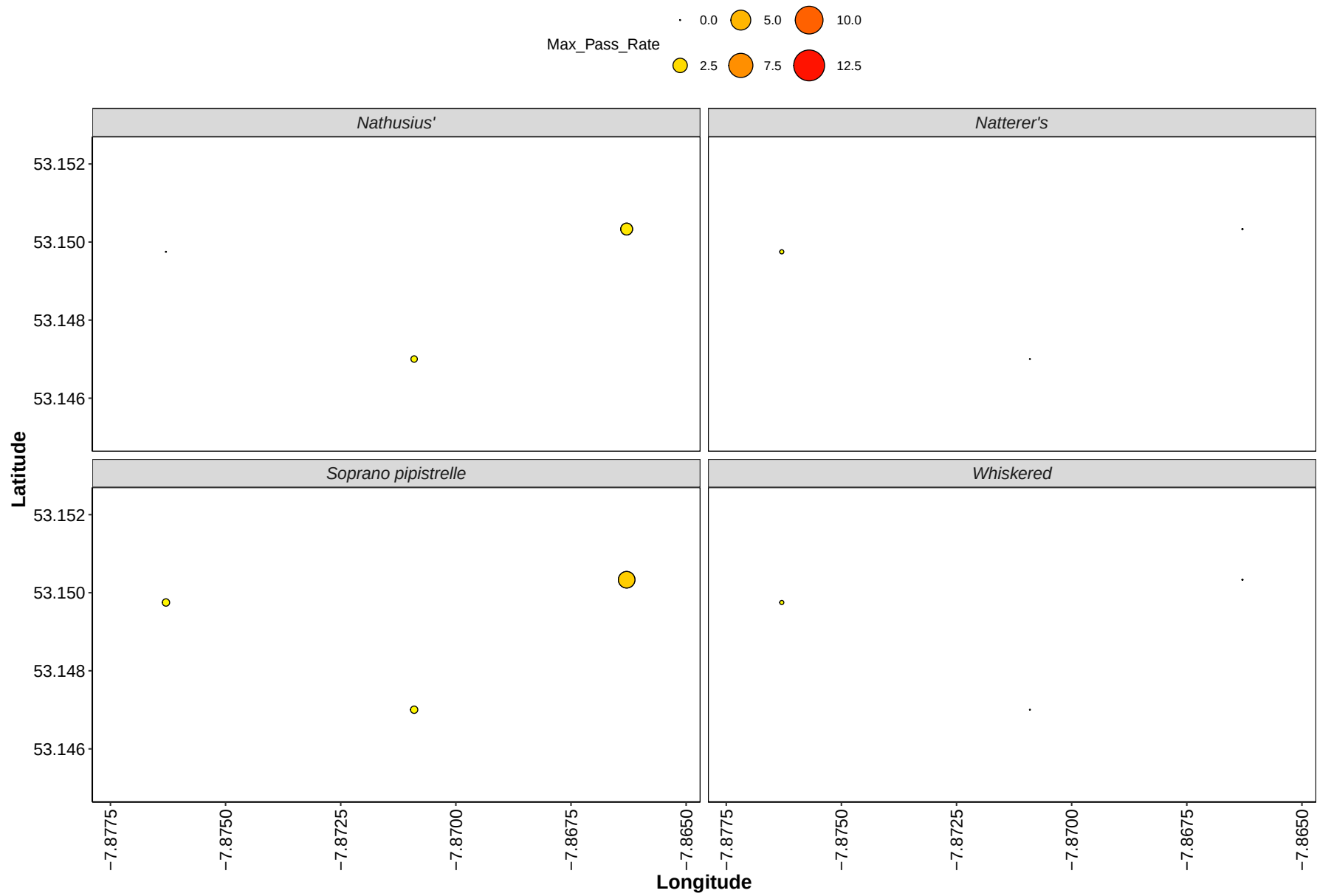


Figure 20. Maximum Nightly Pass Rate (bat passes/hr/night) recorded in a single night throughout the survey period - represented by the size and colour of the point at each detector location.





Thank you for using Ecobat!



Ecobat Report

2025-11-03

Geo filter: county, Time filter: +- 1 month

Summary

Bats were detected on **10** nights between **16/09/2025** and **25/09/2025**, using **3** static bat detectors. Throughout this period, **7** species were recorded. **Table 1.**
Detectors were placed at the following locations:

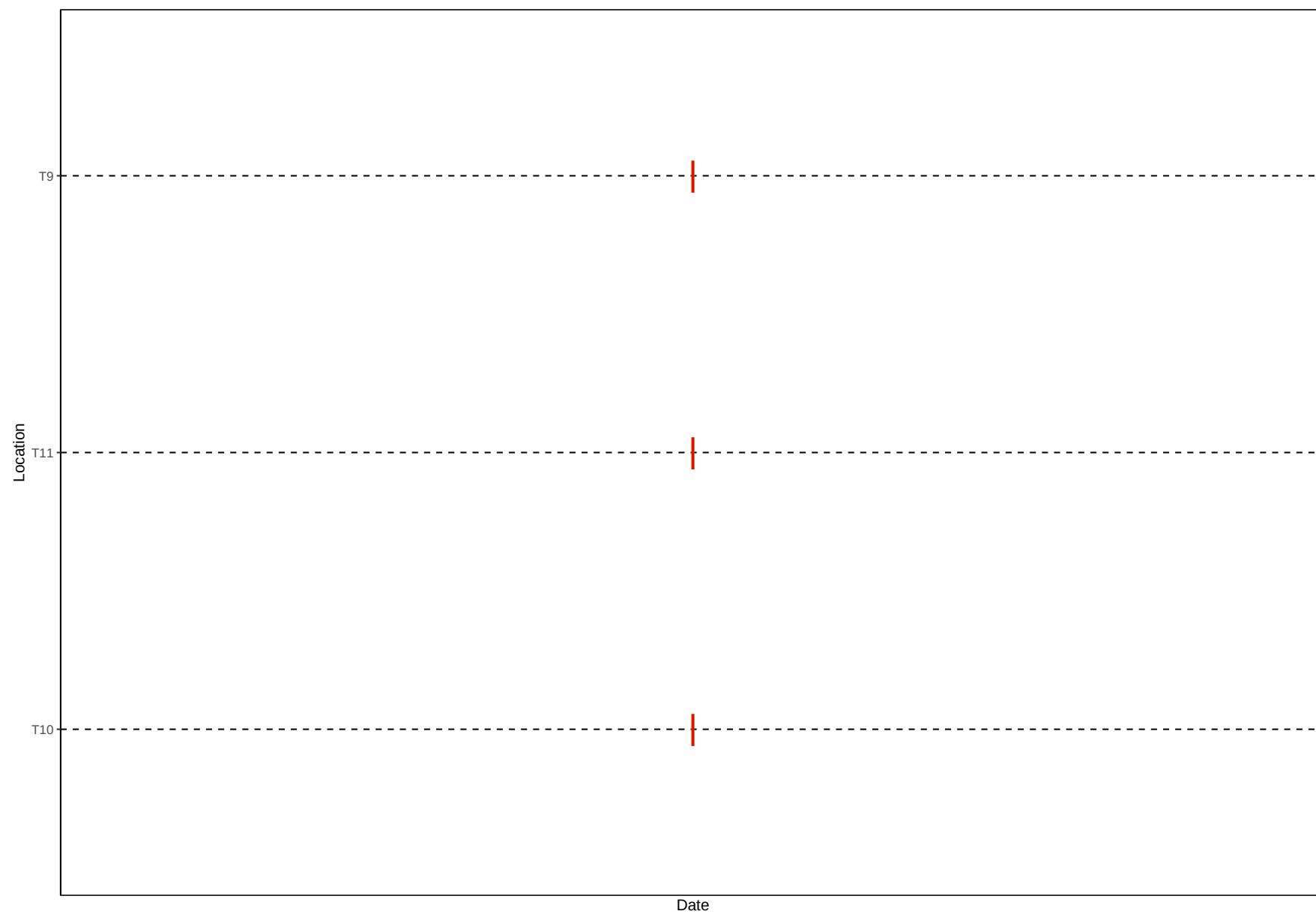
Detector ID	Latitude	Longitude
T9	53.14700	-7.870906
T10	53.14975	-7.876294
T11	53.15033	-7.866291

Survey Nights

Table 2. The number of nights that bats were detected on each recorder. This is not the same as the number of nights that detectors were active if there were nights when no bats were detected.

Detector ID	No. of Nights
T10	10
T11	10
T9	10

Figure 1. Horizontal bars show nights when acoustic detectors recorded bats.



Part 1: Percentile Analysis

This first part of the analysis looks at the relative activity levels of the bats you recorded. We take your value for the total bat passes each night for each species, and compare this to the values in our reference database. We tell you what percentile your data falls at, and therefore what the relative activity level is. For example, if the reference database has values of 5, 10, 15, 20 and you submit a value of 18, this will be the 80th percentile, and be classed as high activity.

Per Detector

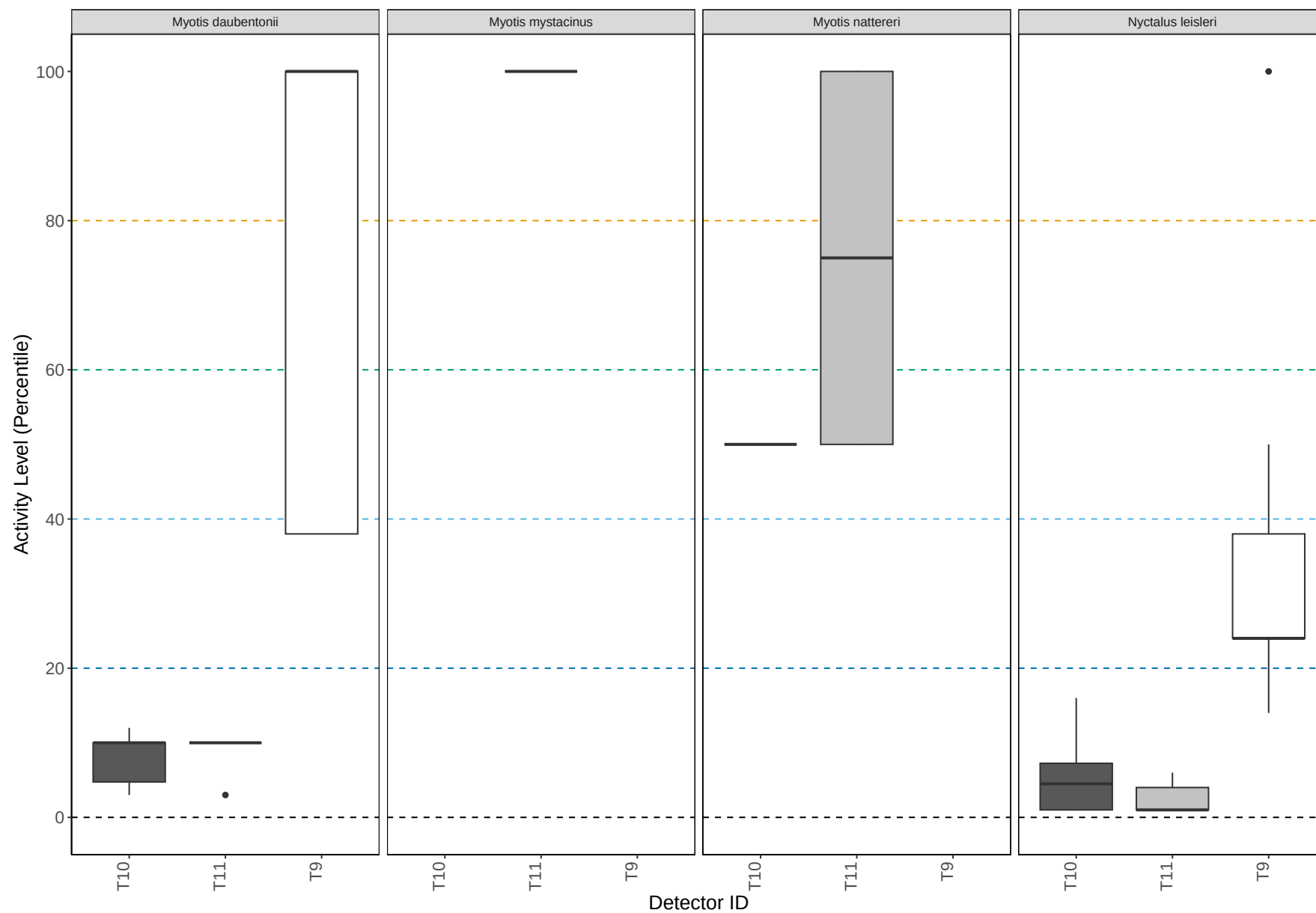
Table 3. Summary table showing the number of nights recorded bat activity fell into each activity band for each species.

Detector ID	Species/Species Group	Nights of Exceptional Activity	Nights of High Activity	Nights of Moderate/High Activity	Nights of Moderate Activity	Nights of Low/Moderate Activity	Nights of Low Activity
T10	Myotis daubentonii	0	0	0	0	0	6
T10	Myotis nattereri	0	0	0	2	0	0
T10	Nyctalus leisleri	0	0	0	0	0	8
T10	Pipistrellus pipistrellus	2	2	1	0	0	2
T10	Pipistrellus pygmaeus	2	0	2	0	0	3
T10	Plecotus auritus	2	2	0	1	2	0
T11	Myotis daubentonii	0	0	0	0	0	5
T11	Myotis mystacinus	1	0	0	0	0	0
T11	Myotis nattereri	2	0	0	2	0	0
T11	Nyctalus leisleri	0	0	0	0	0	9
T11	Pipistrellus pipistrellus	0	2	0	0	0	7
T11	Pipistrellus pygmaeus	0	0	0	0	0	8
T11	Plecotus auritus	0	3	0	0	4	0
T9	Myotis daubentonii	4	0	0	0	3	0
T9	Nyctalus leisleri	1	0	0	1	5	2
T9	Pipistrellus pipistrellus	0	0	0	4	0	1
T9	Pipistrellus pygmaeus	0	1	0	2	0	0

Table 4. Summary table showing key metrics for each species recorded. The reference range is the number of nights for each species that your data were compared to. We recommend a Reference Range of 200+ to be confident in the relative activity level.

Detector ID	Species/Species Group	Median Percentile	95% CIs	Max Percentile	Nights Recorded	Reference Range
T10	Myotis daubentonii	10	3 - 11	12	6	194
T10	Myotis nattereri	50	50 - 50	50	2	8
T10	Nyctalus leisleri	5	1 - 8.5	16	8	540
T10	Pipistrellus pipistrellus	85	33 - 92.5	100	7	238
T10	Pipistrellus pygmaeus	68	3.5 - 84	100	7	263
T10	Plecotus auritus	82	38.5 - 91	100	7	23
T11	Myotis daubentonii	10	10 - 10	10	5	194
T11	Myotis mystacinus	100	0	100	1	1
T11	Myotis nattereri	75	50 - 100	100	4	8
T11	Nyctalus leisleri	1	1 - 3.5	6	9	540
T11	Pipistrellus pipistrellus	3	3 - 50	85	9	238
T11	Pipistrellus pygmaeus	7	1.5 - 16	19	8	263
T11	Plecotus auritus	34	34 - 58	82	7	23
T9	Myotis daubentonii	100	69 - 100	100	7	194
T9	Nyctalus leisleri	24	19 - 62	100	9	540
T9	Pipistrellus pipistrellus	41	41 - 41	41	5	238
T9	Pipistrellus pygmaeus	41	41 - 41	83	3	263

Figure 2. The recorded activity of bats during the survey. The centre line indicates the median activity level whereas the box represents the interquartile range (the spread of the middle 50% of nights of activity).



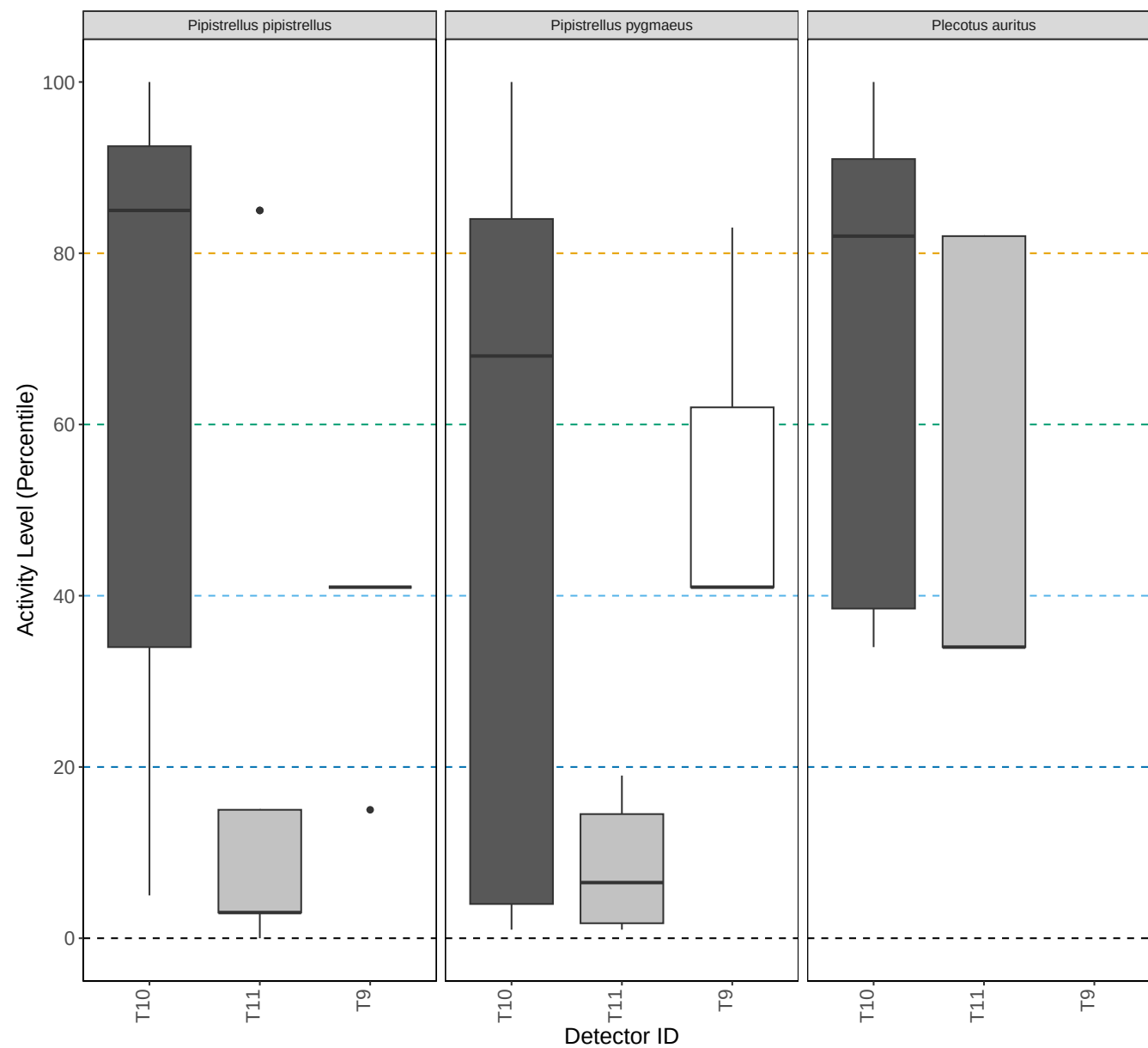
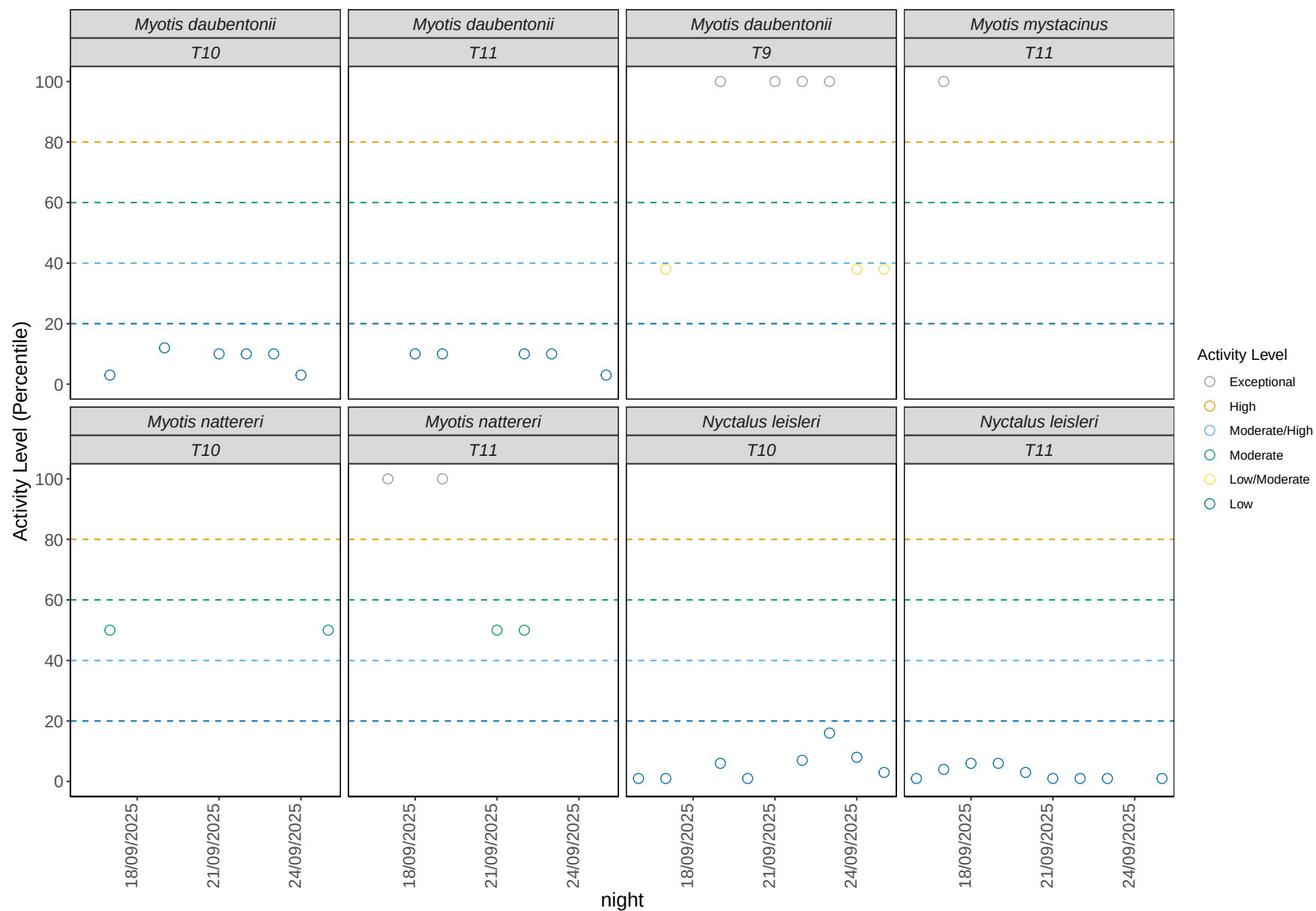
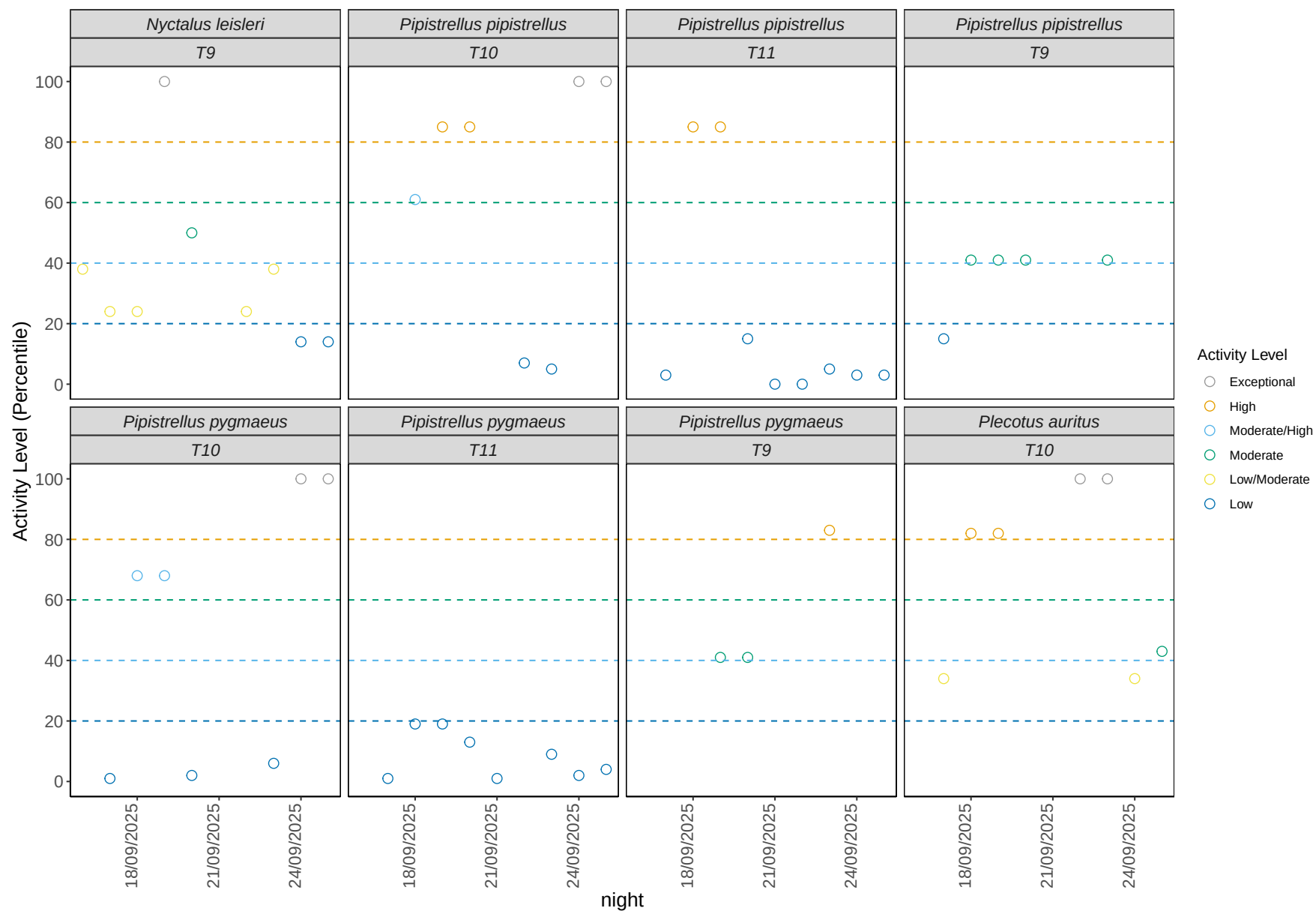


Figure 3. The activity level (percentile) of bats recorded across each night of the bat survey.







night

Per Detector, Per Month

Table 5. Summary table showing the number of nights recorded bat activity fell into each activity band for each species at each detector during each month.

Detector ID	Species/Species Group	month	Nights of Exceptional Activity	Nights of High Activity	Nights of Moderate/High Activity	Nights of Moderate Activity	Nights of Low/Moderate Activity	Nights of Low Activity
T10	Myotis daubentonii	Sep	0	0	0	0	0	6
T10	Myotis nattereri	Sep	0	0	0	2	0	0
T10	Nyctalus leisleri	Sep	0	0	0	0	0	8
T10	Pipistrellus pipistrellus	Sep	2	2	1	0	0	2
T10	Pipistrellus pygmaeus	Sep	2	0	2	0	0	3
T10	Plecotus auritus	Sep	2	2	0	1	2	0
T11	Myotis daubentonii	Sep	0	0	0	0	0	5
T11	Myotis mystacinus	Sep	1	0	0	0	0	0
T11	Myotis nattereri	Sep	2	0	0	2	0	0
T11	Nyctalus leisleri	Sep	0	0	0	0	0	9
T11	Pipistrellus pipistrellus	Sep	0	2	0	0	0	7
T11	Pipistrellus pygmaeus	Sep	0	0	0	0	0	8
T11	Plecotus auritus	Sep	0	3	0	0	4	0
T9	Myotis daubentonii	Sep	4	0	0	0	3	0
T9	Nyctalus leisleri	Sep	1	0	0	1	5	2
T9	Pipistrellus pipistrellus	Sep	0	0	0	4	0	1
T9	Pipistrellus pygmaeus	Sep	0	1	0	2	0	0

Table 6. Summary table showing key metrics for each species recorded per month. Please note that we cannot split the reference range by month, hence this column is not shown in this table.

Detector ID	Species/Species Group	month	Median Percentile	95% CIs	Max. Percentile	Nights Recorded
T10	Myotis daubentonii	Sep	10	3 - 11	12	6
T10	Myotis nattereri	Sep	50	50 - 50	50	2
T10	Nyctalus leisleri	Sep	5	1 - 8.5	16	8
T10	Pipistrellus pipistrellus	Sep	85	33 - 92.5	100	7
T10	Pipistrellus pygmaeus	Sep	68	3.5 - 84	100	7
T10	Plecotus auritus	Sep	82	38.5 - 91	100	7
T11	Myotis daubentonii	Sep	10	10 - 10	10	5
T11	Myotis mystacinus	Sep	100	0	100	1
T11	Myotis nattereri	Sep	75	50 - 100	100	4
T11	Nyctalus leisleri	Sep	1	1 - 3.5	6	9
T11	Pipistrellus pipistrellus	Sep	3	3 - 50	85	9
T11	Pipistrellus pygmaeus	Sep	7	1.5 - 16	19	8
T11	Plecotus auritus	Sep	34	34 - 58	82	7
T9	Myotis daubentonii	Sep	100	69 - 100	100	7
T9	Nyctalus leisleri	Sep	24	19 - 62	100	9
T9	Pipistrellus pipistrellus	Sep	41	41 - 41	41	5
T9	Pipistrellus pygmaeus	Sep	41	41 - 41	83	3

Per Site

In this 'Per Site' section of the analysis, all values are taken from across all of the detectors to provide site-wide averages/medians.

Table 7. Summary table showing the number of nights recorded bat activity fell into each activity band for each species.

Species/Species Group	Nights of Exceptional Activity	Nights of High Activity	Nights of Moderate/High Activity	Nights of Moderate Activity	Nights of Low/Moderate Activity	Nights of Low Activity
Myotis daubentonii	4	0	0	0	3	11
Myotis mystacinus	1	0	0	0	0	0
Myotis nattereri	2	0	0	4	0	0
Nyctalus leisleri	1	0	0	1	5	19
Pipistrellus	2	4	1	4	0	10
pipistrellus						
Pipistrellus	2	1	2	2	0	11
pygmaeus						
Plecotus auritus	2	5	0	1	6	0

Table 8. Summary table showing key metrics for each species recorded.

Species/Species Group	Median Percentile	95% CIs	Max. Percentile	Nights Recorded
Myotis daubentonii	10	69 - 100	100	18
Myotis mystacinus	100	0	100	1
Myotis nattereri	50	50 - 50	100	6
Nyctalus leisleri	6	19 - 62	100	26
Pipistrellus pipistrellus	41	41 - 41	100	21
Pipistrellus pygmaeus	16	41 - 41	100	18
Plecotus auritus	63	38.5 - 91	100	14

Figure 4. The activity level (percentile) of bats recorded across each night of the bat survey for the **entire site**.

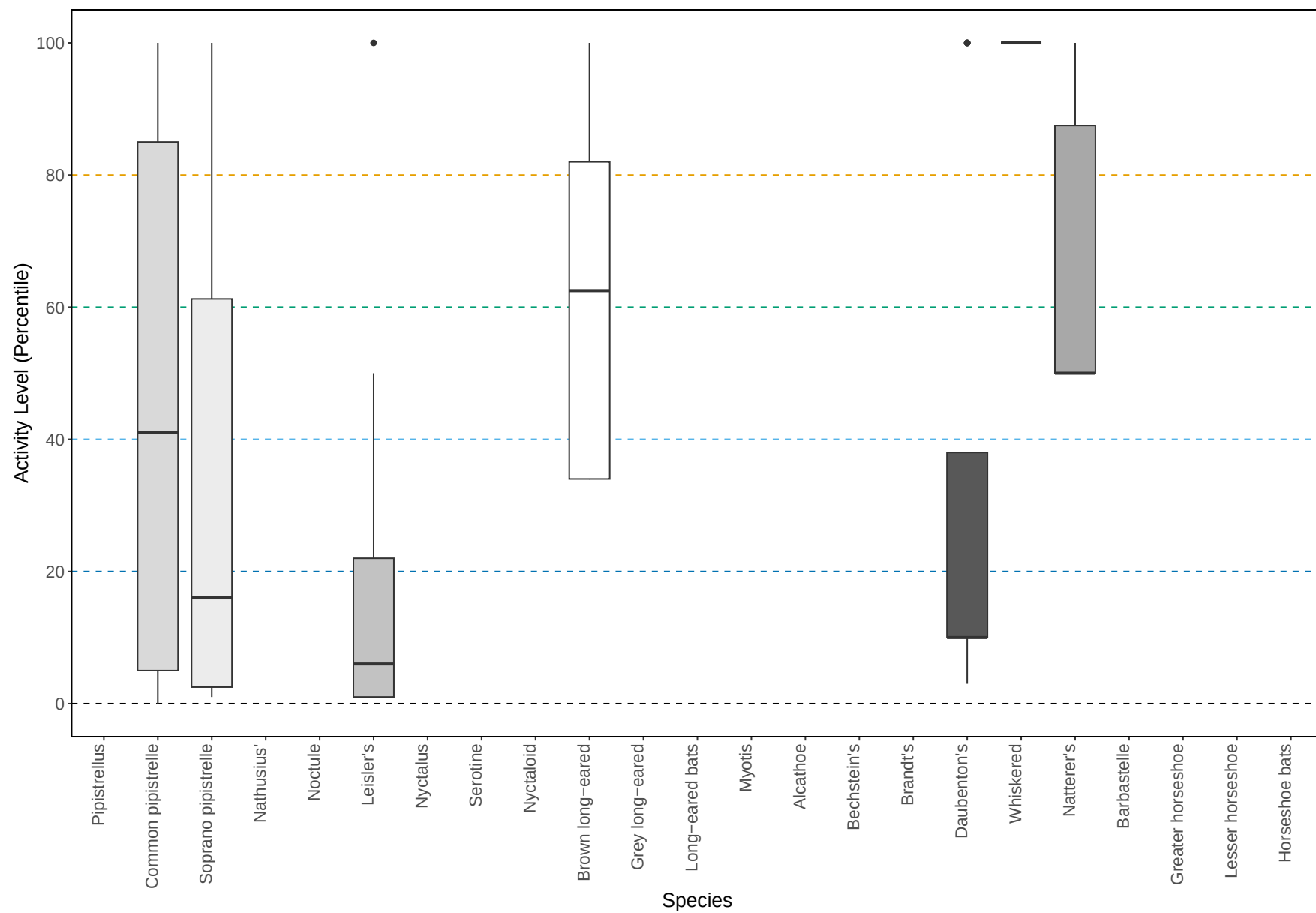


Figure 5. The median activity levels of bats recorded across all detectors each night.

Per Site, Per Month

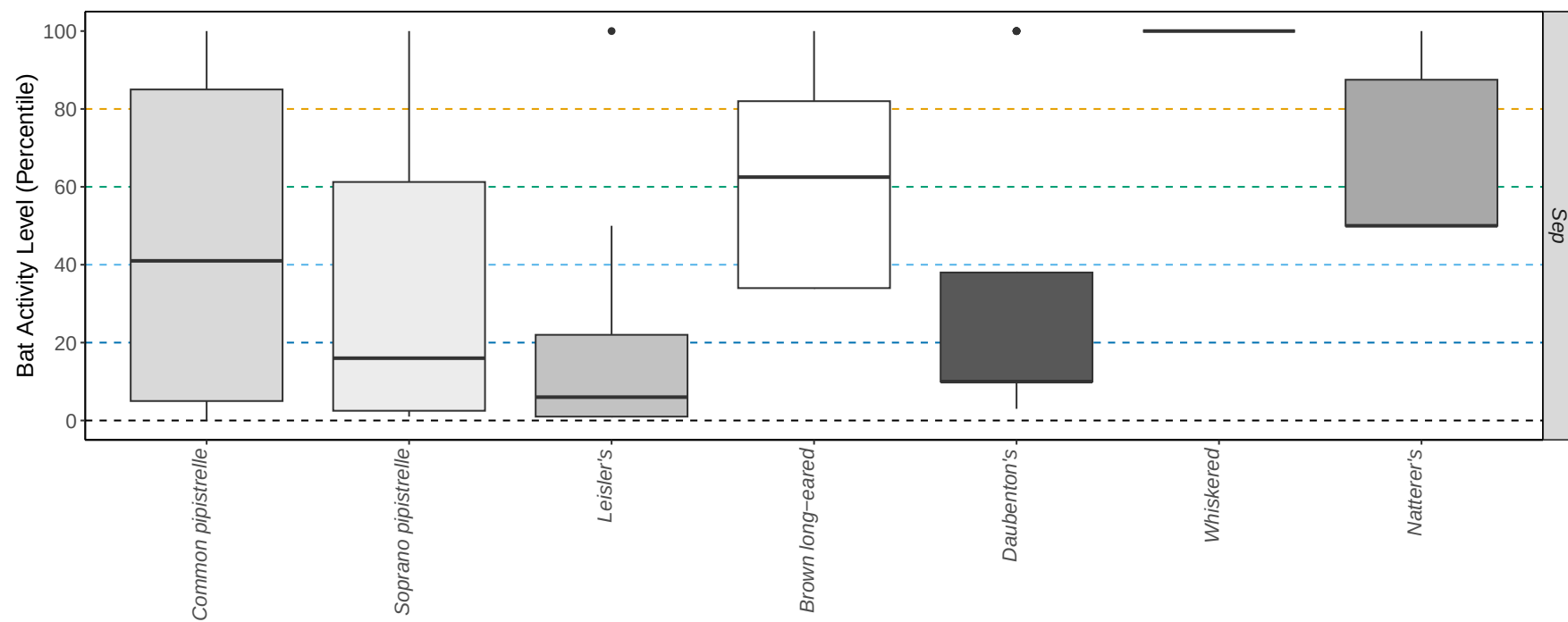
Table 9. Summary table showing the number of nights recorded bat activity fell into each activity band for each species during each month.

Species/Species Group	month	Nights of Exceptional Activity	Nights of High Activity	Nights of Moderate/High Activity	Nights of Moderate Activity	Nights of Low/Moderate Activity	Nights of Low Activity
Myotis daubentonii	Sep	4	0	0	0	3	11
Myotis mystacinus	Sep	1	0	0	0	0	0
Myotis nattereri	Sep	2	0	0	4	0	0
Nyctalus leisleri	Sep	1	0	0	1	5	19
Pipistrellus pipistrellus	Sep	2	4	1	4	0	10
Pipistrellus pygmaeus	Sep	2	1	2	2	0	11
Plecotus auritus	Sep	2	5	0	1	6	0

Table 10. Summary table showing key metrics for each species recorded per month.

Species/Species Group	month	Median Percentile	95% CIs	Max. Percentile	Nights Recorded
Myotis daubentonii	Sep	10	69 - 100	100	18
Myotis mystacinus	Sep	100	0	100	1
Myotis nattereri	Sep	50	50 - 50	100	6
Nyctalus leisleri	Sep	6	19 - 62	100	26
Pipistrellus pipistrellus	Sep	41	41 - 41	100	21
Pipistrellus pygmaeus	Sep	16	41 - 41	100	18
Plecotus auritus	Sep	63	38.5 - 91	100	14

Figure 6. The activity level (percentile) of bats recorded across each night of the bat survey for the entire site, split between months.



Species

Part 2: Nightly Analysis

Entire Survey Period

Sunrise and Sunset Times

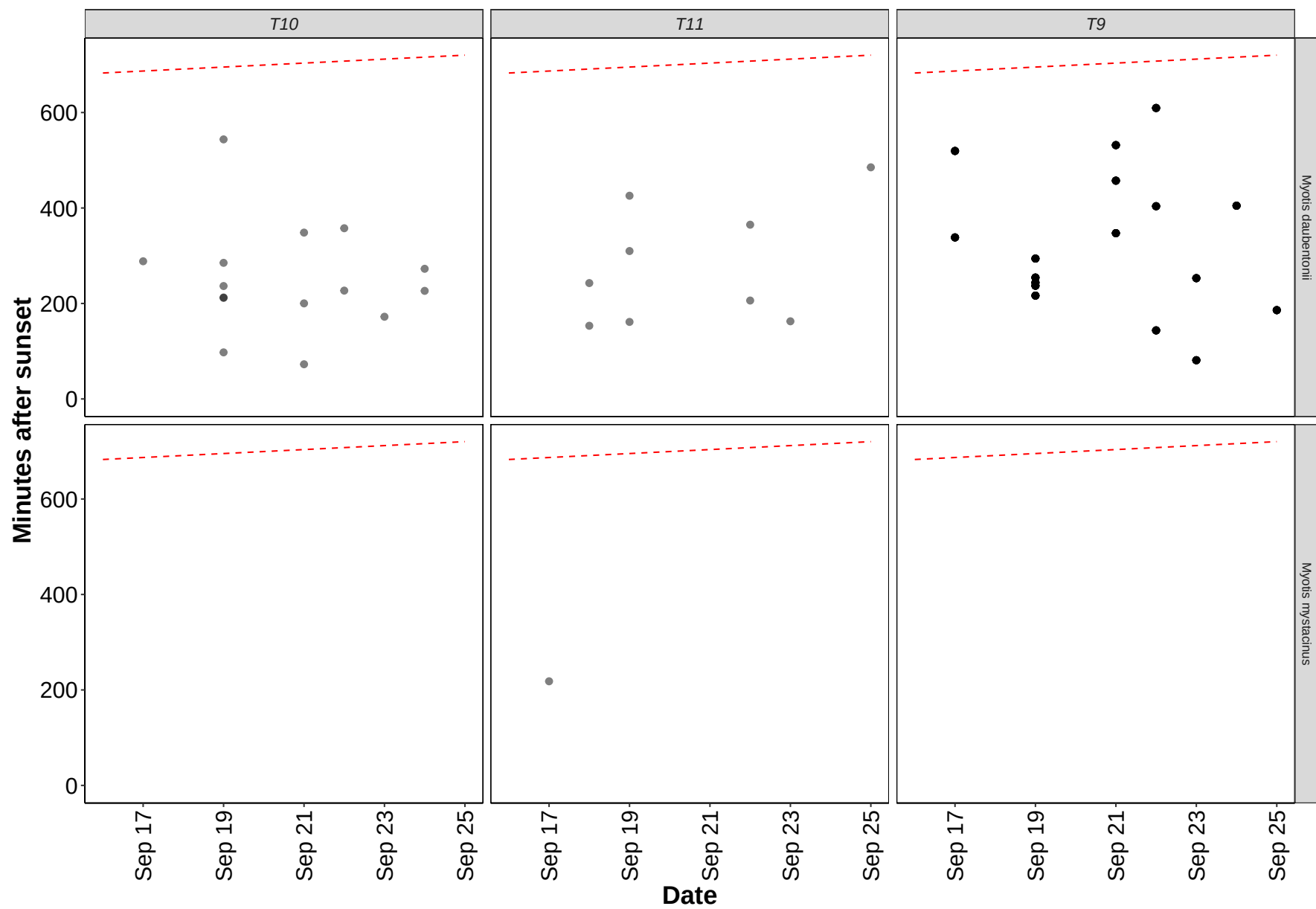
Table 11. The times of sunset and sunrise the following morning for surveys beginning on the date shown.

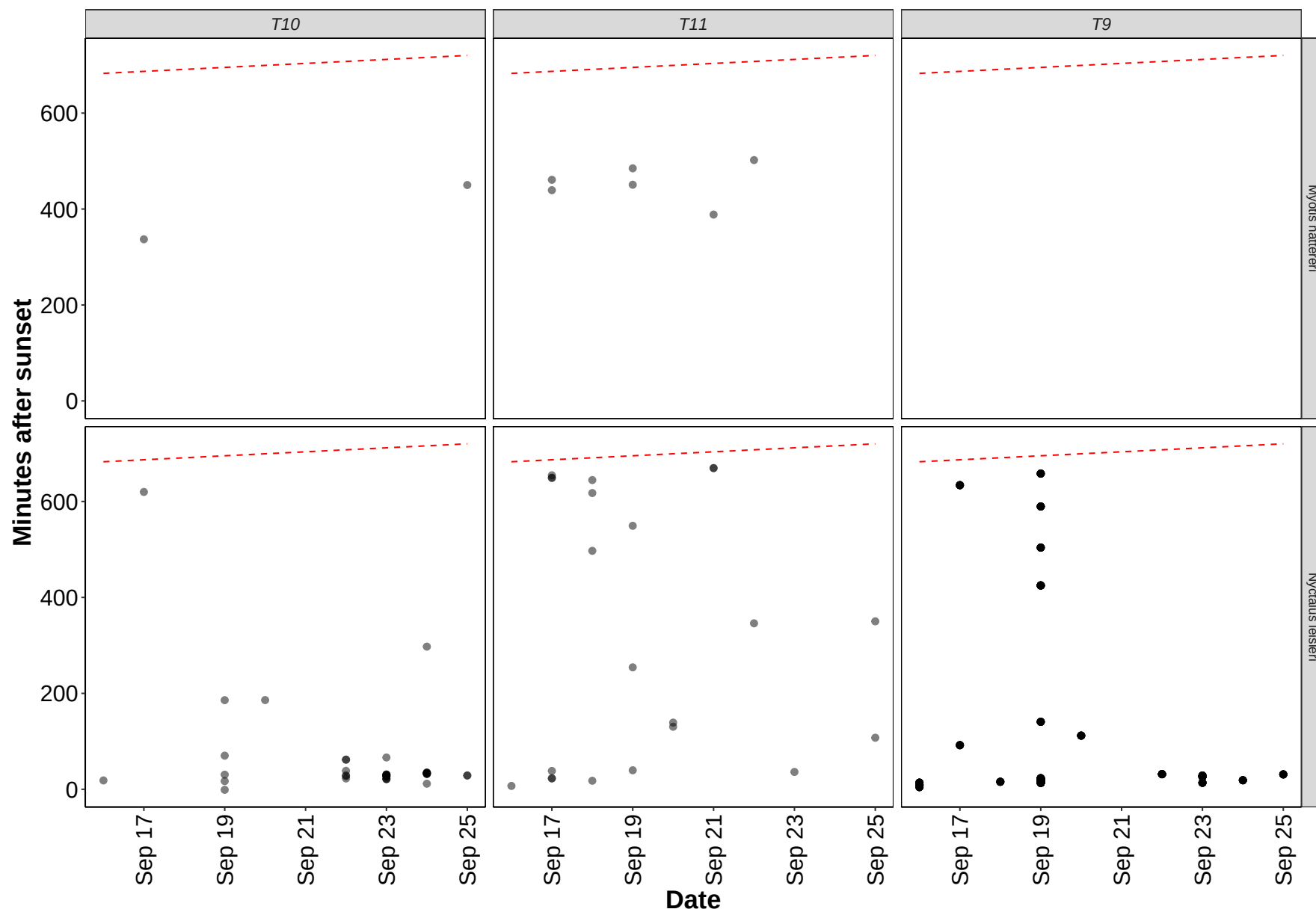
Night (y-m-d)	Sunset (h:m)	Sunrise (h:m)	Night Length (hours)
2025-09-16	19:47	07:10	11.4
2025-09-17	19:44	07:11	11.4
2025-09-18	19:42	07:13	11.5
2025-09-19	19:39	07:15	11.6
2025-09-20	19:37	07:16	11.7
2025-09-21	19:34	07:18	11.7
2025-09-22	19:32	07:20	11.8
2025-09-23	19:30	07:21	11.9
2025-09-24	19:27	07:23	11.9
2025-09-25	19:25	07:25	12.0

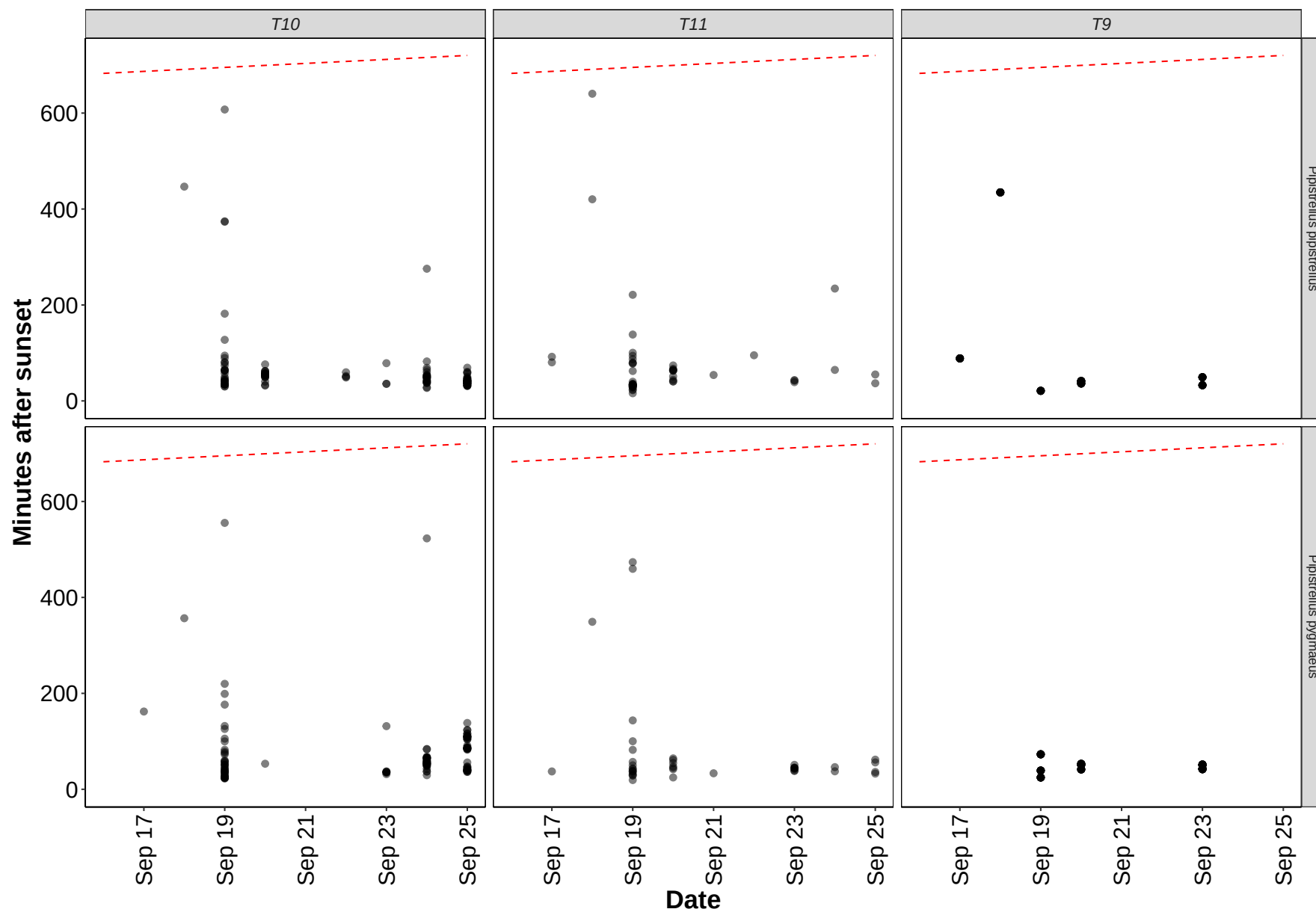
Distribution of Bat Activity Across the Night through Time

Per Detector

Figure 7. Timing of bat calls plotted as minutes before/after sunset, whereby 0 on the y axis represents sunset. Sunrise throughout the survey period is depicted as the red dashed line. Colours indicate kernel densities, with darkest colours showing peaks of activity. These colours are comparative only within each plot, and do not account for overall activity.







Roost Emergence Time and Bat Observation

Based on: Russ, Jon. 2012. British Bat Calls a Guide to species Identification. Pelagic Publishing.

Bat Passes Potentially Indicating Close Proximity to a Roost (Russ 2012)

Table 12. Number of bat calls recorded before the upper time of the species-specific emergence time range, and which therefore may potentially indicate the presence of a nearby roost.

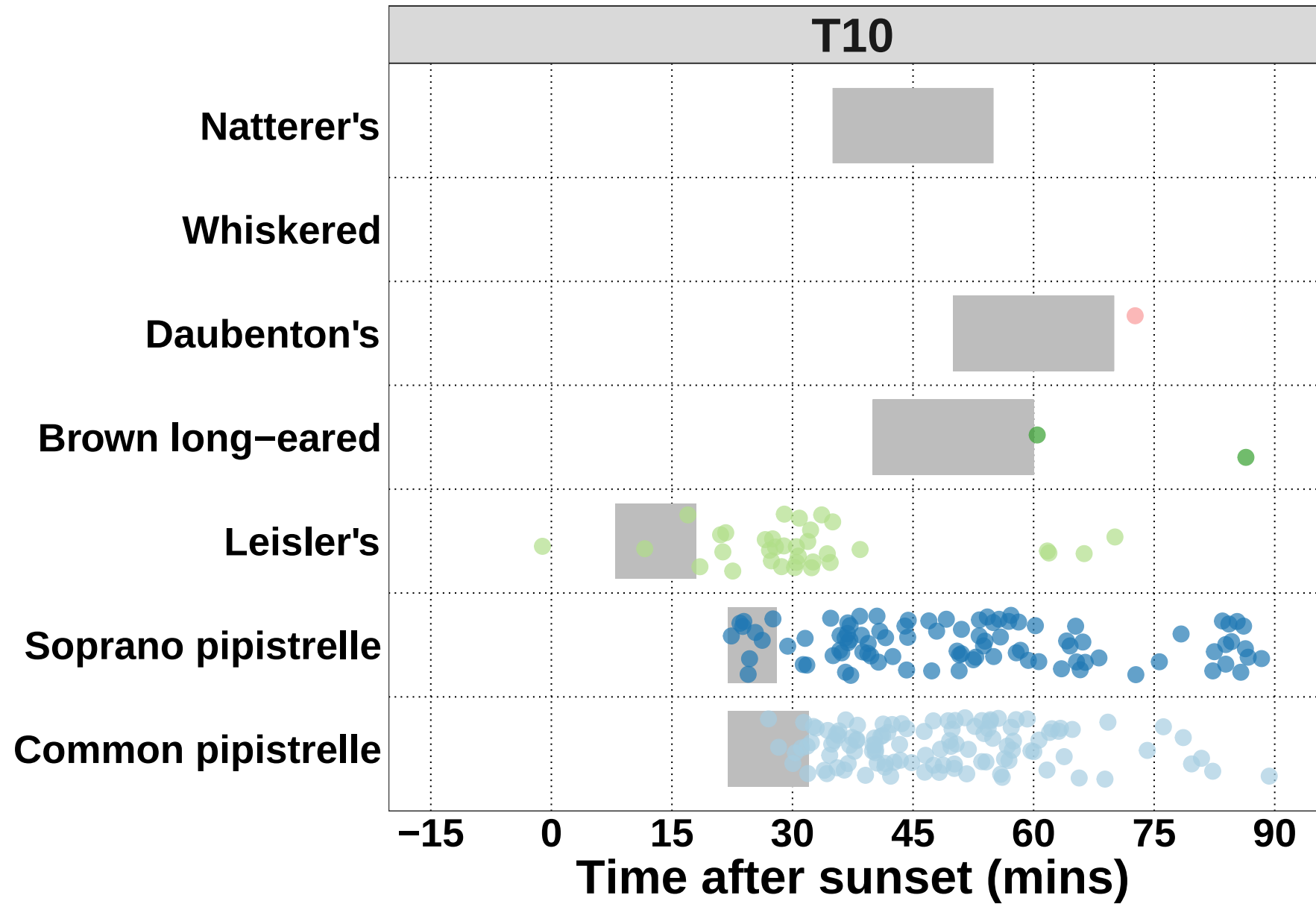
Table 12: Table continues below

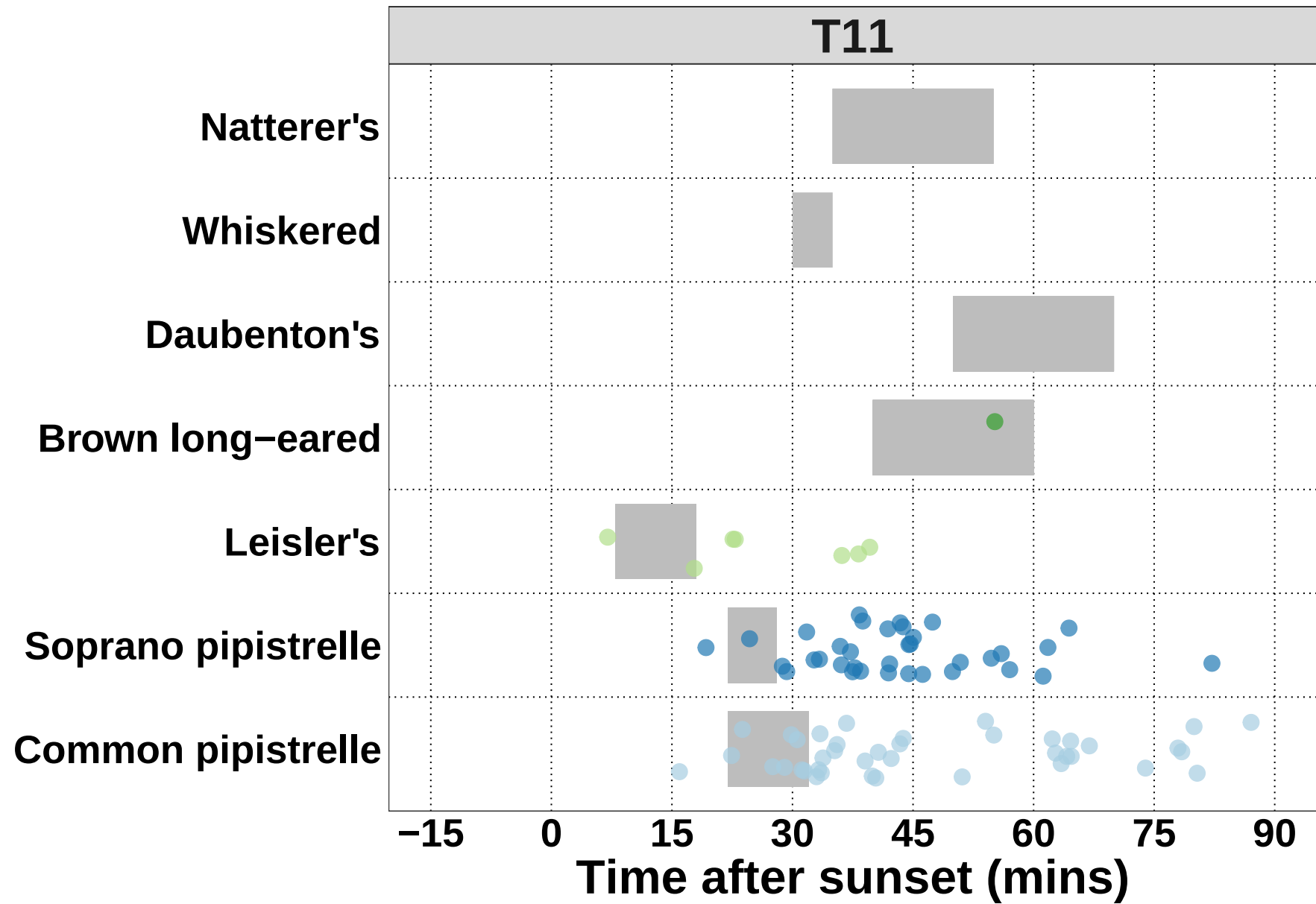
Species	Detector ID	2025-09-16	2025-09-18	2025-09-19	2025-09-20	2025-09-22
Common pipistrelle	T10	0	0	2	1	0
Common pipistrelle	T11	0	0	9	0	0
Common pipistrelle	T9	0	0	10	0	0
Soprano pipistrelle	T10	0	0	9	0	0
Soprano pipistrelle	T11	0	0	1	1	0
Soprano pipistrelle	T9	0	0	10	0	0
Leisler's	T10	0	0	2	0	0
Leisler's	T11	1	1	0	0	0
Leisler's	T9	40	10	120	0	0
Brown long-eared	T11	0	0	0	0	1

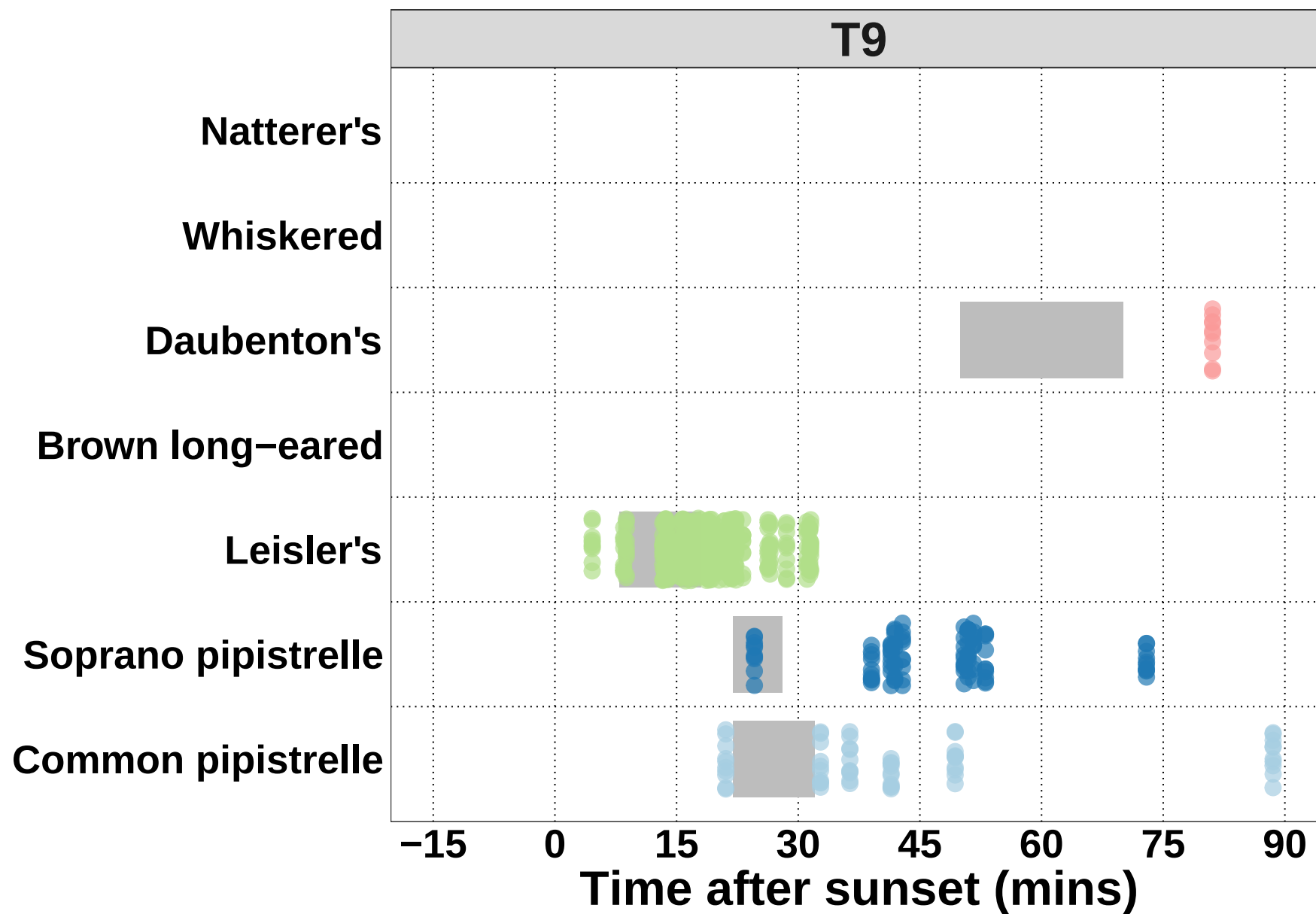
2025-09-23	2025-09-24	2025-09-25
0	2	3
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	1	0
0	0	0
10	0	0
0	0	0

Bat Passes Potentially Indicating Close Proximity to a Roost (Russ 2012)

Figure 8. Time from 15 minutes before to 90 minutes after sunset. Species-specific emergence time ranges are shown as grey bars. Bat passes overlapping species-specific grey bars, or occurring earlier than this time range, may potentially indicate the presence of a nearby roost.







Count of Bat Passes

All Detectors

Table 14. The total number of passes recorded for each species across all of the detectors.

The 'Total' percentage may not be exactly 100% due to rounding of the percentages per species.

Species	Passes (no.)	Percentage of Total (%)
Myotis daubentonii	194	15.3
Myotis mystacinus	1	0.1
Myotis nattereri	8	0.6
Nyctalus leisleri	540	42.6
Pipistrellus pipistrellus	238	18.8
Pipistrellus pygmaeus	263	20.8
Plecotus auritus	23	1.8
Total	1267	100.0

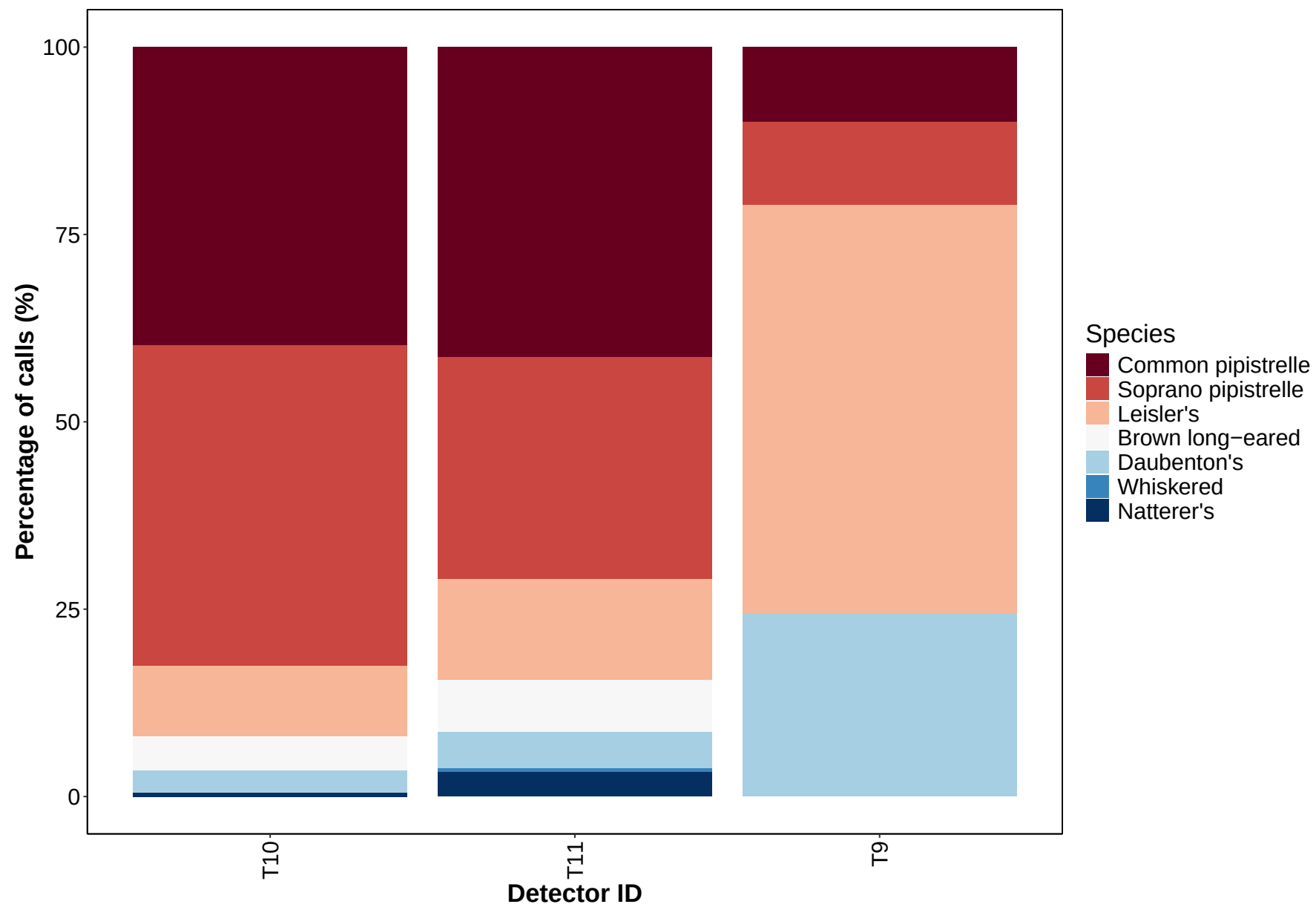
Per Detector

The number of passes recorded for each species at each detector.

Species	Detector ID	Count (no.)	Percentage by Detector (%)
Common pipistrelle	T10	119	38.5113269
Common pipistrelle	T11	49	35.5072464
Common pipistrelle	T9	70	8.5365854
Soprano pipistrelle	T10	123	39.8058252
Soprano pipistrelle	T11	40	28.9855072
Soprano pipistrelle	T9	100	12.1951220
Leisler's	T10	38	12.2977346
Leisler's	T11	22	15.9420290
Leisler's	T9	480	58.5365854
Brown long-eared	T10	12	3.8834951
Brown long-eared	T11	11	7.9710145
Daubenton's	T10	15	4.8543689
Daubenton's	T11	9	6.5217391
Daubenton's	T9	170	20.7317073
Whiskered	T11	1	0.7246377
Natterer's	T10	2	0.6472492
Natterer's	T11	6	4.3478261

Species Composition

Figure 10. Percentage species composition of passes at each detector.



Part 2a: Presence Only

THE NEXT SECTION OF THE REPORT FEATURES THE RAW DATA SUPPLIED TO ECOBAT AND ONLY TAKES INTO ACCOUNT THE PRESENCE, AND NOT THE ABSENCE, OF EACH BAT SPECIES. FOR EACH NIGHT, THERE IS NO 'ZERO DATA' FOR WHEN SPECIES WERE NOT DETECTED.

Nightly Bat Passes Per Hour

Median Per Detector

Table 16. The median Nightly Pass Rate (bat passes per hour, per night) of each species. If NA, then no bat passes.

Bat pass rates are often highly variable between nights, with some nights having few or no passes and other nights having high activity. In these circumstances, the median is likely to be a more useful summary of the 'average' activity than is the mean. For further information see: Lintott, P. R., & Mathews, F. (2018). Basic mathematical errors may make ecological assessments unreliable. *Biodiversity and Conservation*, 27(1), 265-267. <https://doi.org/10.1007/s10531-017-1418-5>

Species	Detector ID	Median Pass Rate
Common pipistrelle	T10	2.4
Common pipistrelle	T11	0.2
Common pipistrelle	T9	1.7
Soprano pipistrelle	T10	3.3
Soprano pipistrelle	T11	0.5
Soprano pipistrelle	T9	2.6
Leisler's	T10	0.3
Leisler's	T11	0.2
Leisler's	T9	1.8
Brown long-eared	T10	0.3
Brown long-eared	T11	0.1
Daubenton's	T10	0.2
Daubenton's	T11	0.2
Daubenton's	T9	3.4
Whiskered	T11	0.1
Natterer's	T10	0.1
Natterer's	T11	0.1

Mean Per Detector

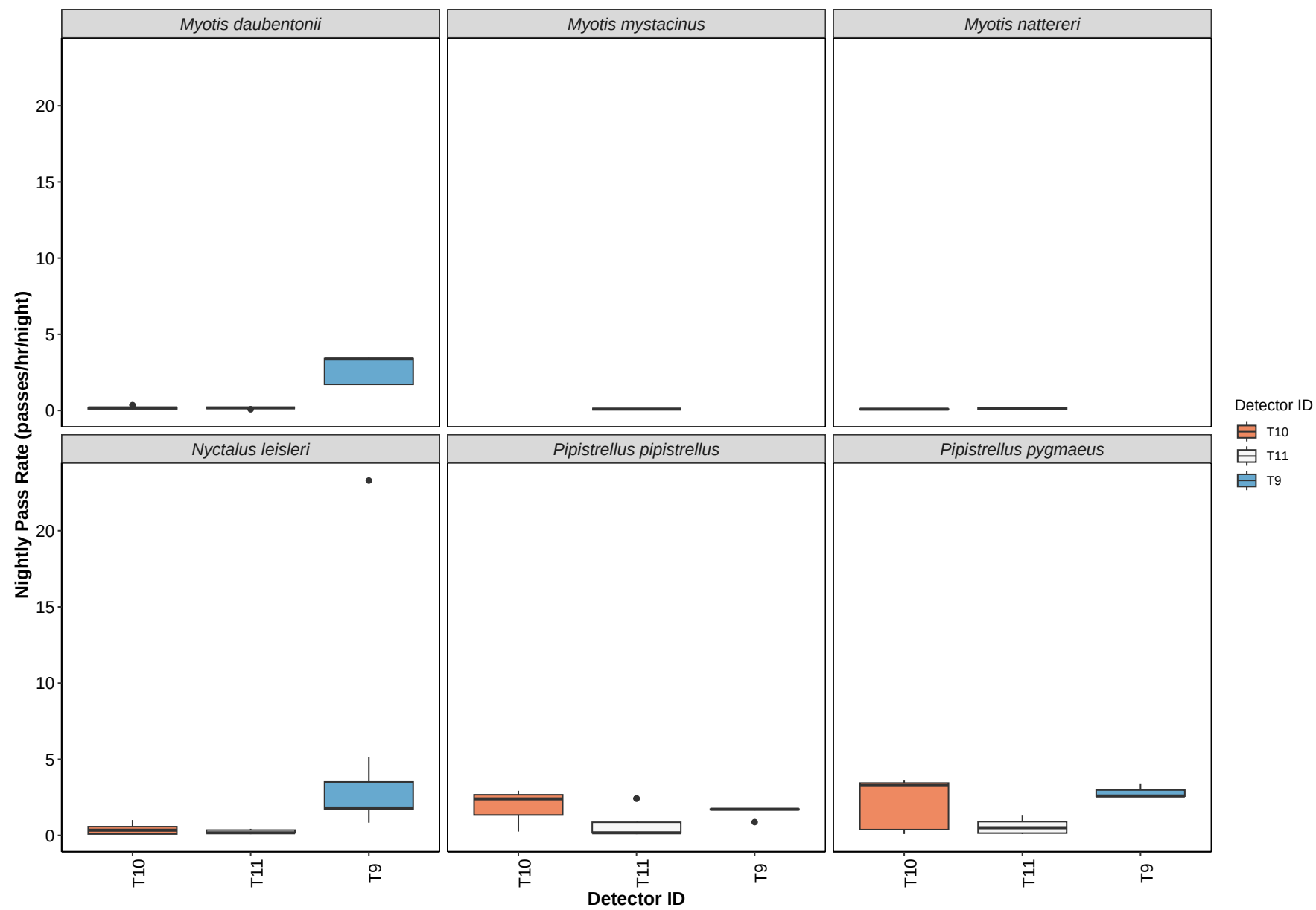
Table 17. The mean Nightly Pass Rate (bat passes per hour, per night) of each species at each detector. Values are given to 1 decimal place.

We recommend using the median values given above, for the reasons stated above, but provide the mean values in the table below.

Species	Detector ID	Mean Pass Rate
Common pipistrelle	T10	1.9
Common pipistrelle	T11	0.7
Common pipistrelle	T9	1.6
Soprano pipistrelle	T10	2.1
Soprano pipistrelle	T11	0.6
Soprano pipistrelle	T9	2.8
Leisler's	T10	0.4
Leisler's	T11	0.2
Leisler's	T9	4.7
Brown long-eared	T10	0.2
Brown long-eared	T11	0.2
Daubenton's	T10	0.2
Daubenton's	T11	0.2
Daubenton's	T9	2.7
Whiskered	T11	0.1
Natterer's	T10	0.1
Natterer's	T11	0.1

Per Detector

Figure 11. Boxplots for the number of bat passes per hour each night, for each detector. The 'box' shows the interquartile range, which is where the middle 50% of the data lie. The line dividing the box is the median, the mid-point of the data. The 'whiskers' extend from the box and represent the ranges for the bottom 25% and the top 25% of the data values, excluding outliers. An outlier is any extreme value that lies further away from the box than 1.5 times the interquartile range. Outliers are shown as dots. Where very few passes are recorded it is not possible to produce the box, so the data are shown as a line.





Detector ID

Split by Month

Total Bat Passes per Detector each Month

Table 18. The total number of bat passes of each species in each month at each detector.

This table simply tells you how many bats of each species were recorded passing each detector during each month. These numbers are not standardised by the night length, or how many nights each detector was active for during each month.

Species	Detector ID	Sep
Common pipistrelle	T10	160
Common pipistrelle	T11	77
Common pipistrelle	T9	90
Soprano pipistrelle	T10	172
Soprano pipistrelle	T11	55
Soprano pipistrelle	T9	100
Leisler's	T10	38
Leisler's	T11	25
Leisler's	T9	490
Brown long-eared	T10	18
Brown long-eared	T11	13
Daubenton's	T10	12
Daubenton's	T11	9
Daubenton's	T9	220
Whiskered	T11	1
Natterer's	T10	2
Natterer's	T11	6

Survey Effort

Table 19. The number of survey nights per month per detector.

month	Detector ID	No. of Survey Nights
Sep	T10	10
Sep	T11	10
Sep	T9	10

Nightly Bat Passes for Each Month

Median Per Detector

Table 20. The median Nightly Pass Rate (bat passes per hour, per night) of each species throughout each month. If NA, then no bat passes.

Bat pass rates are often highly variable between nights, with some nights having few or no passes and other nights having high activity. In these circumstances, the median is likely to be a more useful summary of the 'average' activity than is the mean. For further information see: Lintott, P. R., & Mathews, F. (2018). Basic mathematical errors may make ecological assessments unreliable. *Biodiversity and Conservation*, 27(1), 265-267. <https://doi.org/10.1007/s10531-017-1418-5>

Species	Detector ID	Sep
Common pipistrelle	T10	2.4
Common pipistrelle	T11	0.2
Common pipistrelle	T9	1.7
Soprano pipistrelle	T10	3.3
Soprano pipistrelle	T11	0.5
Soprano pipistrelle	T9	2.6
Leisler's	T10	0.3
Leisler's	T11	0.2
Leisler's	T9	1.8
Brown long-eared	T10	0.3
Brown long-eared	T11	0.1
Daubenton's	T10	0.2
Daubenton's	T11	0.2
Daubenton's	T9	3.4
Whiskered	T11	0.1
Natterer's	T10	0.1
Natterer's	T11	0.1

Mean Per Detector

Table 21: The mean Nightly Pass Rate (bat passes per hour, per night) of each species throughout each month. Values are given to 1 decimal place.

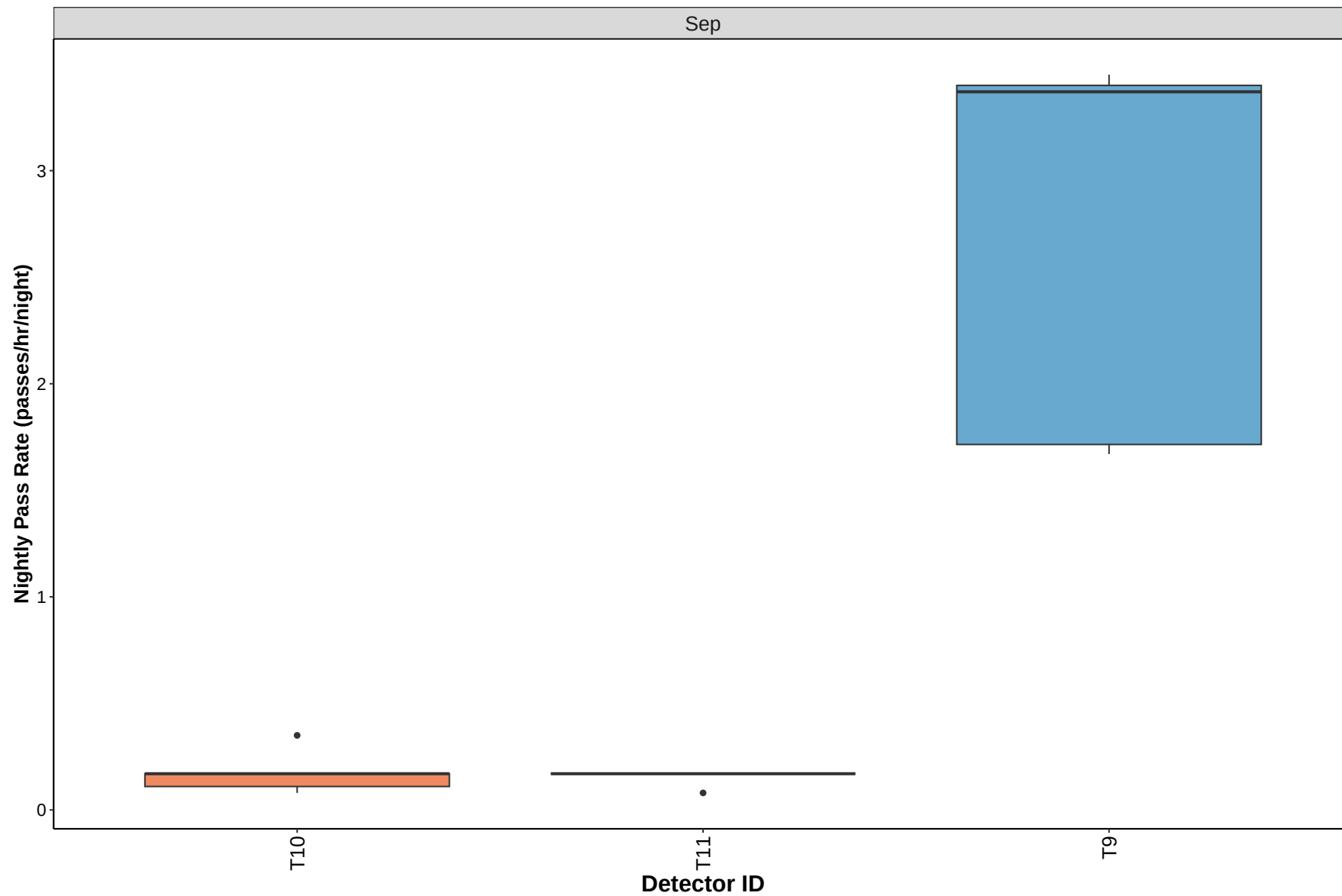
We recommend using the median values given above, for the reasons stated above, but provide the mean values in the table below.

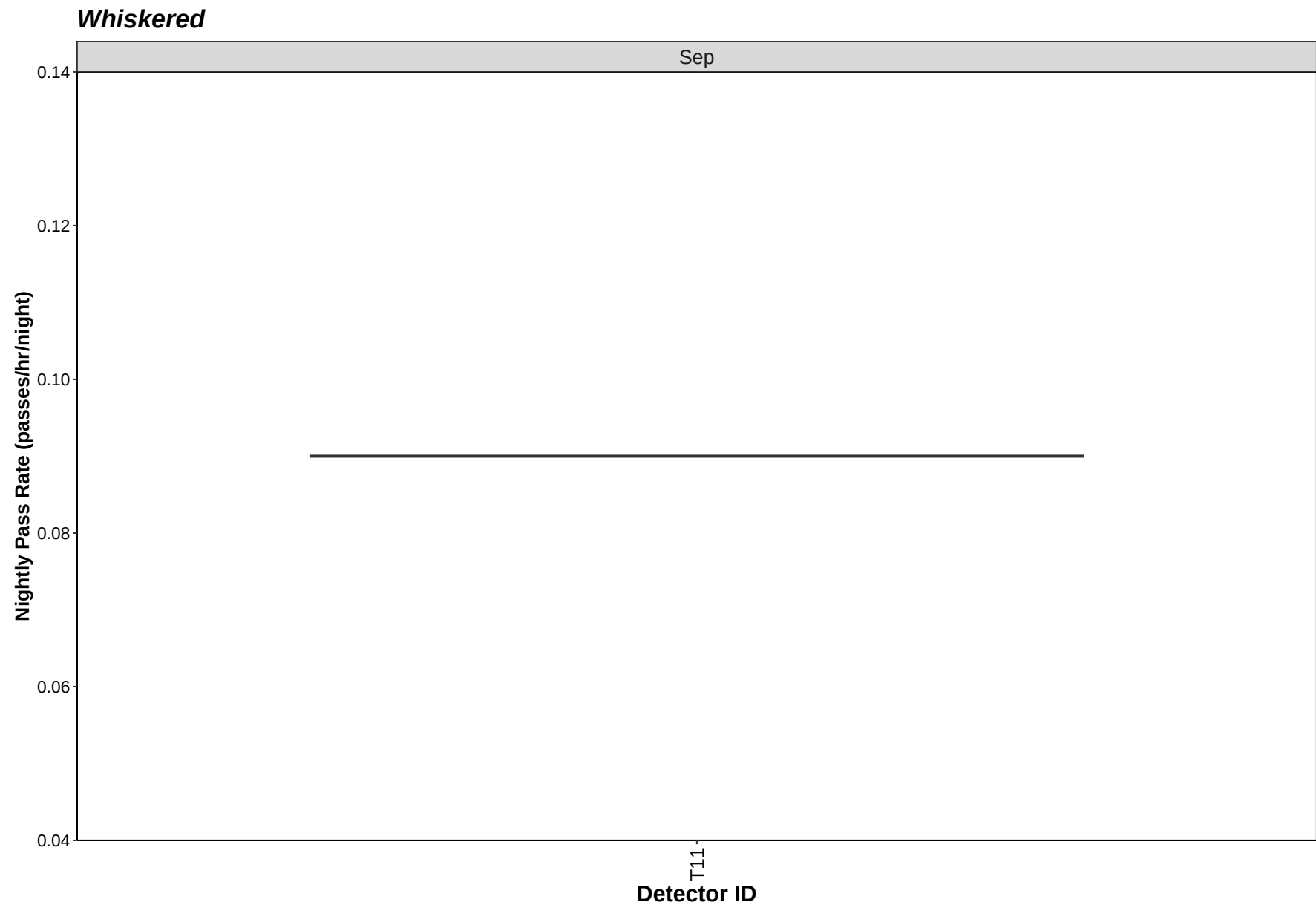
Species	Detector ID	Sep
Common pipistrelle	T10	1.9
Common pipistrelle	T11	0.7
Common pipistrelle	T9	1.6
Soprano pipistrelle	T10	2.1
Soprano pipistrelle	T11	0.6
Soprano pipistrelle	T9	2.8
Leisler's	T10	0.4
Leisler's	T11	0.2
Leisler's	T9	4.7
Brown long-eared	T10	0.2
Brown long-eared	T11	0.2
Daubenton's	T10	0.2
Daubenton's	T11	0.2
Daubenton's	T9	2.7
Whiskered	T11	0.1
Natterer's	T10	0.1
Natterer's	T11	0.1

Per Detector

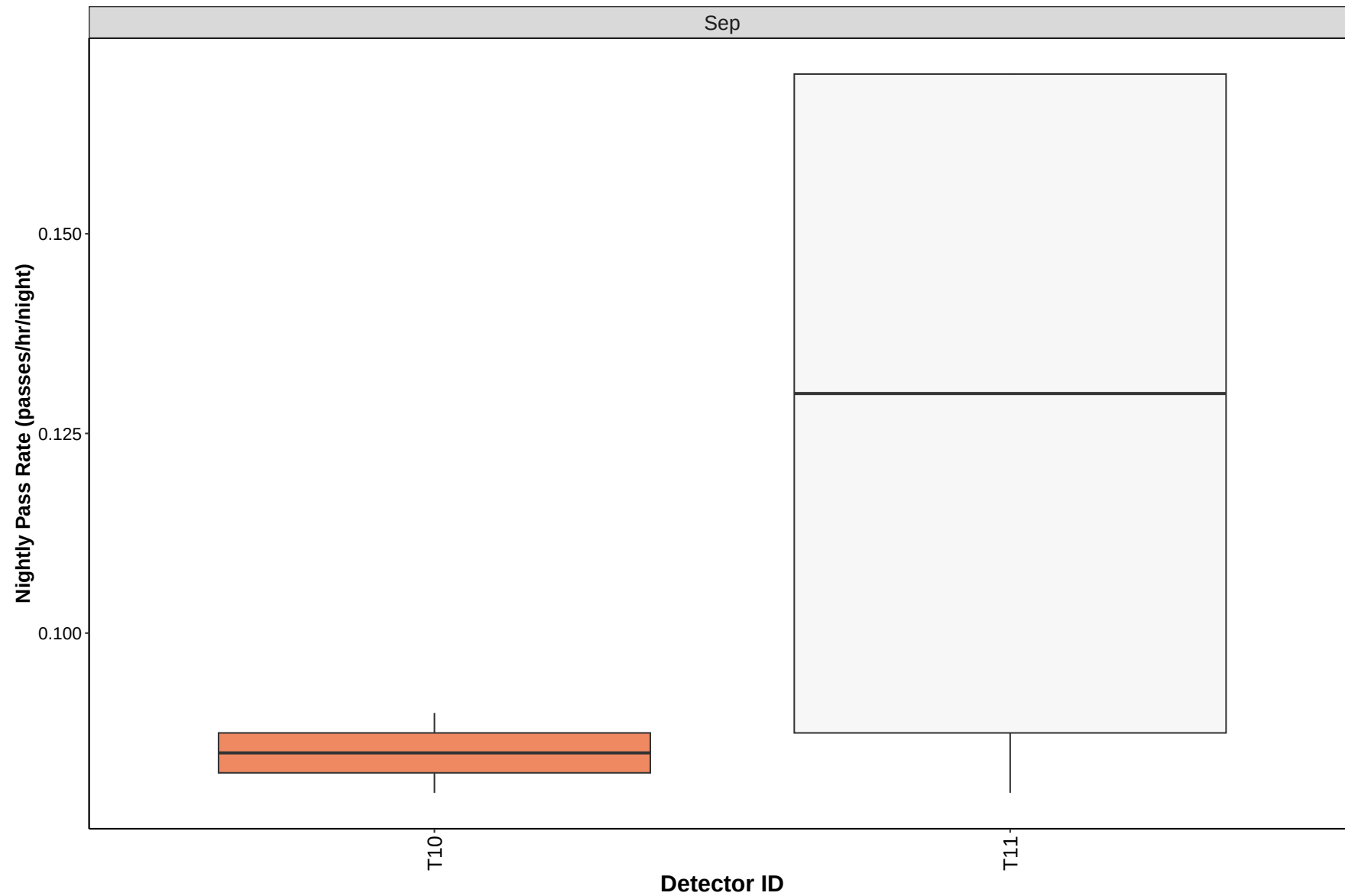
Figure 12. Figures show boxplots for the number of bat passes per hour by detector, for each month. The 'box' shows the interquartile range, which is where the middle 50% of the data lie. The line dividing the box is the median, the mid-point of the data. The 'whiskers' extend from the box and represent the ranges for the bottom 25% and the top 25% of the data values, excluding outliers. An outlier is any extreme value that lies further away from the box than 1.5 times the interquartile range. Outliers are shown as dots. Where very few passes are recorded it is not possible to produce the box, so the data are shown as a line.

Daubenton's

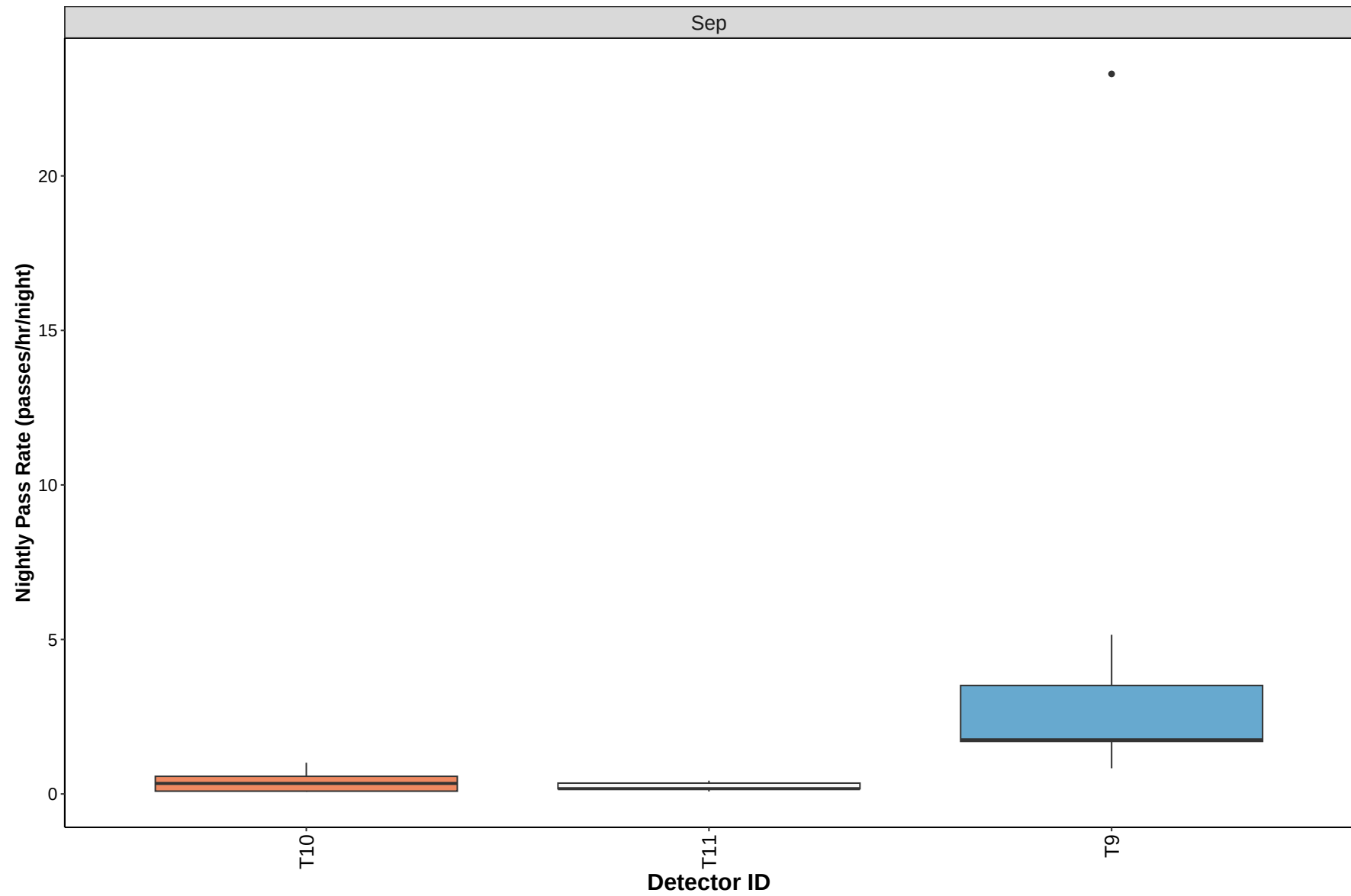




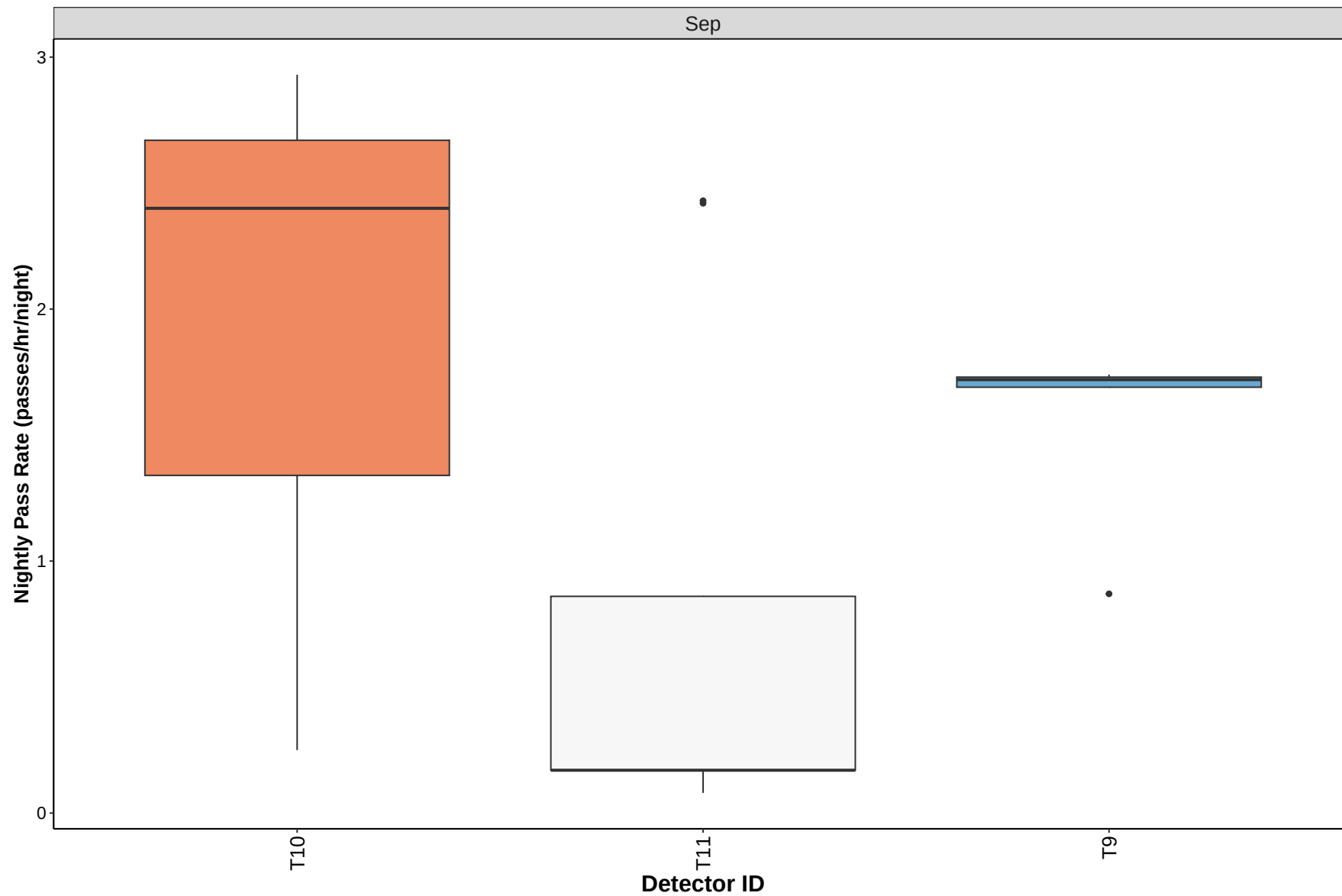
Natterer's



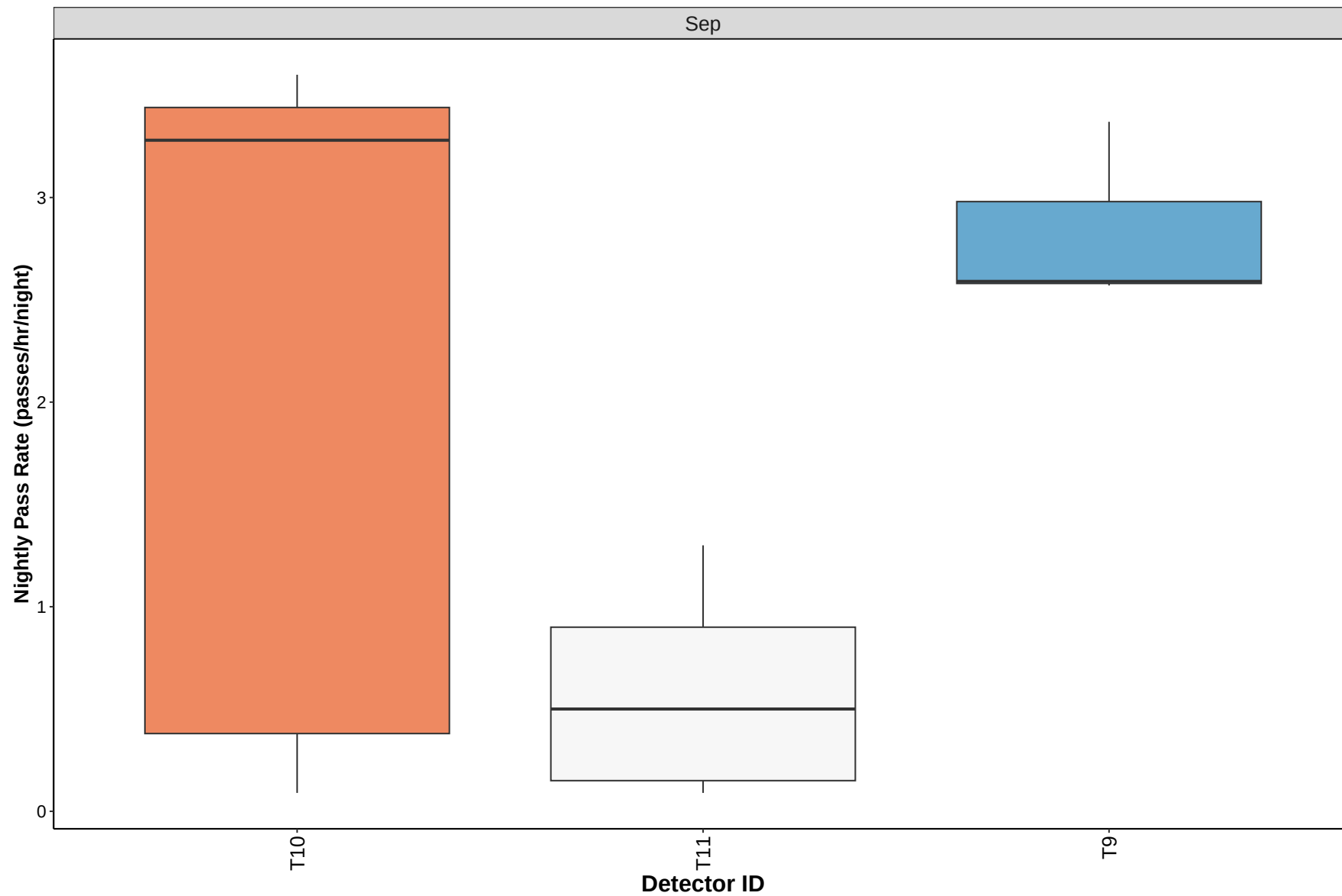
Leisler's

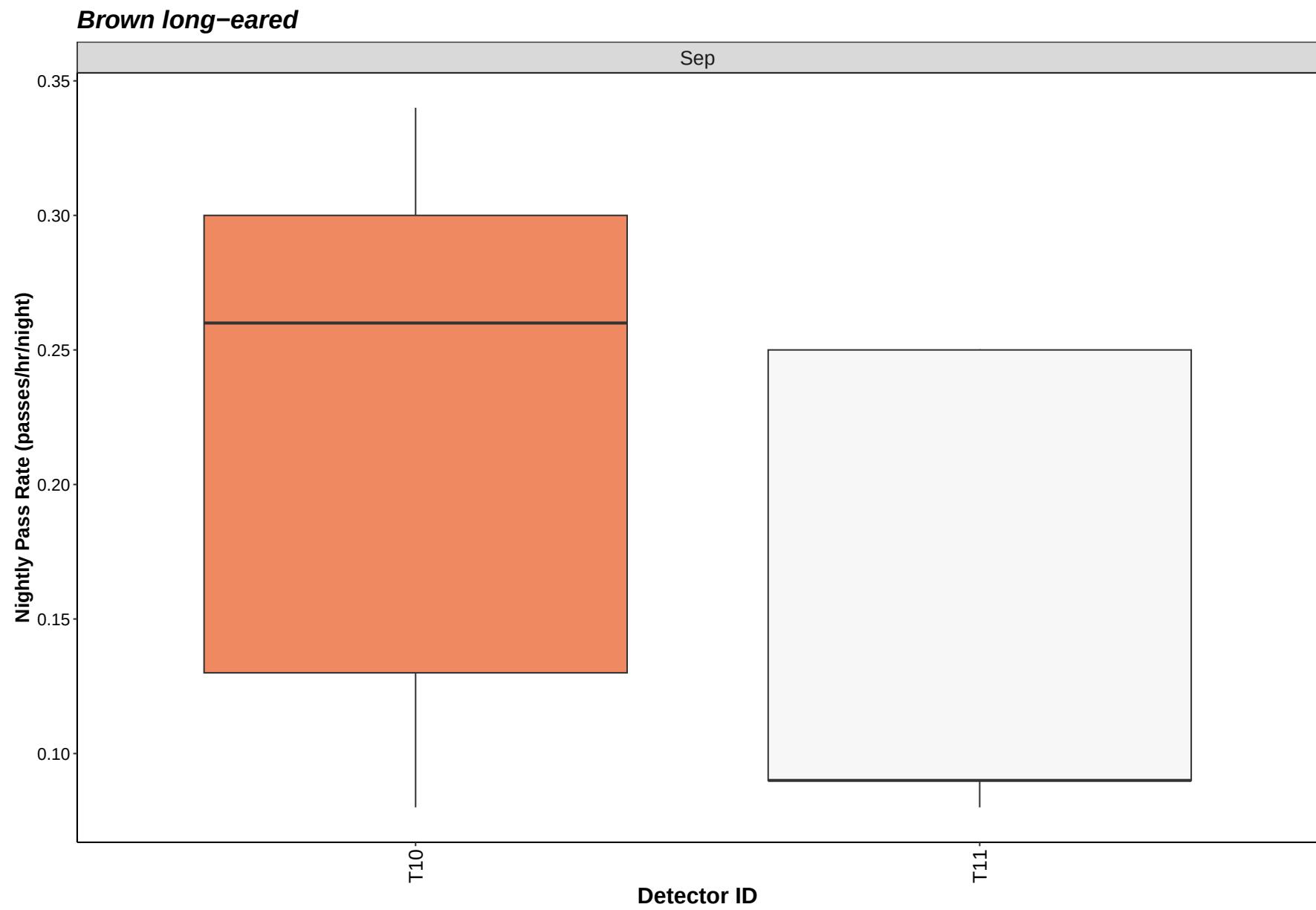


Common pipistrelle



Soprano pipistrelle





Bat Activity per Detector Location

Figure 13. Detector ID reference:

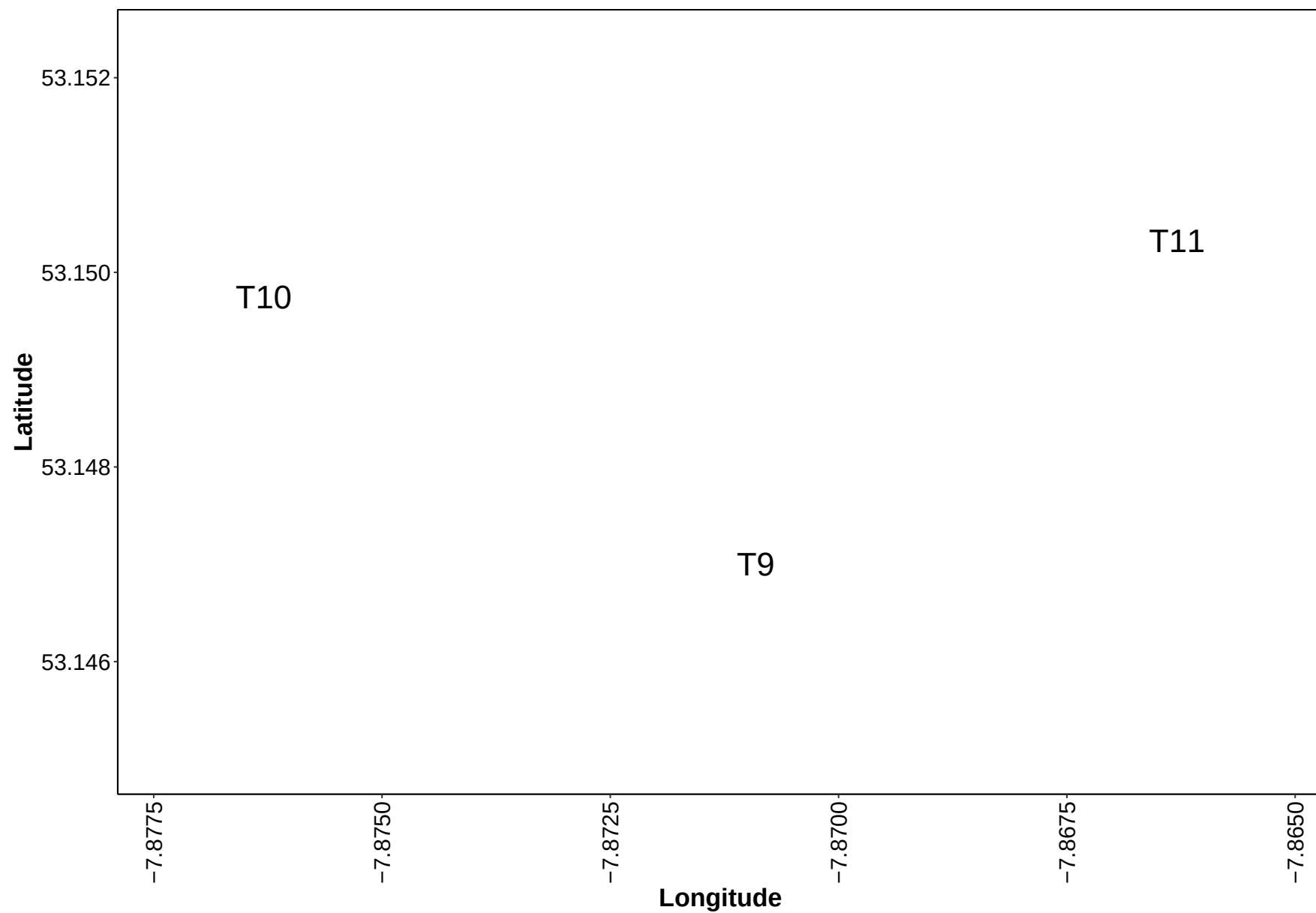
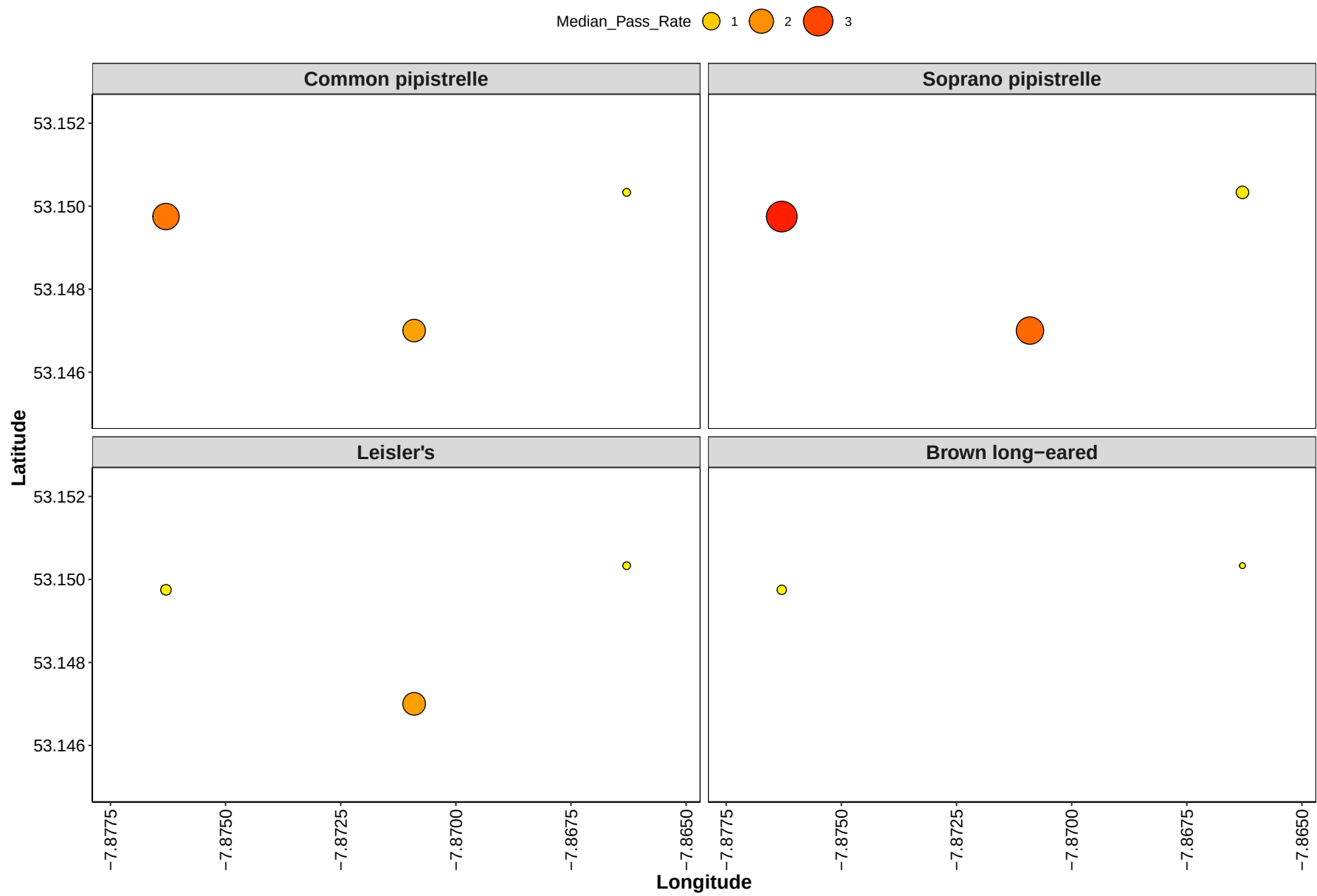


Figure 14. Median Nightly Pass Rate (bat passes/hr/night) throughout the survey period - represented by the size and colour of the point at each detector location.



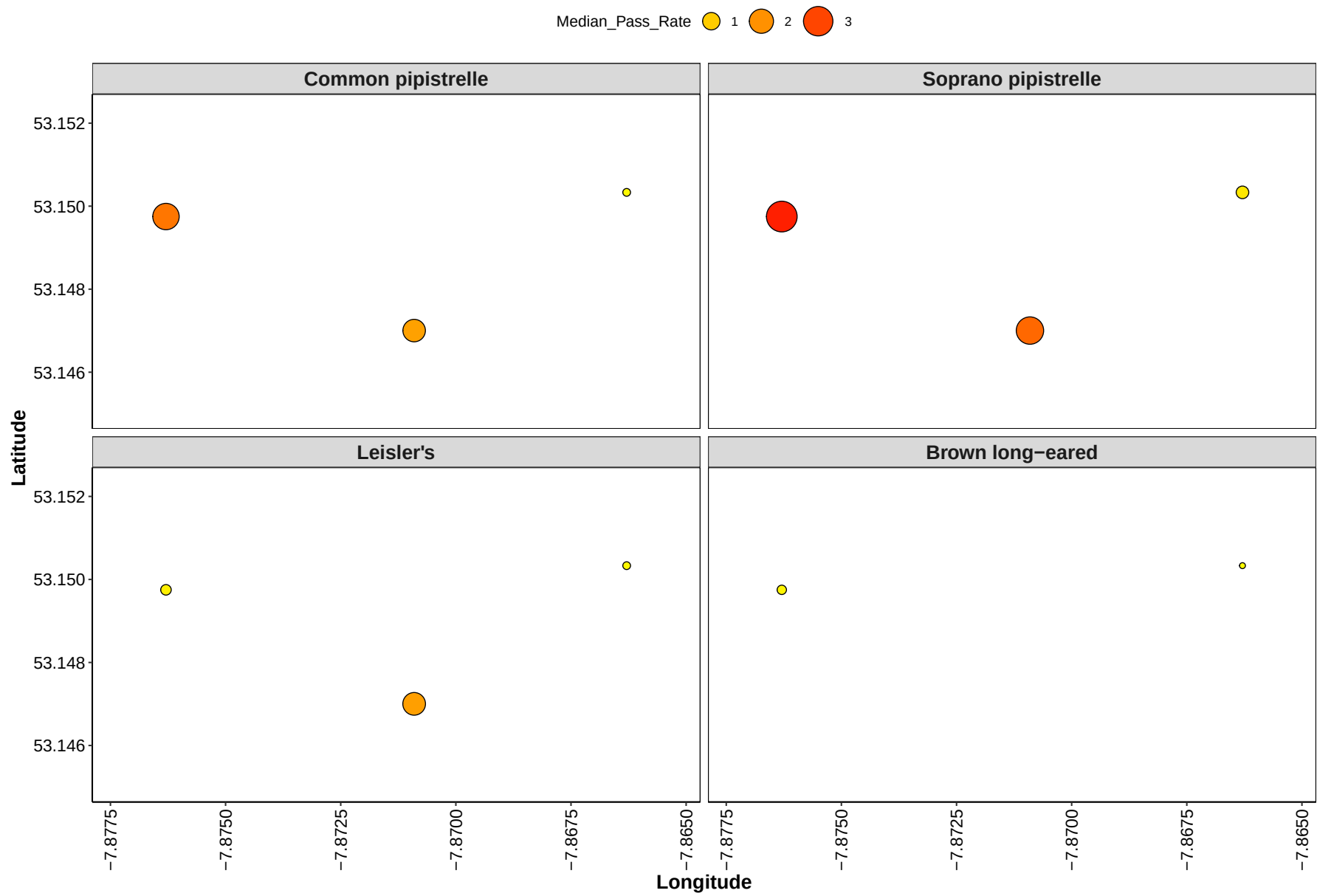
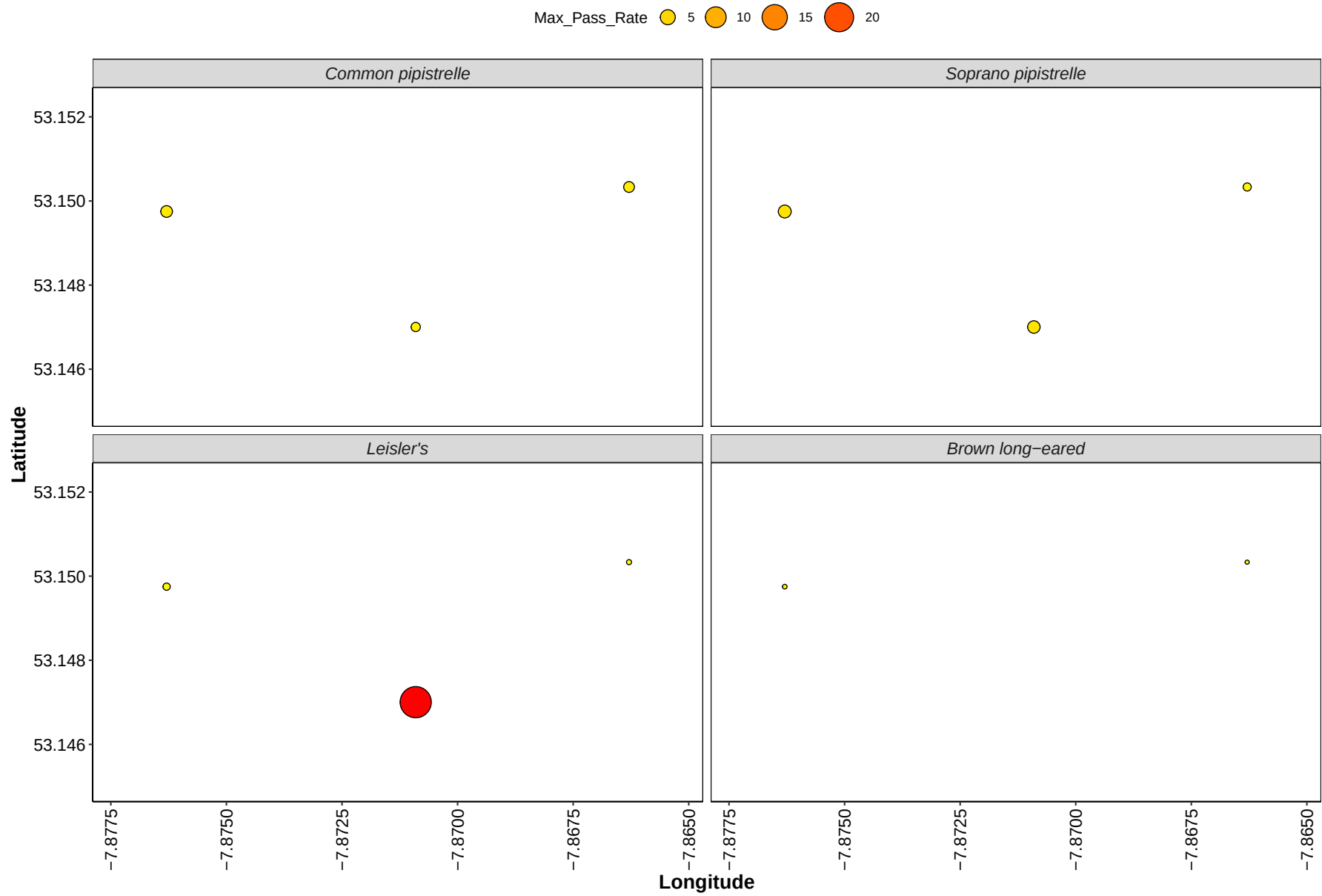
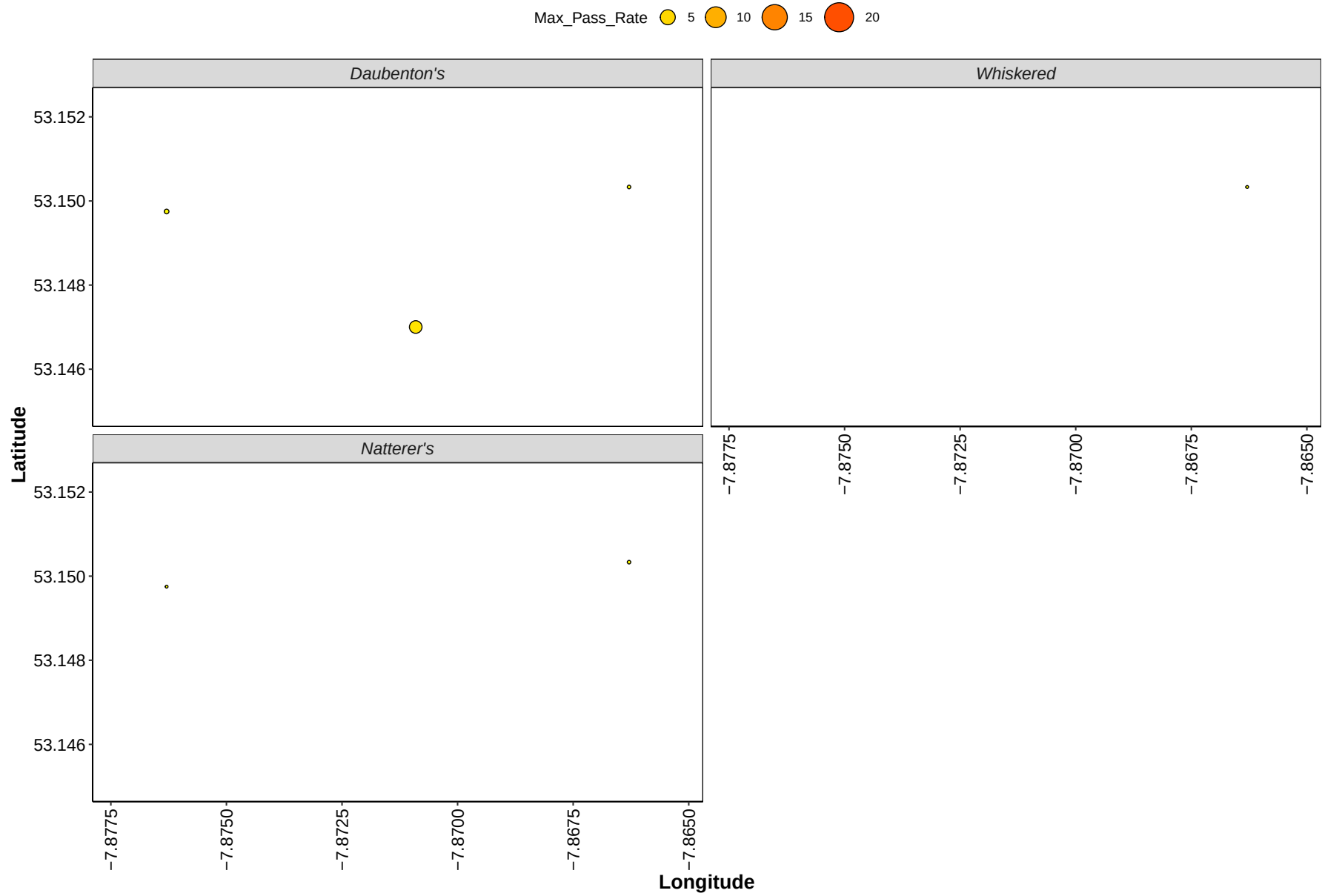


Figure 15. Maximum Nightly Pass Rate (bat passes/hr/night) recorded in a single night throughout the survey period - represented by the size and colour of the point at each detector location.





Part 2b: Includes Absences

THE NEXT SECTION OF THE REPORT FEATURES THE DATA SUPPLIED TO ECOBAT BUT TAKES INTO ACCOUNT SPECIES ABSENCES, AND THEREFORE INCLUDES 'ZERO DATA' FOR WHEN SPECIES WERE NOT DETECTED AT EACH DETECTOR ON A NIGHT. THIS DRAMATICALLY LOWERS THE MEANS AND MEDIANS OF THE DATA PRESENTED.

Nightly Bat Pass Rate

Median per Detector

Table 22. The median Nightly Pass Rate (bat passes per hour, per night) of each species. If NA, then no bat passes.

Bat pass rates are often highly variable between nights, with some nights having few or no passes and other nights having high activity. In these circumstances, the median is likely to be a more useful summary of the 'average' activity than is the mean. For further information see: Lintott, P. R., & Mathews, F. (2018). Basic mathematical errors may make ecological assessments unreliable. *Biodiversity and Conservation*, 27(1), 265-267. <https://doi.org/10.1007/s10531-017-1418-5>

Species	Detector ID	Median Pass Rate
Brown long-eared	T10	0.1
Brown long-eared	T11	0.1
Brown long-eared	T9	0.0
Common pipistrelle	T10	1.3
Common pipistrelle	T11	0.2
Common pipistrelle	T9	0.4
Daubenton's	T10	0.1
Daubenton's	T11	0.0
Daubenton's	T9	1.7
Leisler's	T10	0.2
Leisler's	T11	0.2
Leisler's	T9	1.7
Natterer's	T10	0.0
Natterer's	T11	0.0
Natterer's	T9	0.0
Soprano pipistrelle	T10	0.4
Soprano pipistrelle	T11	0.2
Soprano pipistrelle	T9	0.0
Whiskered	T10	0.0
Whiskered	T11	0.0
Whiskered	T9	0.0

Mean per Detector

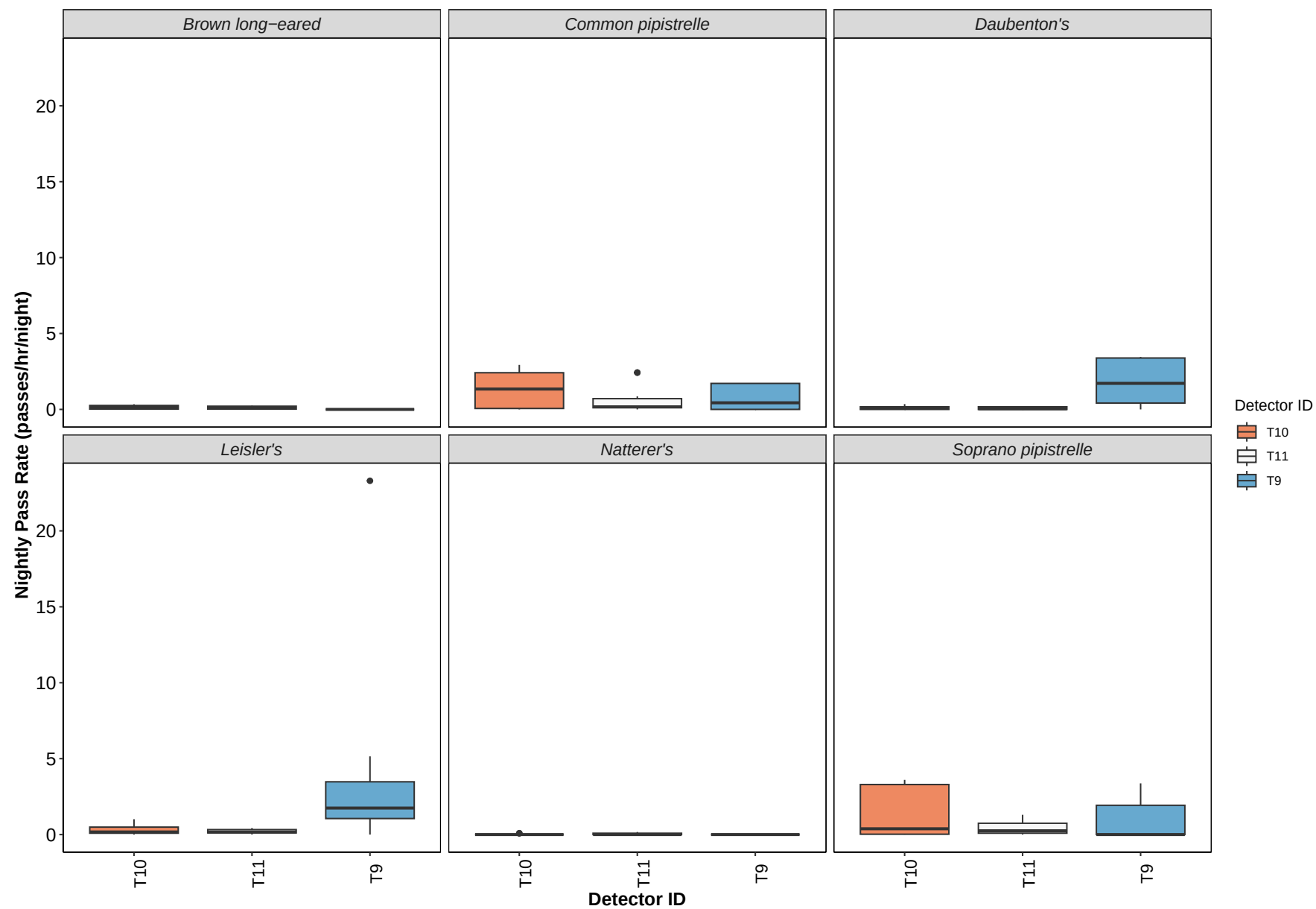
Table 23. The mean Nightly Pass Rate (bat passes per hour, per night) of each species at each detector. Values are given to 1 decimal place.

We recommend using the median values given above, for the reasons stated above, but provide the mean values in the table below.

Species	Detector ID	Mean Pass Rate
Brown long-eared	T10	0.2
Brown long-eared	T11	0.1
Brown long-eared	T9	0.0
Common pipistrelle	T10	1.4
Common pipistrelle	T11	0.7
Common pipistrelle	T9	0.8
Daubenton's	T10	0.1
Daubenton's	T11	0.1
Daubenton's	T9	1.9
Leisler's	T10	0.3
Leisler's	T11	0.2
Leisler's	T9	4.2
Natterer's	T10	0.0
Natterer's	T11	0.1
Natterer's	T9	0.0
Soprano pipistrelle	T10	1.5
Soprano pipistrelle	T11	0.5
Soprano pipistrelle	T9	0.9
Whiskered	T10	0.0
Whiskered	T11	0.0
Whiskered	T9	0.0

Per Detector

Figure 16. Figures show boxplots for the number of bat passes per hour each night, for each detector. The 'box' shows the interquartile range, which is where the middle 50% of the data lie. The line dividing the box is the median, the mid-point of the data. The 'whiskers' extend from the box and represent the ranges for the bottom 25% and the top 25% of the data values, excluding outliers. An outlier is any extreme value that lies further away from the box than 1.5 times the interquartile range. Outliers are shown as dots. Where very few passes are recorded it is not possible to produce the box, so the data are shown as a line.





Detector ID

Survey Effort

Table 24. The number of nights bats were detected per month per detector.

month	Detector ID	No. of Survey Nights
Sep	T10	10
Sep	T11	10
Sep	T9	10

Nightly Bat Pass Rate for Each Month

Median per Detector

Table 25. The median Nightly Pass Rate (bat passes per hour, per night) of each species throughout each month. If NA, then no bat passes.

Bat pass rates are often highly variable between nights, with some nights having few or no passes and other nights having high activity. In these circumstances, the median is likely to be a more useful summary of the ‘average’ activity than is the mean. For further information see: Lintott, P. R., & Mathews, F. (2018). Basic mathematical errors may make ecological assessments unreliable. *Biodiversity and Conservation*, 27(1), 265-267. <https://doi.org/10.1007/s10531-017-1418-5>

Species	Detector ID	Sep
Brown long-eared	T10	0.1
Brown long-eared	T11	0.1
Brown long-eared	T9	0.0
Common pipistrelle	T10	1.3
Common pipistrelle	T11	0.2
Common pipistrelle	T9	0.4
Daubenton's	T10	0.1
Daubenton's	T11	0.0
Daubenton's	T9	1.7
Leisler's	T10	0.2
Leisler's	T11	0.2
Leisler's	T9	1.7
Natterer's	T10	0.0
Natterer's	T11	0.0
Natterer's	T9	0.0
Soprano pipistrelle	T10	0.4
Soprano pipistrelle	T11	0.2
Soprano pipistrelle	T9	0.0
Whiskered	T10	0.0
Whiskered	T11	0.0
Whiskered	T9	0.0

Mean per Detector

Table 26. The mean Nightly Pass Rate (bat passes per hour, per night) of each species throughout each month. Values are given to 1 decimal place.

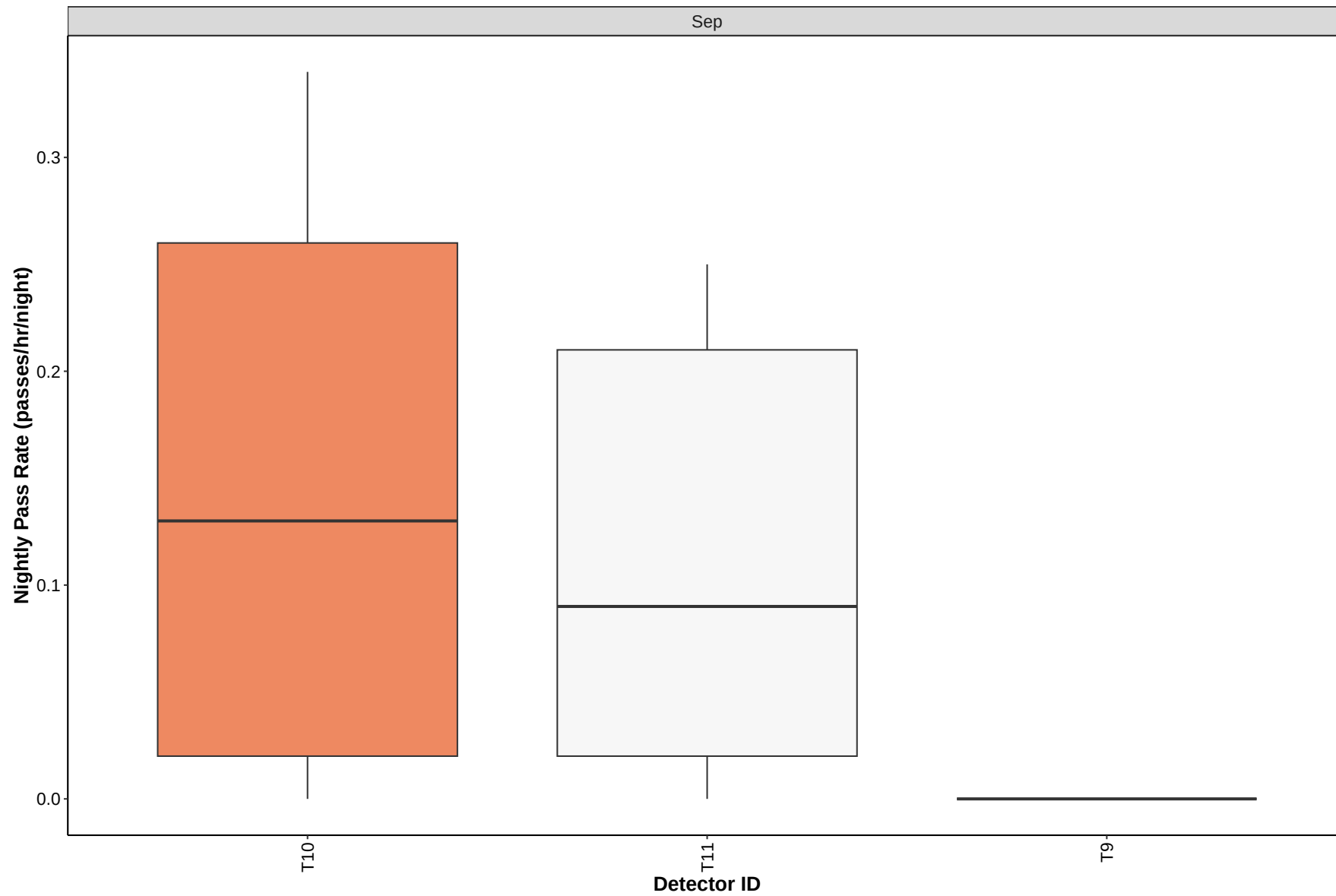
We recommend using the median values given above, for the reasons stated above, but provide the mean values in the table below.

Species	Detector ID	Sep
Brown long-eared	T10	0.2
Brown long-eared	T11	0.1
Brown long-eared	T9	0.0
Common pipistrelle	T10	1.4
Common pipistrelle	T11	0.7
Common pipistrelle	T9	0.8
Daubenton's	T10	0.1
Daubenton's	T11	0.1
Daubenton's	T9	1.9
Leisler's	T10	0.3
Leisler's	T11	0.2
Leisler's	T9	4.2
Natterer's	T10	0.0
Natterer's	T11	0.1
Natterer's	T9	0.0
Soprano pipistrelle	T10	1.5
Soprano pipistrelle	T11	0.5
Soprano pipistrelle	T9	0.9
Whiskered	T10	0.0
Whiskered	T11	0.0
Whiskered	T9	0.0

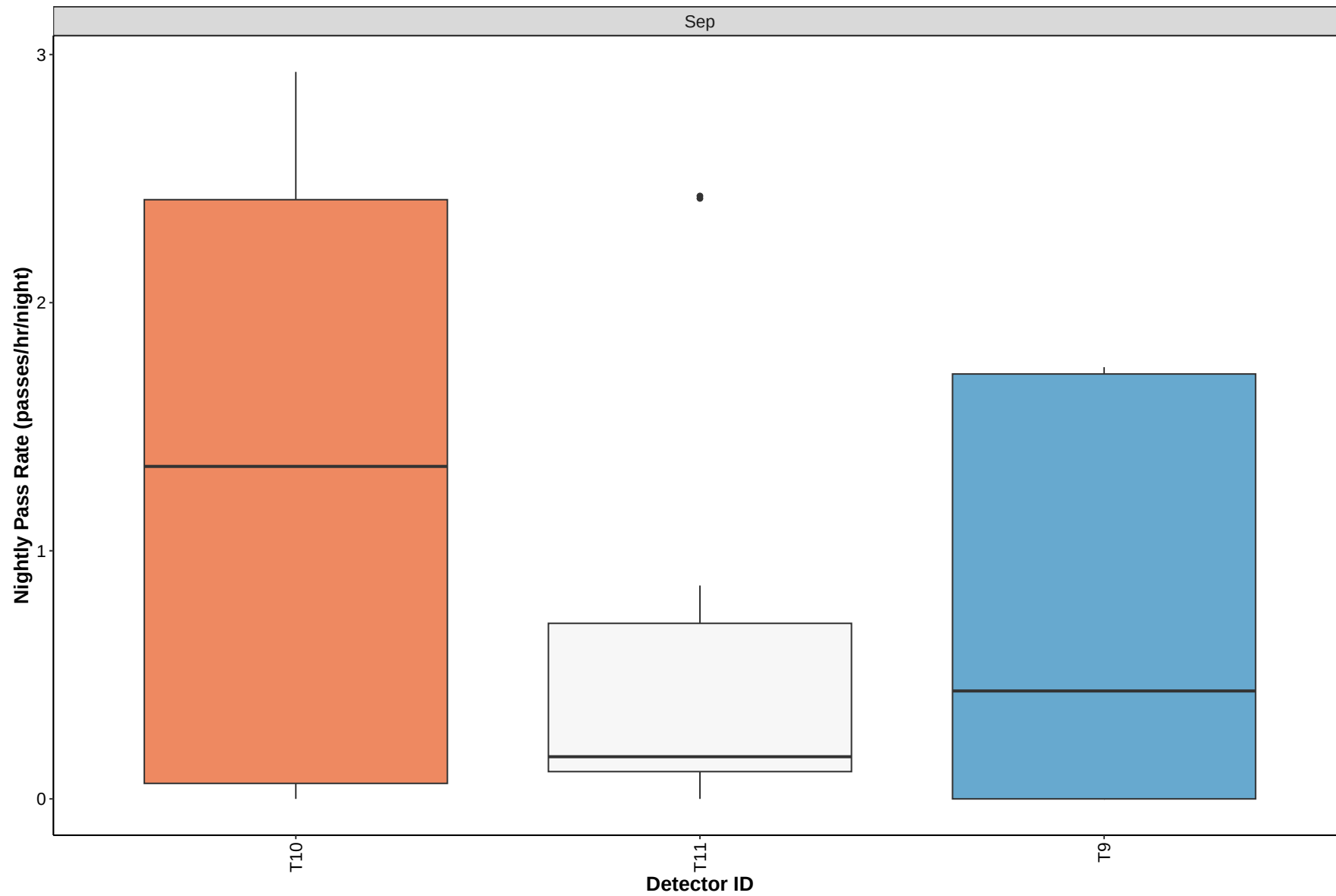
Per Detector

Figure 17. Figures show boxplots for the number of bat passes per hour by detector, for each month. The 'box' shows the interquartile range, which is where the middle 50% of the data lie. The line dividing the box is the median, the mid-point of the data. The 'whiskers' extend from the box and represent the ranges for the bottom 25% and the top 25% of the data values, excluding outliers. An outlier is any extreme value that lies further away from the box than 1.5 times the interquartile range. Outliers are shown as dots. Where very few passes are recorded it is not possible to produce the box, so the data are shown as a line.

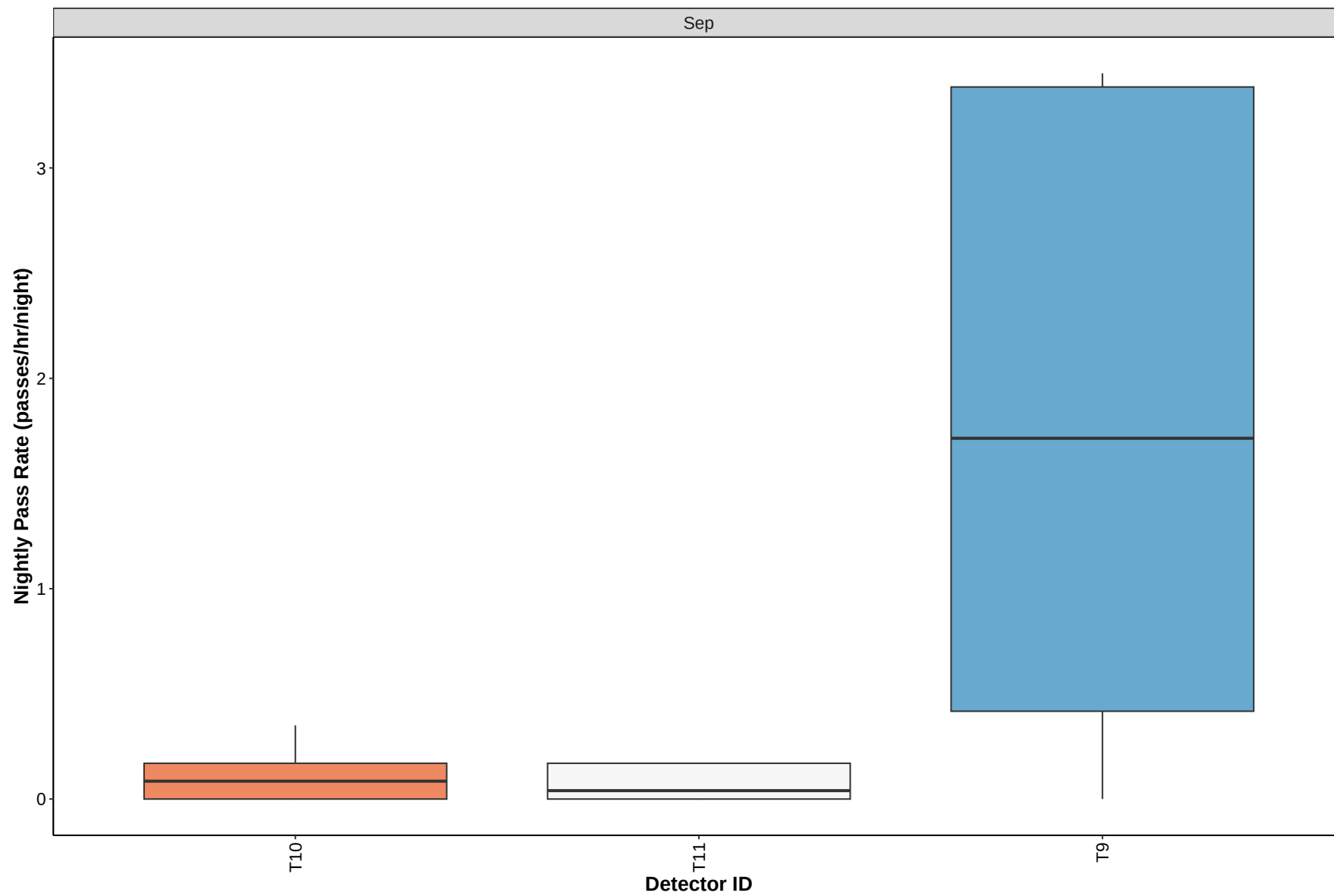
Brown long-eared



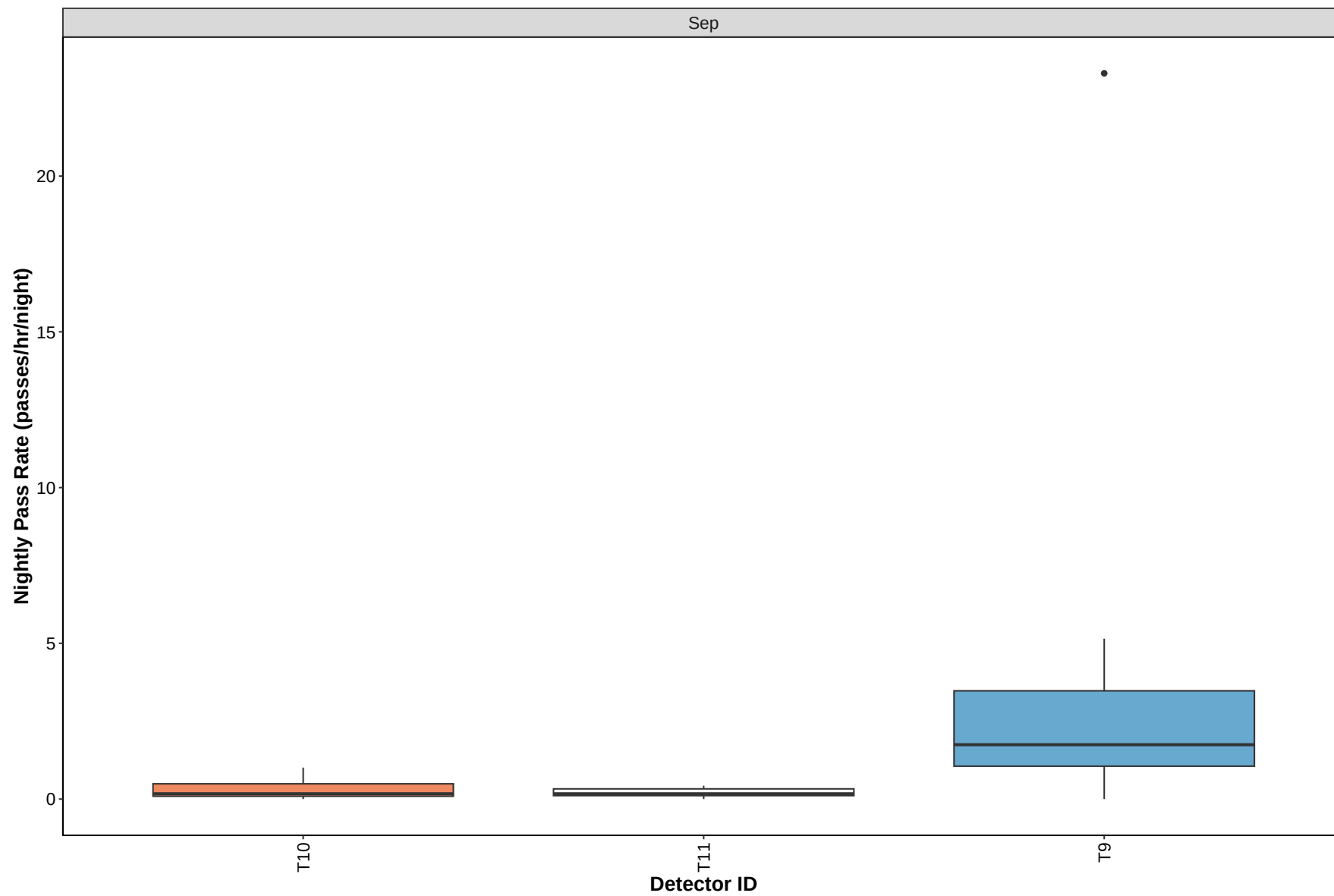
Common pipistrelle



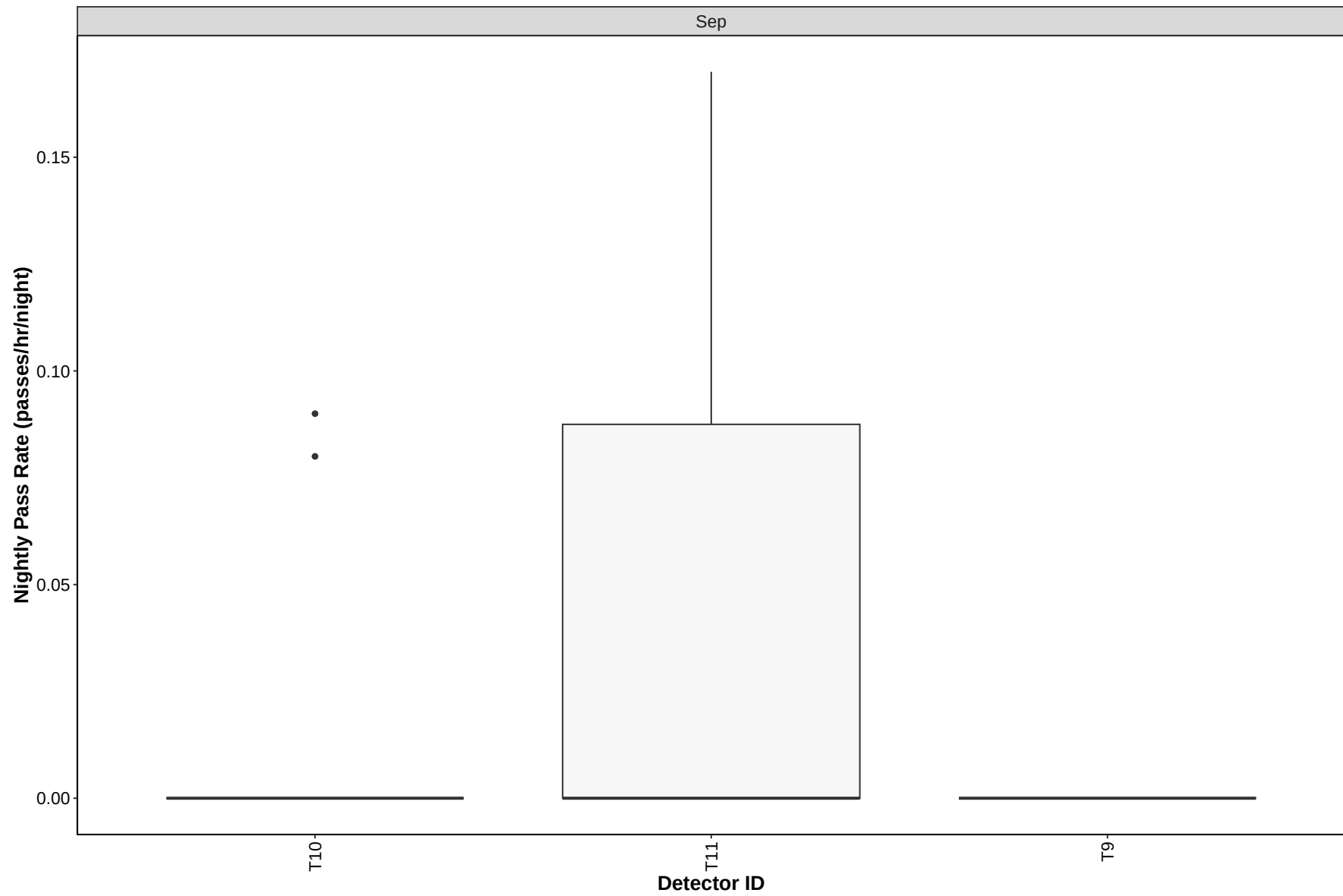
Daubenton's



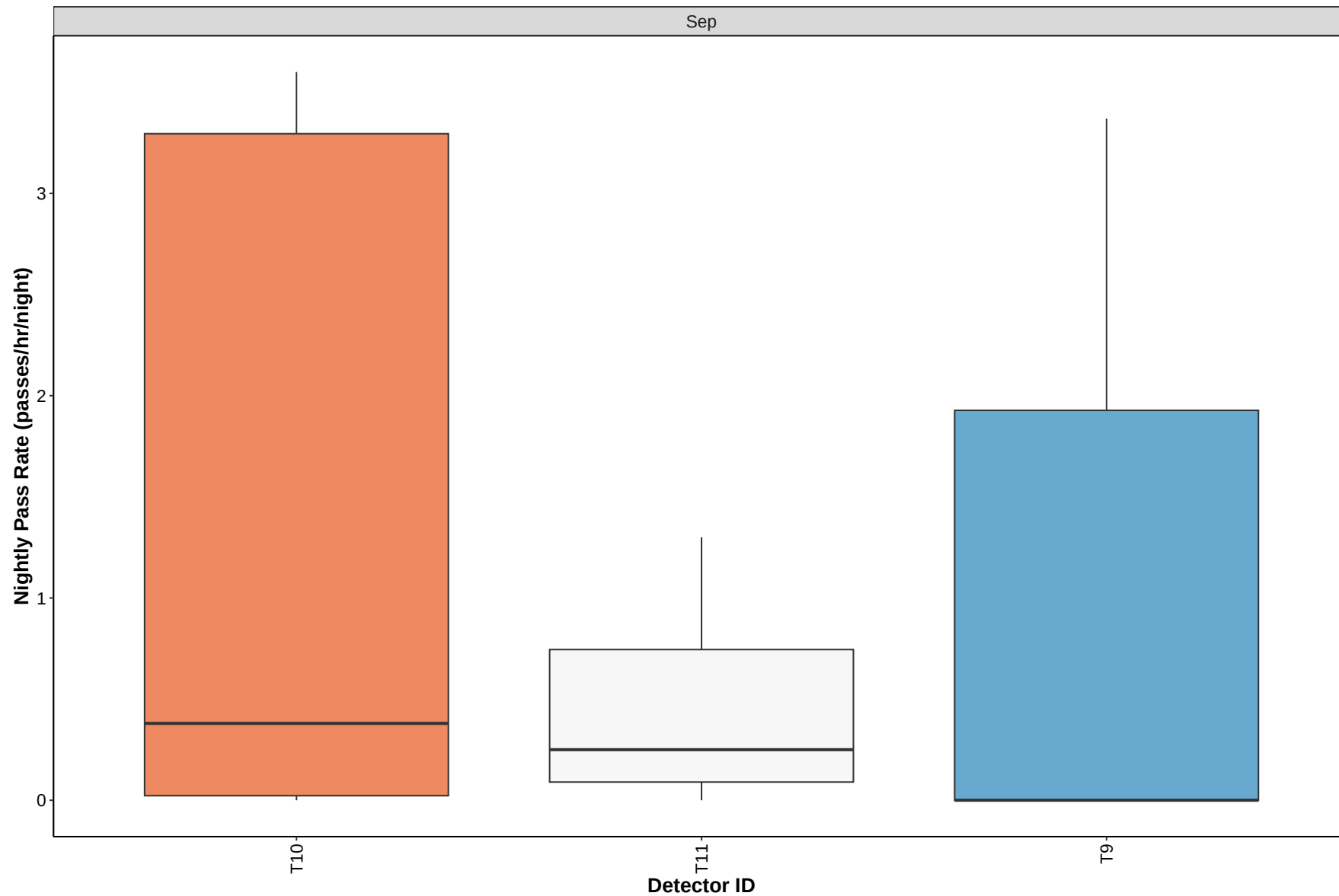
Leisler's

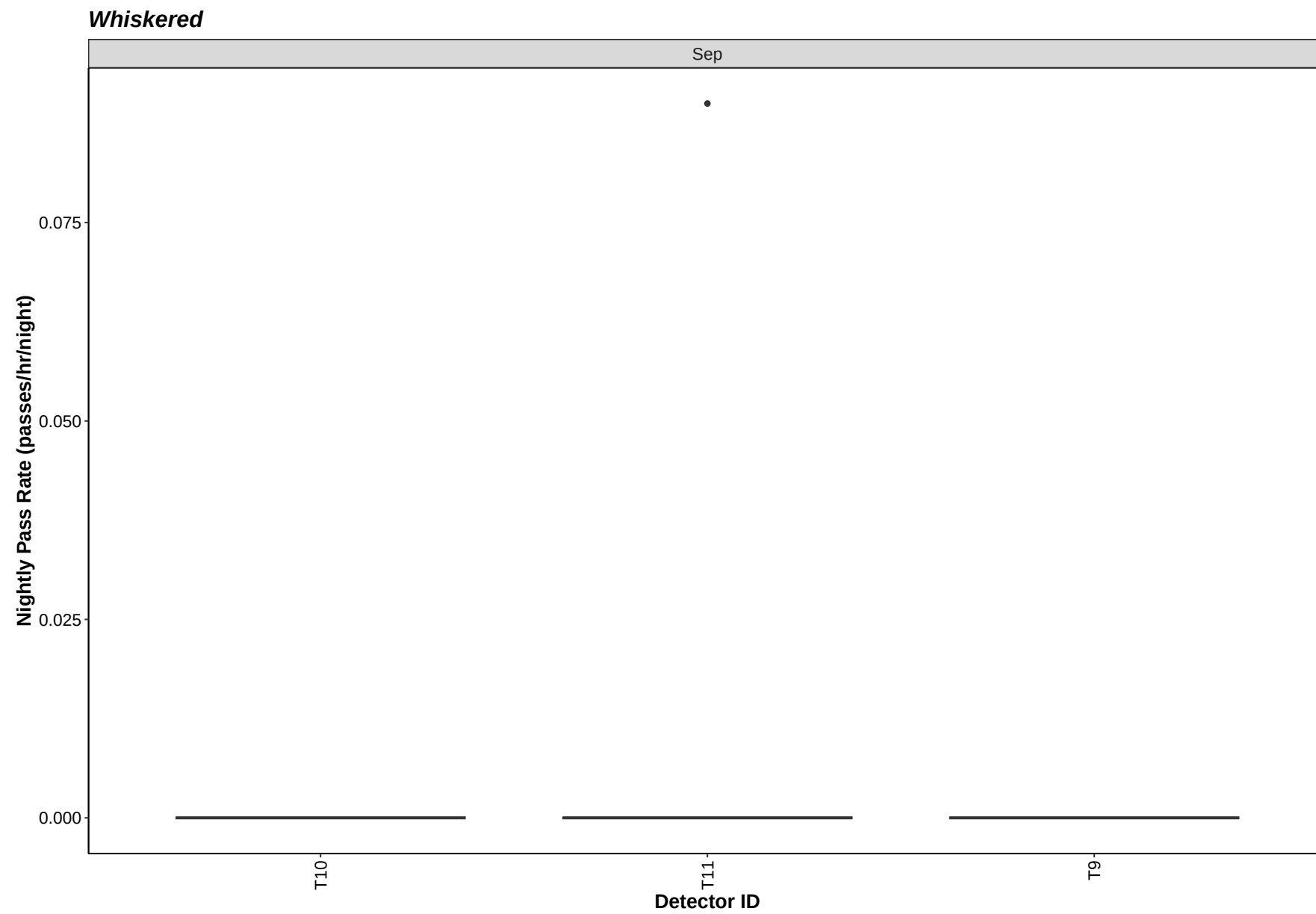


Natterer's



Soprano pipistrelle





Bat Activity per Detector Location

Figure 18. Detector ID reference:

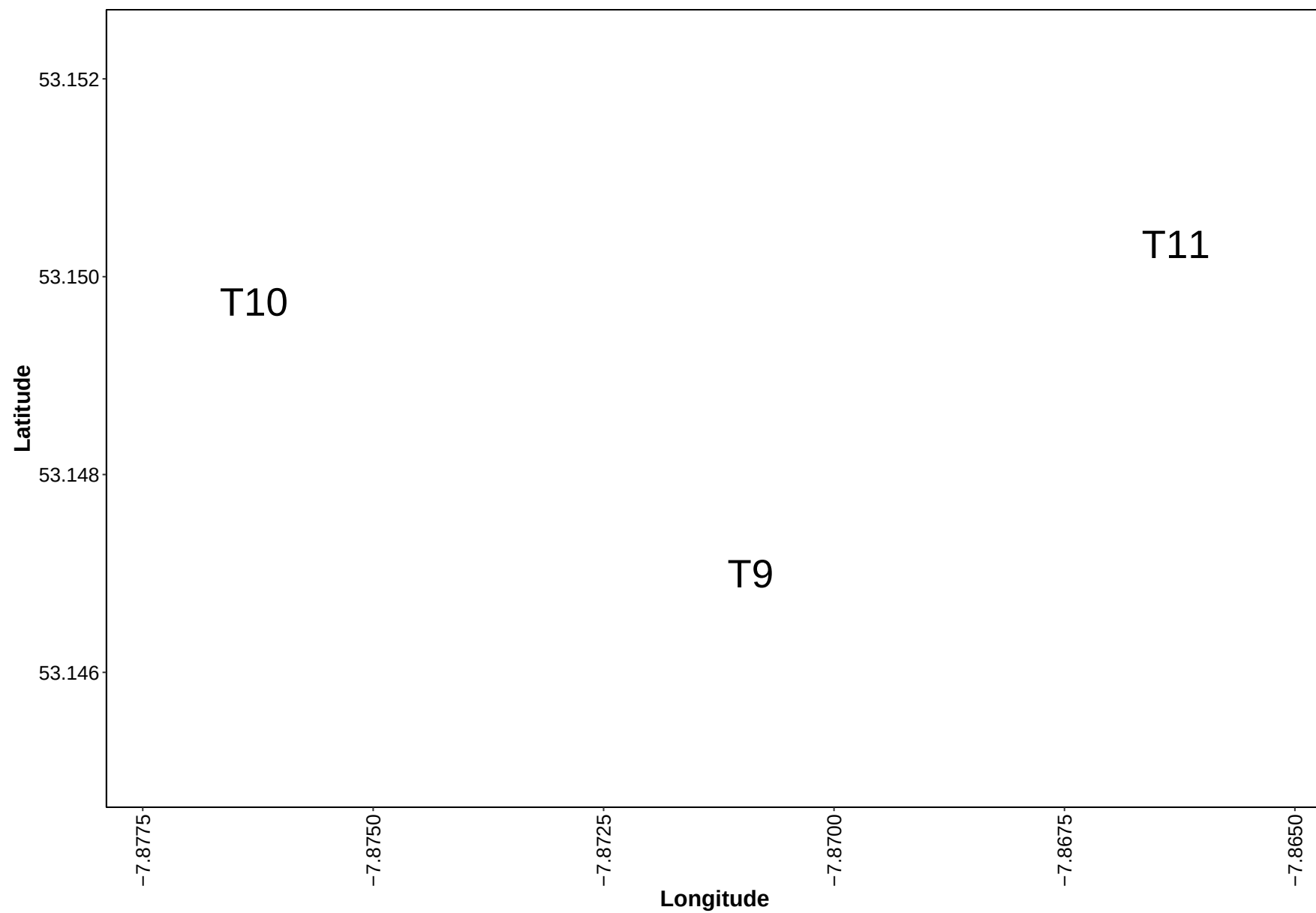
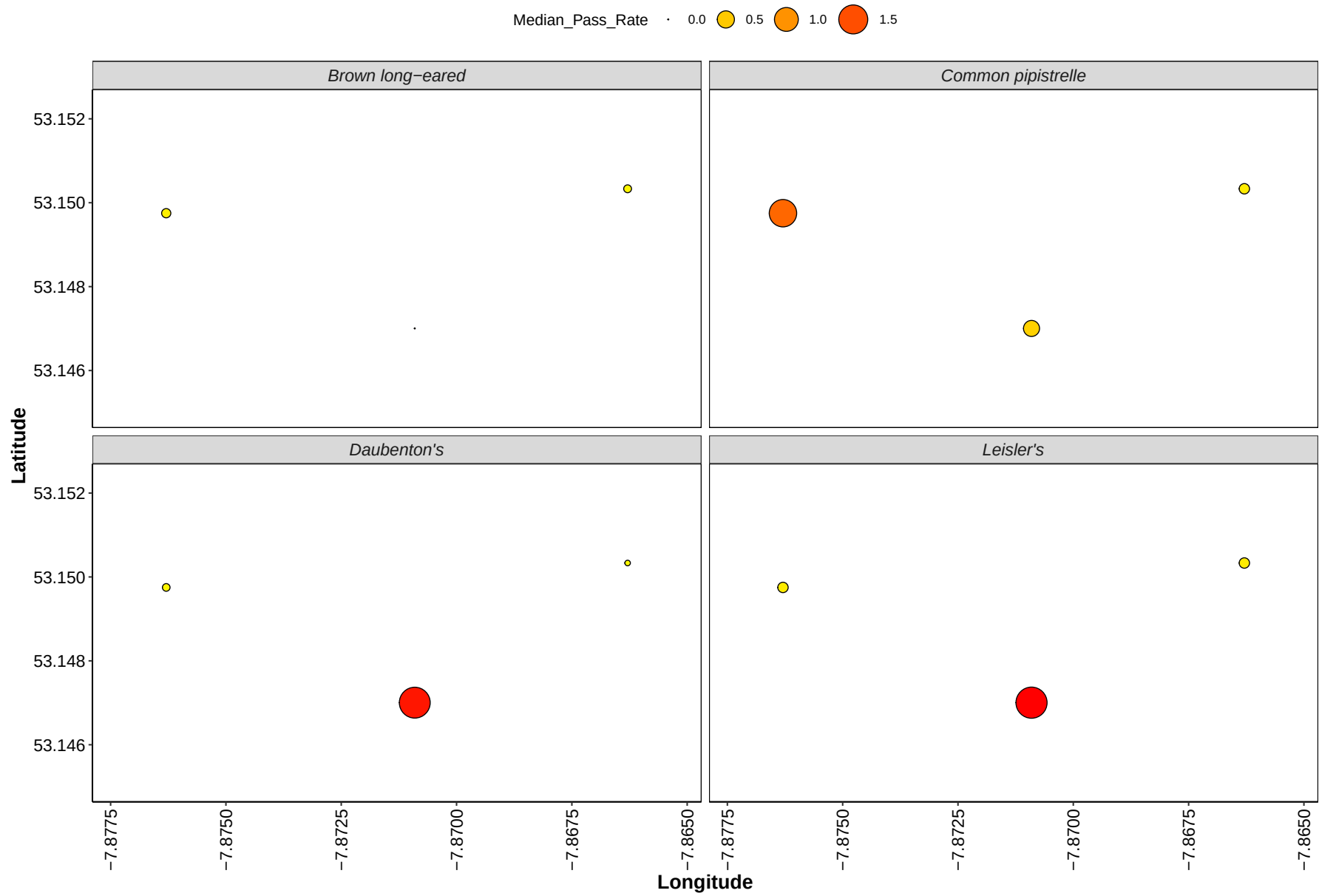


Figure 19. Median Nightly Pass Rate (bat passes/hr/night) throughout the survey period - represented by the size and colour of the point at each detector location.



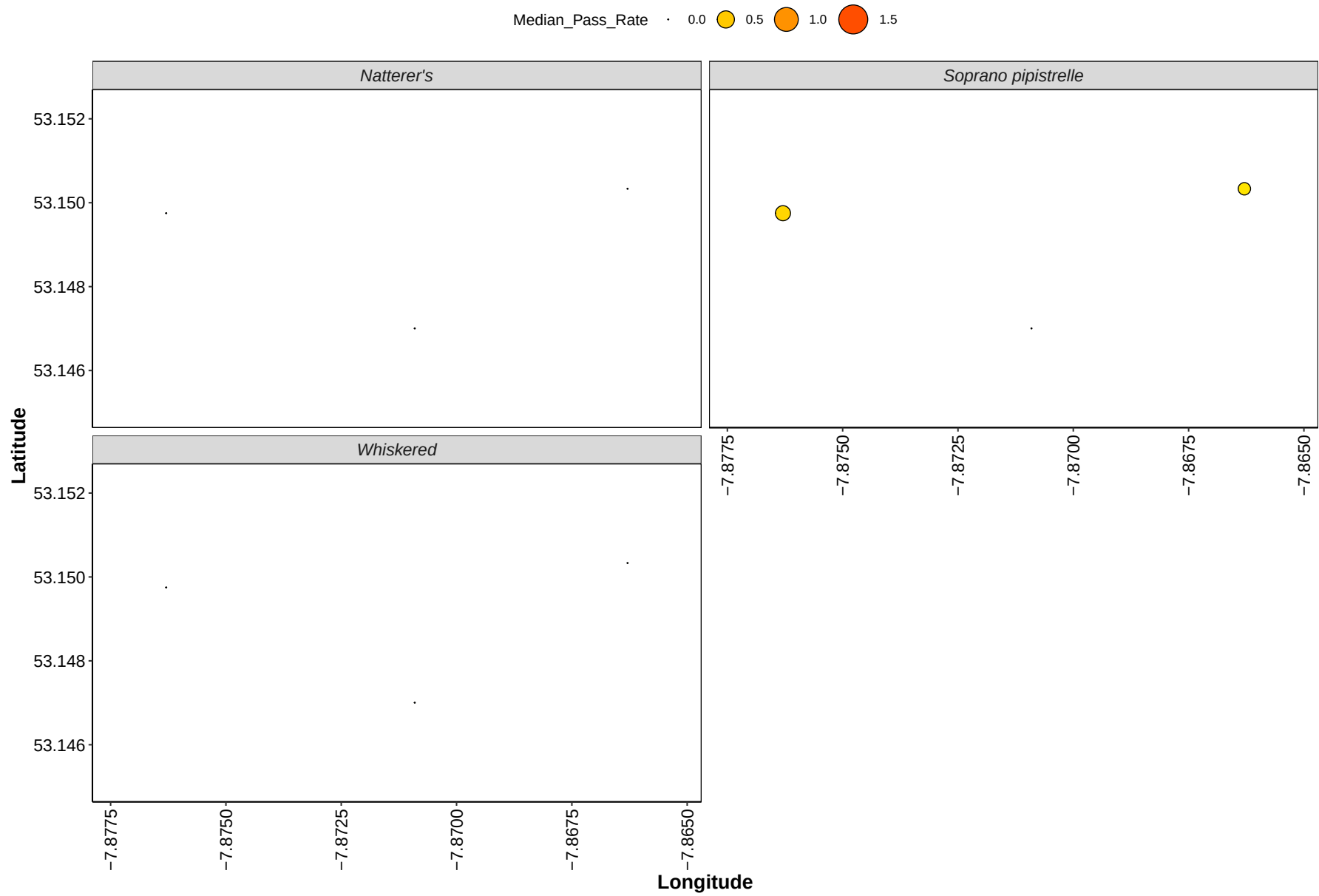
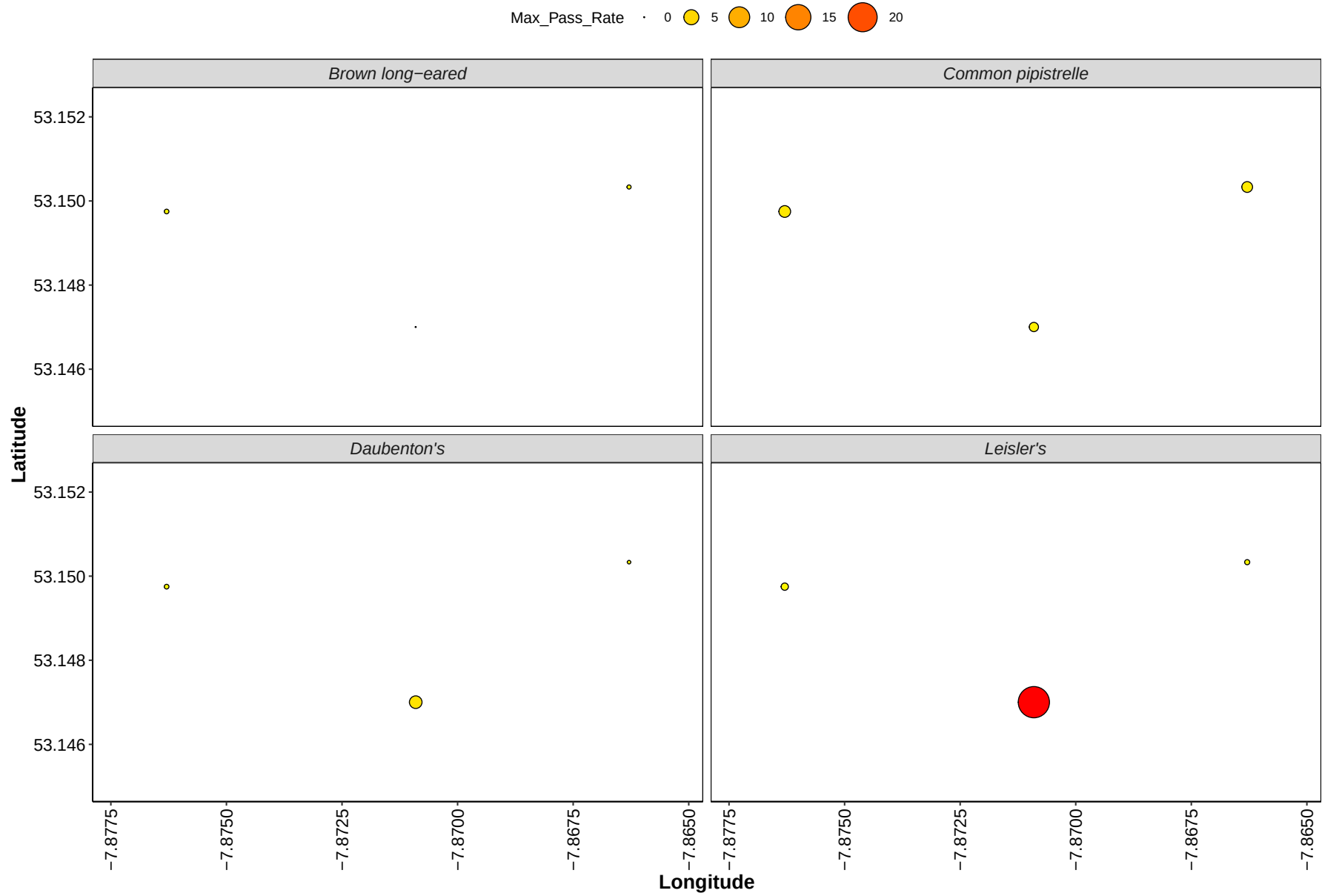
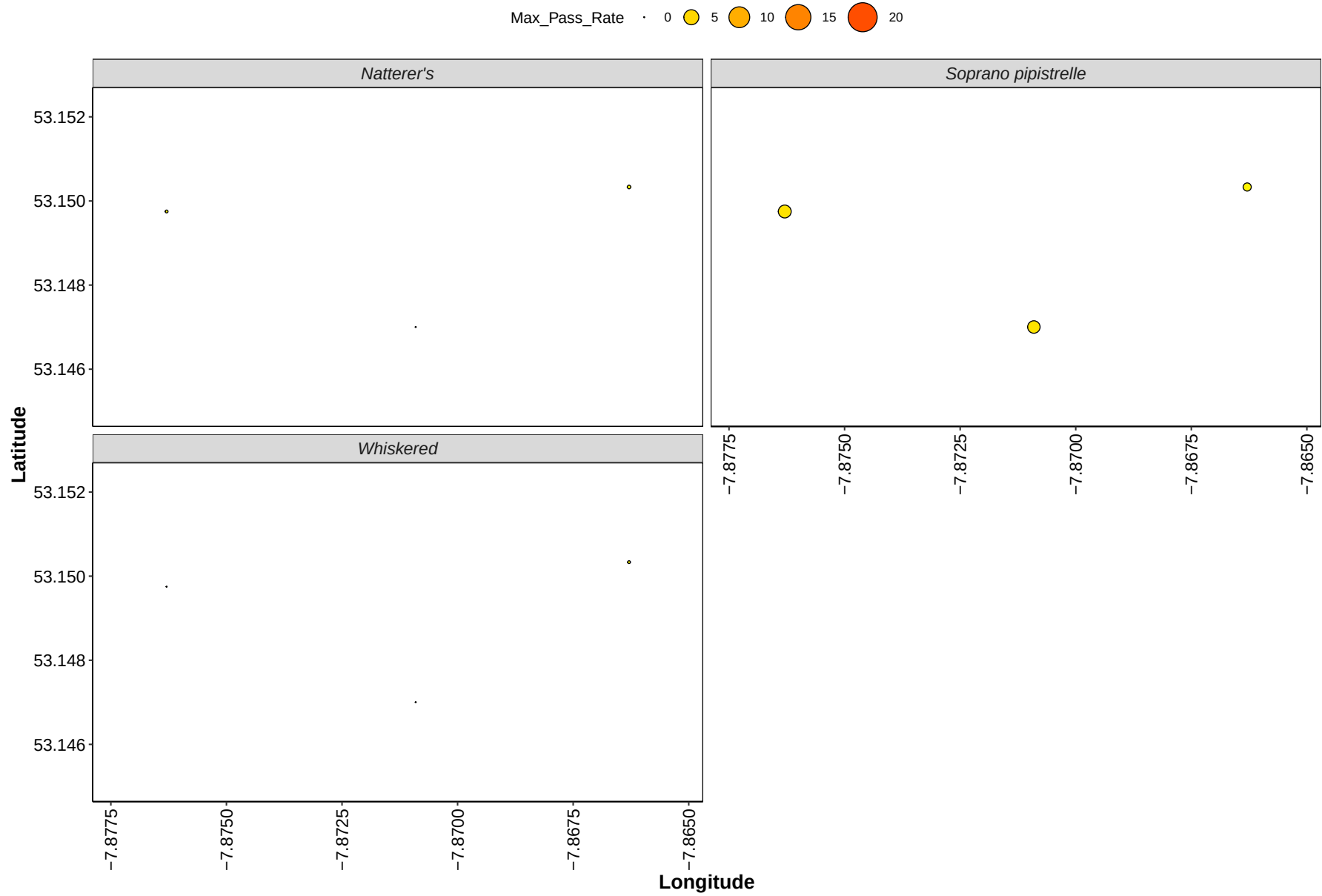
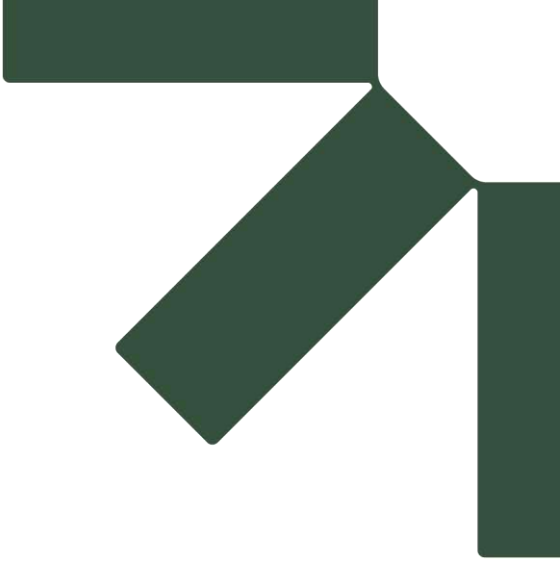


Figure 20. Maximum Nightly Pass Rate (bat passes/hr/night) recorded in a single night throughout the survey period - represented by the size and colour of the point at each detector location.





Thank you for using Ecobat!



Appendix G Weather Data

Baseline Bat Survey Report

Cush Wind Farm Phase III

Cush Wind Limited

SLR Project No.: 501.065723.00001

21 October 2026

Table G 1 Survey Dates and Weather Conditions – Static Detectors

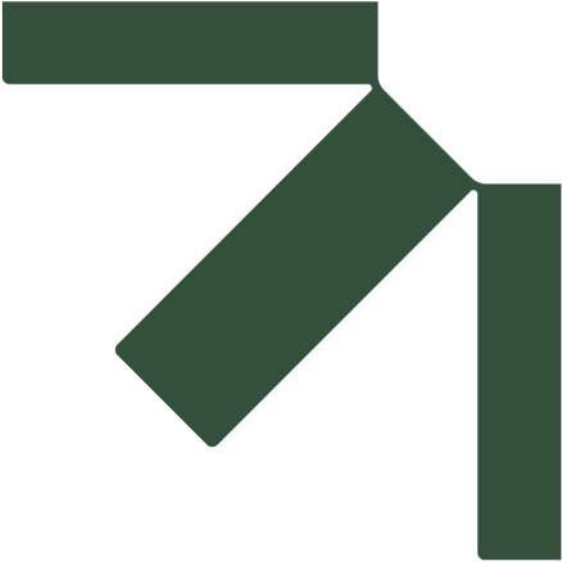
Survey Nights Used for Analysis	Sunset Date	Sunrise Date	Sunset (hh:mm)	Sunrise (hh:mm)	Temperature at Sunset (°C)	Mean Nightly Wind Speed (m/s)	Total Nightly Rainfall (mm)
Spring session 2025 - deployment dates: 10 nights between 06/05/2025 and 16/05/2025							
Night 1	06-May-25	07-May-25	21:08	05:45	12	1	0
Night 2	07-May-25	08-May-25	21:10	05:43	14.6	2.1	0
Night 3	08-May-25	09-May-25	21:12	05:41	11.6	1.3	0
Night 4	09-May-25	10-May-25	21:13	05:39	13.7	3.7	0
Night 5	10-May-25	11-May-25	21:15	05:38	14.2	1.5	0
Night 6	11-May-25	12-May-25	21:17	05:36	11.9	3.6	0.3
Night 7	12-May-25	13-May-25	21:18	05:34	15.7	3.2	0
Night 8	13-May-25	14-May-25	21:20	05:33	15.6	3.7	0
Night 9	14-May-25	15-May-25	21:22	05:31	14.7	2.6	0
Night 10	15-May-25	16-May-25	21:23	05:30	15.8	2.7	0
Summer session 2025 - deployment dates: 12 nights between 04/06/2025 and 16/06/2025							
Night 1	04-Jun-25	05-Jun-25	21:51	05:07	11.6	4.1	4.8
Night 2	05-Jun-25	06-Jun-25	21:52	05:06	11	3.4	1.4
Night 3	06-Jun-25	07-Jun-25	21:53	05:06	10.9	3.5	1.9
Night 4	07-Jun-25	08-Jun-25	21:54	05:05	11.1	3.4	0
Night 5	08-Jun-25	09-Jun-25	21:55	05:05	12.8	3.2	0
Night 6	09-Jun-25	10-Jun-25	21:56	05:04	14.2	5.1	1.7
Night 7	10-Jun-25	11-Jun-25	21:56	05:04	16.3	2.3	0.1
Night 8	11-Jun-25	12-Jun-25	21:57	05:04	16.1	3.3	8.2



Survey Nights Used for Analysis	Sunset Date	Sunrise Date	Sunset (hh:mm)	Sunrise (hh:mm)	Temperature at Sunset (°C)	Mean Nightly Wind Speed (m/s)	Total Nightly Rainfall (mm)
Night 9	12-Jun-25	13-Jun-25	21:58	05:04	16.5	5.3	0.3
Night 10	13-Jun-25	14-Jun-25	21:59	05:03	15.8	1.7	0
Night 11	14-Jun-25	15-Jun-25	21:59	05:03	14.3	4	0.4
Night 12	15-Jun-25	16-Jun-25	22:00	05:03	13.7	3.3	0
Autumn session 2025 - deployment dates: 10 nights between 16/09/2025 and 26/09/2025							
Night 1	16-Sept-25	17-Sept-25	19:44	07:09	13.2	7.4	16.6
Night 2	17-Sept-25	18-Sept-25	19:42	07:11	14.6	5.6	0
Night 3	18-Sept-25	19-Sept-25	19:39	07:12	17.8	5.3	3.2
Night 4	19-Sept-25	20-Sept-25	19:37	07:14	14.3	1.3	0.7
Night 5	20-Sept-25	21-Sept-25	19:34	07:16	11.6	5	0
Night 6	21-Sept-25	22-Sept-25	19:32	07:17	10.5	1.9	0
Night 7	22-Sept-25	23-Sept-25	19:29	07:19	11.7	0.6	0
Night 8	23-Sept-25	24-Sept-25	19:27	07:21	12.3	2.6	0
Night 9	24-Sept-25	25-Sept-25	19:25	07:23	13.4	3.3	0
Night 10	25-Sept-25	26-Sept-25	19:22	07:24	13.8	4	0







Appendix I Construction Environmental Management Plan

**Appropriate Assessment Screening Report and Natura
Impact Statement**

Cush Wind Farm Phase II

Cush Wind Limited

SLR Project No.: 501.065723.00001

23 October 2026





Cush Wind Farm
Phase II

Environmental Impact Assessment Report

Annex 3.4: Planning-Stage Construction Environmental Management Plan

Cush Wind Limited

DOCUMENT CONTROL

Stage	Date	Name
Content	21/10/2026	Declan Owens
Approval	21/10/2026	Gavin Daly

RECORD OF CHANGES

Revision	Issue Date	Summary of Changes	Approved
00	21/10/2026	Content	Declan Owens
01			
02			

DISTRIBUTION LIST

#	Purpose	Company	Name (Optional)
1	Review	Cush Wind Limited	James Carville
2			
3			
Notes:			

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1.0 INTRODUCTION

Galetech Energy Services (GES), on behalf of Cush Wind Limited, has prepared this Planning-Stage Construction Environmental Management Plan (CEMP) for the construction of the Cush Wind Farm Phase II.

1.1 PURPOSE OF THIS REPORT

This CEMP has been prepared to outline the management of activities during the construction of the project to ensure that all construction activities are undertaken in an environmentally responsible manner. This CEMP summarises the environmental commitments made in respect of the project and the measures to be adopted to ensure compliance with legislation and the requirements of statutory bodies.

This CEMP (Planning-Stage/Preliminary) is a live document and will be updated by the appointed contractor prior to the commencement of development. Prior to the commencement of construction, the updated CEMP will be reviewed by the Environmental Manager (EM) and Ecological Clerk of Works (ECoW), as necessary, to confirm the appropriateness of the measures set out therein. This CEMP will form part of the main civil construction works contract. The contractor will take account of the structure, content, methods and requirements contained within the various sections of this CEMP when further developing this document (to include environmental plans and other related construction management plans and method statements) as required.

1.2 OBJECTIVES OF THE CEMP

This CEMP has been developed in accordance with the Institute of Environmental Management and Assessment (IEMA) *Practitioner Environmental Management Plans Best Practice Series Volume 12 (December 2008)* and has been designed to address the proposed environmental construction strategies that are to be implemented in advance of and during the construction of the project.

This CEMP aims to define good working practices as well as specific actions required to implement mitigation requirements as identified in the Environmental Impact Assessment Report (EIAR), Natura Impact Statement (NIS), the planning process, and/or other licensing or consenting processes.

1.3 STRUCTURE OF THE CEMP

The CEMP has been structured such that it can be read as a consolidated document or as discreet documents addressing specific environmental topics. In particular, we refer to the technical annexes enclosed which address specific matters such as emergency responses (**Annex 1**), waste management (**Annex 2**), peat/spoil management (**Annex 3**), surface water management (**Annex 4**), and water quality management (**Annex 5**).

A copy of the CEMP will be maintained in the site offices for the duration of the construction phase and will be available for review at any time. The contractor's EM will be responsible for the continued development of the CEMP throughout the construction phase.

Where specific construction management plans or method statements are prepared by the contractor, these will be inserted into the relevant section of this CEMP.

1.4 ROLES & RESPONSIBILITIES

Cush Wind Limited, and its appointed Project Manager, will be responsible for the overall implementation of the environmental measures and procedures set out in the CEMP. The role of the Project Manager relates to compliance monitoring with the CEMP and other planning/environmental/licensing requirements. Additionally, the Project Manager shall be empowered to halt works where he/she considers that continuation of the works would be likely to result in a substantial environmental risk.

The Project Manager will also carry out site checks that the works are being undertaken in accordance with the CEMP and will prepare a record of same.

The Contractor will appoint an EM who will be responsible for coordination and development of the CEMP and any other surveys, reports or construction management plans necessary for the discharge of the requirements of the CEMP. The EM will also review the contractors construction management plans as required, carry out compliance auditing during the construction phase and coordinate the Environmental Management Group (see below) and required liaisons between Cush Wind Limited, the Contractor, and other statutory authorities.

Prior to commencement of construction, the Contractor will identify a core Environmental Management Group, comprising of specific project personnel and including the Project Manager, EM and ECoW. The Environmental Management Group will meet monthly to discuss the monthly environmental report and will advise site personnel on areas where improvements may be made on site. The group will draw on technical expertise from relevant specialists where required and will liaise with other relevant external bodies as required.

1.5 REPORTING PROCEDURES

Appropriate reporting procedures are key to the proper implementation of the measures outlined within this CEMP and include reporting between parties involved in the construction of the project and also external stakeholders, such as the relevant local authorities.

Emergency and environmental incident reporting procedures are set out in the Environmental & Emergency Response Plan (see **Annex 1**).

2.0 DESCRIPTION OF THE PROJECT

Cush Wind Limited proposes to construct Cush Wind Farm Phase II, comprising a three-turbine extension to the permitted Cush Wind Farm Phase I. The project comprises:

- 3 no. wind turbines with overall tip heights within the range of 199.1 m to 200 m, rotor diameters within the range of 158 m to 175 m and hub heights within the range of 111.6 m to 120.9 m;
- all associated turbine foundations and crane hardstanding areas;
- construction of approximately 1.7km of new internal site access tracks and upgrading of existing and permitted access tracks and access arrangements;
- use of the construction compounds permitted as part of Cush Wind Farm Phase I;
- 1 no. electrical switch room building and associated compound, including a new site entrance from the L300321 local road;

- underground electrical and communications cabling within the wind farm site;
- storage of excavated peat and spoil within designated peat and spoil deposition areas;
- site drainage, surface water management and environmental protection measures;
- reinstatement, environmental stabilisation and drainage management works, having regard to the wider rehabilitation objectives for Galros Bog;
- a c.5 km underground electricity line extending from the proposed electrical switch room to facilitate connection of the proposed wind farm to the national electricity network;
- temporary and permanent accommodation works along the turbine component haul route to facilitate the delivery of turbine components; and
- all associated and ancillary site development, excavation, construction, landscaping, reinstatement and environmental mitigation works.

The wind farm site is located in rural County Offaly, approximately 4 km north of Birr and c.28 km south-west of Tullamore. It extends across the townlands of Galros East, Whigsborough, Ballycollin, and Eglish, County Offaly.

The c.5 km underground electricity line will extend from the proposed electrical switch room, located on the southern side of the wind farm site, to the connection point at the proposed Mullanafawnia 110 kV substation. The Mullanafawnia 110 kV substation is third-party infrastructure that is subject to a separate consenting process and does not form part of the project.

The turbine component haul route and associated accommodation works extend through Counties Galway, Roscommon, Westmeath and Offaly. Turbine components will be transported from the Port of Galway through Counties Galway, Roscommon and Westmeath to the wind farm site in County Offaly.

The following environmental documents have informed the preparation of this CEMP:

- the Environmental Impact Assessment Report, prepared by Galetech Energy Services; and
- the Natura Impact Statement, prepared by SLR Consulting.

3.0 GENERAL CONSTRUCTION SEQUENCE

The construction phase is anticipated to last approximately 15–18 months, commencing with enabling works and continuing through turbine installation and commissioning to site reinstatement and landscaping.

Construction activities will be carried out between 07:00 and 19:00 Monday to Friday, excluding public holidays, and between 07:00 and 13:00 on Saturdays. Works outside these hours will be required on occasion to make optimal use of suitable weather conditions or during critical stages of the construction programme. These works will include turbine installation activities requiring low-wind conditions, continuous concrete pours and the delivery of large turbine components along public roads.

Where works are required outside the normal working hours, nearby residents and the Planning Authority will be notified in advance. Work on Sundays or public holidays will

only be undertaken in exceptional circumstances and will be agreed in advance with the Planning Authority.

3.1 CONSTRUCTION METHOD

The construction of the project will generally comprise the following sequence of activities, with a number of activities occurring concurrently or progressively:

- Implementation of traffic management and surface water protection measures;
- Establishment of the site entrances;
- Use of the temporary construction compounds permitted as part of Cush Wind Farm Phase I, including bunded areas for the storage of oils, fuels and lubricants;
- Establishment of peat/spoil deposition areas;
- Construction of internal access tracks and turbine hardstands;
- Excavation and construction of turbine foundations.
- Temporary accommodation works along the turbine delivery haul route;
- Trenching for underground ducting and laying of cables;
- Construction of the switch room building and compound, and associated electrical apparatus;
- Construction of the underground electricity line between the wind farm switch room and the proposed Mullanafawnia 110 kV substation;
- Erection of wind turbines.
- Testing and commissioning of the wind turbines, electrical apparatus and underground electricity line; and
- Progressive site reinstatement, restoration and landscaping, including re-profiling of spoil/peat deposition areas and removal of construction compounds.

Once the turbines are installed, and the switch room and electrical system completed, the turbines will be tested and commissioned.

In addition to the roles of the EM and ECoW described above, the construction phase will be supervised by a range of environmental and engineering specialist personnel; including a Project Supervisor for the Construction Stage (PSCS), Archaeological Clerk of Works (ACoW), and Geotechnical Clerk of Works (GCoW), among others; who will liaise closely with the appointed contractor's on-site EM to monitor construction activities and to ensure that all applicable environmental control measures are implemented in full.

3.2 SITE ENTRANCES

A total of 3 no. site entrances will be used to facilitate access to the project site, as described in **Chapter 3** and **Chapter 14** of the EIAR. These comprise:

- 1 no. permitted construction phase site entrance from the N62 national road, permitted as part of Cush Wind Farm Phase I, which will be used for construction traffic and turbine component deliveries;

- 1 no. permitted operation phase site entrance from the L300321 local road, permitted as part of Cush Wind Farm Phase I; and,
- 1 no. new site entrance from the L300321 local road to provide construction and operational access to the proposed electrical switch room building and associated compound.

The detailed design and assessment of the proposed site entrance, including visibility splays and traffic management requirements, are set out in **Chapter 3** and **Chapter 14** of the EIAR. The construction and use of the site entrances will be undertaken in accordance with the planning application drawings, the requirements of the Planning Authority and a Traffic Management Plan to be prepared prior to commencement of development (see **Section 3.8** below).

The new switch room entrance will be constructed within the defined entrance footprint and will include the placement of geotextile or geogrid, granular fill and surface dressing as required. Drainage features will be installed, where required, to manage runoff and prevent sediment-laden water from entering adjacent drains or surface water features. Temporary traffic management measures will be implemented during the works to ensure the safety of road users and construction personnel.

Following completion of the construction phase, the N62 construction phase entrance will be closed off and retained for occasional use in the event that access is required for major turbine component replacement during the operation phase. The permitted operation phase entrance from the L300321 local road and the new switch room entrance will be retained for operation phase access.

3.3 HARDSTANDING AREAS AND ON-SITE ACCESS TRACKS

The construction of crane hardstanding areas and on-site access tracks is described in **Chapter 3** of the EIAR. The purpose of this section is to summarise the principal construction and environmental management measures to be implemented during these works.

Hardstanding areas and access tracks will generally be constructed using imported granular material and, where suitable, re-used excavated material. The works will typically comprise the placement of geotextile or geogrid, followed by the placement and compaction of granular fill in layers to the required design depth. All such areas will remain permeable insofar as practicable, to minimise the generation of surface water runoff.

Where access tracks or hardstanding areas interface with existing drainage features, appropriate drainage measures will be installed in accordance with the drainage design and the mitigation measures set out in **Chapter 7** of the EIAR. These measures will be designed to maintain existing drainage patterns, prevent sediment release and avoid obstruction of surface water flow.

Temporary turbine component set down areas and crane assembly areas will be reinstated following completion of turbine installation works. Reinstatement will generally comprise the removal of temporary stone and geotextile, re-profiling with suitable excavated material and allowing the areas to revegetate naturally, unless otherwise required by the final reinstatement design. Permanent crane hardstanding areas and access tracks will be retained during the operation phase to facilitate maintenance access and potential major component replacement.

3.4 TEMPORARY SITE FACILITIES, LAYDOWN AND EQUIPMENT STORAGE AREAS

Temporary construction phase facilities, laydown areas and equipment storage areas required to support the works will be provided in accordance with the final contractor's method statements and the detailed CEMP to be prepared prior to commencement of development. These facilities will support construction management only and do not comprise a separate operational element of the project.

The final location, layout and management of any temporary site facilities will be confirmed prior to commencement and will have regard to the mitigation measures set out in the EIAR (**Annex 1.9**), including the requirements relating to surface water management, ecological protection, peat/spoil management, traffic management, waste management, chemical storage and emergency response.

Temporary storage and laydown areas will be appropriately demarcated and managed to prevent uncontrolled access, uncontrolled runoff, sediment release, spillages or the spread of waste materials. Following completion of the construction phase, temporary storage and laydown areas will be reinstated, unless otherwise required for operational access or maintenance.

3.5 CHEMICAL STORAGE & REFUELLING

The storage and handling of oils, fuels and chemicals will be undertaken in accordance with the mitigation measures set out in the EIAR (**Annex 1.9**), including **Chapter 7: Water**, and the detailed measures to be included in the final CEMP.

All oils, fuels and chemicals will be stored in appropriately bunded areas, with bunds having sufficient capacity for the quantity of material to be stored. Bunded storage areas will be located away from surface water features and drains, and no fuel, oils or chemicals will be stored or handled within the required buffer of surface water features.

Refuelling will be carried out by suitably trained personnel using appropriate equipment, including double-skinned bowsers, drip trays and spill kits and will not be permitted at works locations within the 50m hydrological buffer, as set out at Hydrological Constraints Map at **Annex 7.4** of the EIAR. Mobile refuelling will be subject to strict controls and will not take place within the surface water buffer zone. Spill kits and absorbent materials will be maintained at refuelling locations, fuel storage areas and in relevant site vehicles.

In the event of an accidental spillage, works will cease in the immediate area and the spill response procedures set out in this CEMP will be implemented. Any contaminated materials arising from a spill will be removed from site by an appropriately authorised waste contractor and brought to a suitably licensed or permitted facility.

3.6 CONSTRUCTION WASTE MANAGEMENT

Construction waste will be managed in accordance with the Waste Management Plan included within this CEMP (**Annex 2** hereto) and the waste management measures set out in **Chapter 3** of the EIAR. The appointed contractor will be responsible for ensuring that all waste generated during the construction phase is managed in accordance with relevant legislation, best practice and the waste hierarchy.

The principal construction waste streams are expected to include:

- surplus hardcore, stone, gravel, concrete and other construction materials;
- timber, packaging, plastics and dry recyclables;
- waste from welfare facilities;
- oils, fuels, chemicals and contaminated materials, where arising; and,
- unsuitable excavated material which cannot be reused on-site.

Waste will be segregated on site and stored in suitable skips, containers or other sealed receptacles within designated waste storage areas. Wherever practicable, suitable materials will be reused on site for reinstatement, landscaping or other appropriate construction purposes. Uncontaminated excavated material will be reused within the project site in preference to importation of clean inert fill, where suitable and subject to the requirements of the Spoil Management Plan.

All waste leaving the site will be transported by appropriately authorised waste contractors and brought to suitably licensed or permitted waste facilities. Waste transfer documentation will be retained by the contractor and made available for inspection as required.

Excavated peat/spoil will be managed separately in accordance with the Peat & Spoil Management Plan (**Annex 3** hereto) and the mitigation measures set out in the EIAR (**Annex 1.9**), including **Chapter 6** and **Chapter 7**.

3.7 CONSTRUCTION EMPLOYMENT

The construction phase workforce is described in **Chapter 3** and assessed, where relevant, in **Chapter 4** of the EIAR.

Cush Wind Farm Phase II will be constructed concurrently with the permitted Cush Wind Farm Phase I as part of a single coordinated construction programme. The project will require an additional construction workforce of up to 40 people, with the number present on site varying according to the activities being undertaken.

Employment will be the responsibility of the appointed contractor. Where practicable, opportunities for local employment and local supply chain participation will be supported during the construction phase.

3.8 CONSTRUCTION TRAFFIC

Vehicular construction traffic is assessed in detail in **Chapter 14** and is also described in **Chapter 3** of the EIAR. The purpose of this section is to summarise the principal traffic management measures to be implemented during the construction phase.

Construction traffic will include HGVs delivering construction materials, turbine components, electrical equipment and cabling; tipper trucks and excavation plant; cranes and crane support vehicles; and light vehicles associated with the construction workforce.

Turbine components are expected to be transported from the Port of Galway to the project site via the N6, M6, N52 and N62, before accessing the project site via the permitted construction phase site entrance from the N62. Turbine component deliveries will be undertaken in accordance with the Route Access Survey (**Annex 3.5**), a Traffic Management Plan and the requirements of the Planning Authority

(Authorities). Deliveries of turbine components will be timed to avoid peak traffic periods, where practicable, and will be accompanied by escort vehicles as required.

Construction traffic will be managed in accordance with a Traffic Management Plan to be prepared prior to commencement of development. The Traffic Management Plan will include, as appropriate:

- signage at site entrances and along relevant construction traffic routes;
- management of construction vehicle movements to and from the site;
- temporary traffic management measures at site entrances and works areas;
- measures to keep temporary traffic restrictions to the minimum necessary duration and extent;
- arrangements for abnormal load deliveries, including escort vehicles and consultation with relevant authorities;
- measures to prevent the deposition of mud, spoil or debris on the public road network;
- speed restrictions for construction traffic within and approaching the project site;
- arrangements for maintaining access for local residents, landowners and emergency services; and,
- contact details for a designated person responsible for traffic/access management.

Temporary and permanent accommodation works required along the turbine component haul route are described in **Chapter 3** and assessed in **Chapter 14**. These works will be undertaken in consultation with the relevant road authorities and in accordance with all necessary consents, licences and permits.

4.0 ENVIRONMENTAL MITIGATION & MANAGEMENT MEASURES

This section consolidates the construction phase environmental mitigation and monitoring measures derived from the Project Environmental Impact Assessment Report (EIAR), together with the relevant requirements of the Natura Impact Statement (NIS). The measures apply to the construction of Cush Wind Farm Phase II, comprising turbines T9–T11 and associated wind farm infrastructure, the proposed switch room, the c.5km underground electricity line and turbine haul route accommodation works. They cover activities before and during construction and the reinstatement of temporary working areas.

The appointed Contractor will incorporate these measures into the detailed Construction Stage CEMP, construction method statements, work instructions and site inductions. The Environmental Manager (EM), Ecological Clerk of Works (ECOW), Archaeologist and Geotechnical Engineer will oversee the relevant specialist measures. The requirements of the EIAR, Natura Impact Statement (NIS), supporting environmental management plans and any conditions of consent will be implemented in full.

References to the Peat & Spoil Management Plan (PSMP), Surface Water Management Plan (SWMP), Water Quality Management Plan (WQMP), Waste Management Plan (WMP) and Environmental & Emergency Response Plan (EERP) relate to the accompanying CEMP plans. The detailed plans will develop the

arrangements for implementing the assessed measures before works commence.

4.1 'DESIGNED-IN' MEASURES

The following measures will be implemented, as standard, as part of the construction of the project:-

- The turbine model will be selected within the assessed dimension range: rotor diameter 158m–175m, hub height 111.6m–120.9m and overall tip height 199.1m–200m. Construction will remain within the assessed development footprint and the scope of the planning permission. Any permitted micro-siting will retain the environmental constraints and protection measures identified in the EIAR;
- The construction arrangements will use the access infrastructure and temporary construction compounds permitted for Cush Wind Farm Phase I, as described in Chapter 3. The Phase II Contractor will coordinate shared facilities, deliveries and site activities with the Phase I construction team. Phase I will remain subject to the requirements of its own permission;
- The principal construction entrance will be from the N62. A separate entrance will serve the proposed switch room from the L300321 local road. Visibility splays of 90m in both directions, measured from a 2.4m setback, will be provided at the switch room entrance in accordance with the planning drawings;
- Internal wind farm cabling and the c.5km electricity line will be installed underground. The line will cross the N52 and L7006 public roads and the Rapemills River at two locations using horizontal directional drilling (HDD). These four crossings avoid open trenching within the public roads and river channel;
- No access-track crossing of a natural or EPA-designated watercourse is proposed within the wind farm site. Where tracks cross artificial bog drains, appropriately sized culverts or cross-drains will maintain the existing drainage pathways;
- The 50m buffer to natural watercourses will be maintained at the wind farm infrastructure. The specific pollution-prevention, HDD and flood-risk controls set out at Table C.1 will apply to underground electricity line works within this buffer;
- The extent of vegetation clearance and ground disturbance will be restricted to the works required for the assessed infrastructure. Retained hedgerows, treelines and habitats will be protected from unnecessary disturbance, with access between working areas restricted to the approved access/works corridor;
- Vegetation, topsoil, peat, subsoil and geological material excavated during construction will be segregated and managed in accordance with the Peat & Spoil Management Plan. Suitable material will be reused for reinstatement and landscaping, with surplus material placed within the designated deposition areas as assessed;
- The deposition arrangements will comprise the dedicated area southeast of T11 and the smaller deposition areas identified on the project drawings. The permissible locations, loading and construction methods will follow the Peat

Stability Assessment at Annex 6.1 and the Peat & Spoil Management Plan;

- Access tracks and crane hardstands will be constructed using the assessed methods, including floated construction where appropriate, geotextile and compacted aggregate. The Contractor will consult the turbine supplier during detailed design to confirm access and lifting requirements within the consented scheme;
- Temporary turbine-component set-down and crane-assembly areas will be located as shown on the planning drawings. Following their use, temporary aggregate and geotextile will be removed, the ground reinstated and the areas allowed to revegetate. The permanent crane hardstands and access tracks required for the operation phase will be retained;
- The site drainage system will be installed progressively ahead of the respective earthworks. Clean runoff will be separated from construction runoff, and sediment-laden water will be collected, attenuated and treated before controlled discharge. The drainage system will reflect the design assessed in Chapter 7 and the accompanying SWMP;
- The existing Galros Bog drains will be integrated with the project drainage where appropriate, having regard to the draft Galros Bog Rehabilitation Plan at Annex 6.2. The existing Bord na Móna settlement ponds provide supplementary attenuation/treatment; the project will not rely on those ponds as a substitute for its own drainage controls;
- Before construction, the Contractor will prepare detailed method statements for excavation, peat/spoil management, underground-line installation, HDD, construction drainage and working within watercourse buffers. The EM and relevant specialist will review the methods before the affected work commences;
- Only short sections of underground electricity line trench will be open at one time. Topsoil and subsoil will be stored separately and reinstated in sequence, subject to the technical requirements for bedding and cable protection. Completed working areas will be reinstated promptly;
- Works within the mapped Kilcormac Esker County Geological Site will remain confined to the cable trench and necessary working area. Geological material will be reinstated in its original sequence so far as practicable, original contours restored and no spoil permanently deposited within the mapped geological site;
- Materials will be sourced from appropriately authorised suppliers. Asphalt/road cuttings and other material unsuitable for on-site reuse or deposition will be removed by appropriately authorised collectors to appropriately authorised facilities;
- Fuels, oils and chemicals will be stored in the designated bunded compound facilities. Refuelling will use the specified double-skinned bowser, drip trays and spill-response equipment, with the watercourse and Rath Group Water Scheme restrictions set out at Table C.1;
- Temporary welfare facilities will use sealed chemical toilets/portaloos maintained by an authorised supplier. No untreated welfare wastewater will discharge to ground, surface water or the site drainage system;

- Normal construction hours will be 07:00–19:00 Monday to Friday, excluding public holidays, and 07:00–13:00 on Saturdays. Occasional works outside these hours will be necessary for favourable low-wind conditions, continuous concrete pours and delivery of large turbine components. Nearby residents and the Planning Authority will be notified in advance. Sunday or public-holiday working will occur only exceptionally and with the prior agreement of the Planning Authority;
- The ecological timing, species-buffer and lighting measures in Table C.1 will be addressed in the construction programme and work method statements. The Contractor will obtain ECoW input before activities that could disturb protected fauna or their breeding/resting places;
- Turbine component deliveries will follow the assessed Galway Port–N6–M6–N52–N62 route and the Route Access Survey at Annex 3.5. Abnormal loads will have the required permits, approvals and escorts, with timing agreed with the relevant road authorities and An Garda Síochána;
- A designated Project Manager and EM will coordinate the environmental requirements, supported by appropriately qualified ecological, archaeological and geotechnical personnel. Site inductions and toolbox talks will explain the relevant work-area constraints, pollution controls and incident reporting arrangements; and
- Temporary works, material stores and redundant construction facilities will be removed following their use. Reinstatement will proceed progressively, with drainage and erosion controls retained until the affected surfaces have stabilised.

4.2 CONSTRUCTION PHASE ENVIRONMENTAL MITIGATION AND MONITORING SCHEDULE

Table C.1 below sets out the consolidated construction phase mitigation and monitoring measures for implementation through this CEMP. It provides the measures in full, with references to the relevant EIAR chapters and NIS provisions for traceability. Construction implementation procedures are included where the assessments require their development or implementation through this CEMP.

The measures in Table C.1 will be implemented alongside the designed-in measures in **Section 4.1**. They include the construction, installation and reinstatement requirements for drainage, landscaping, aviation and other infrastructure that remains in use during the operation phase.

Topic and source	Construction mitigation and monitoring measures
Population & Human Health EIAR Chapter 4, Section 4.6.1	Landowner agreements As identified above, a series of measures has been agreed with involved landowners regarding the management of agricultural activities during the construction phase. These measures have been incorporated into signed legal agreements with the landowners and will be implemented in full.
Biodiversity EIAR Chapter 5, Section 5.6.1.1	Environmental supervision and construction practice A CEMP (Annex 3.4) has been prepared for the project to ensure adequate protection of the water environment. All personnel working on the project will be responsible for the environmental control of their work and will perform their duties

Topic and source	Construction mitigation and monitoring measures
	<p>in accordance with the requirements and procedures of the CEMP.</p> <p>During the construction phase, all works associated with the construction of the project will be undertaken in accordance with the guidance contained within CIRIA Document C741 'Environmental Good Practice on Site' (CIRIA, 2015). Any groundwater encountered will be managed and treated in accordance with CIRIA C750, 'Groundwater control: design and practice' (CIRIA, 2016).</p>
<p>Water Quality</p> <p>Natura Impact Statement, construction practice requirements</p>	<p>CEMP and construction practice</p> <p>A CEMP has been prepared for the Project to ensure adequate protection of the water environment. All personnel working on the project will be responsible for the environmental control of their work and will perform their duties in accordance with the requirements and procedures of the CEMP.</p> <p>During the construction phase, all works associated with the construction of the project will be undertaken in accordance with the guidance contained within CIRIA Document C811 'Environmental Good Practice on Site' . Any groundwater encountered will be managed and treated in accordance with CIRIA C750, 'Groundwater control: design and practice' .</p>
<p>Biodiversity</p> <p>EIAR Chapter 5, Section 5.6.1.2</p>	<p>Habitats and replacement planting</p> <p>Any treelines or hedgerows removed will be replaced in-situ or elsewhere in the Project at appropriate locations (i.e. designed to maximise ecological connectivity and outside of bat mitigation buffers). All new treelines or hedgerows will be planted using native species and in a similar composition to treelines or hedgerows lost.</p> <p>To avoid widespread disturbance to habitats, access within the project will be restricted to the footprint of the proposed works corridor and no access between different parts of the project will be permitted, except via the proposed works corridor. An Ecological Clerk of Works (ECoW) will be employed throughout the construction phase to ensure that construction activities do not encroach, unnecessarily, into any important habitats outside of the footprint of the Project.</p>
<p>Biodiversity</p> <p>EIAR Chapter 5, Section 5.6.1.1</p>	<p>Vegetation clearance and water protection</p> <p>Mitigation by Avoidance. There is a requirement in the Forest Service Code of Practice and in the FSC Certification Standard for the installation of buffer zones adjacent to aquatic zones at planting stage.</p> <p>During the construction phase, a self-imposed conservative buffer zone of 50m will be maintained for all Rapemills River and West Galros Stream where possible.</p> <p>The large distance between the majority of the felling areas and sensitive aquatic zones means that any poor quality runoff arising from felling areas can be adequately managed and attenuated prior to even reaching the aquatic buffer zone and primary drainage routes. Where tree felling is required in the vicinity of streams, the additional mitigation measures outlined below will be employed.</p> <p>Mitigation by Design. Mitigation measures which will reduce the risk of entrainment of suspended solids and nutrient release in surface watercourses comprise best practice methods, as follows:-</p> <ul style="list-style-type: none"> • Machine combinations (i.e. handheld or mechanical) will be chosen which are most suitable for ground conditions and which will minimise soils disturbance; • Checking and maintenance of tracks and culverts will be ongoing through any felling operation. No tracking of vehicles through watercourses will occur.

Topic and source	Construction mitigation and monitoring measures
	<p>Where possible, existing drains will not be disturbed during felling works;</p> <ul style="list-style-type: none"> • Ditches which drain from the areas to be felled towards existing surface watercourses will be blocked, and temporary silt traps will be constructed. No direct discharge of such ditches to watercourses will occur. Drains and sediment traps will be installed during ground preparation. Collector drains will be excavated at an acute angle to the contour (~0.3%-3% gradient), to minimise flow velocities. Main drains to take the discharge from collector drains will include water drops and rock armour, as required, where there are steep gradients, and avoid being placed at right angles to the contour; • Sediment traps will be sited in drains downstream of felling areas. Machine access will be maintained to enable the accumulated sediment to be excavated. Sediment will be carefully disposed of in the spoil disposal areas. All new silt traps will be constructed on even ground and not on sloping ground; • In areas particularly sensitive to erosion or where felling inside the 50m buffer is required, it will be necessary to install double or triple sediment traps; • All drainage channels will taper out before entering the 50m buffer zone. This ensures that discharged water gently fans out over the buffer zone before entering the aquatic zone, with sediment filtered out from the flow by ground vegetation within the zone. On erodible soils, silt traps will be installed at the end of the drainage channels, to the outside of the buffer zone; • Drains and silt traps will be maintained throughout all felling works, ensuring that they are clear of sediment build-up and are not severely eroded. Correct drain alignment, spacing and depth will ensure that erosion and sediment build-up are minimized and controlled; • Brash or bog mats will be used to support vehicles on soft ground, reducing topsoil and mineral soils erosion and avoiding the formation of rutted areas, in which surface water ponding can occur. Brash mat renewal will take place before they become heavily used and worn. Provision will be made for brash mats along all off-road routes, to protect the soil from compaction and rutting. Where there is risk of severe erosion occurring, extraction will be suspended during periods of high rainfall; • Timber will be stacked in dry areas, and outside the 50m watercourse buffer. Straw bales and check dams will be emplaced on the down gradient side of timber storage/processing sites; • Works will be carried out during periods of no, or low, rainfall in order to minimise entrainment of exposed sediment in surface water run-off; • Checking and maintenance of roads/tracks and culverts will be ongoing through the felling operation; • Refuelling or maintenance of machinery will not occur within 50m of a watercourse. Mobile bowser, drip kits, qualified personnel will be used where refuelling is required; • A permit to refuel system will be adopted; • Branches, logs or debris will not be allowed to build up in aquatic zones. All such material will be removed when harvesting operations have been completed, but care will be taken to avoid removing natural debris deflectors; • Trees will be cut manually from along streams and using machinery to extract whole trees; and • Travel will only be permitted perpendicular to and away from surface water features. <p>Silt Traps. Silt traps will be strategically placed down-gradient within forestry drains near streams. The main purpose of the silt traps and drain blocking is to slow water flow, increase residence time and allow settling of silt in a controlled manner.</p> <p>Drain Inspection and Maintenance. The following items will be carried out during</p>

Topic and source	Construction mitigation and monitoring measures
	<p>pre-felling inspections and regularly thereafter:-</p> <ul style="list-style-type: none"> • Communication with tree felling operatives in advance to determine whether any areas have been reported where there is unusual waterlogging or bogging of machines; • Inspection of all areas reported as having unusual ground conditions; • Inspection of main drainage ditches and outfalls. During pre-felling inspections, the main drainage ditches will be identified. Where possible, the pre-felling inspection will be carried out during rainfall; • Following tree felling, all main drains will be inspected to ensure that they are functioning; • Extraction tracks within 10m of drains will be broken up and diversion channels created to ensure that water in the tracks spreads out over the adjoining ground; • Culverts on drains exiting the site, if impeded by silt or debris, will be unblocked; and • All accumulated silt will be removed from drains and culverts, and silt traps, and this removed material will be deposited away from watercourses to ensure that it will not be carried back into the trap or stream during subsequent rainfall. <p>Surface Water Quality Monitoring. Sampling will be completed before, during (if the operation is conducted over a protracted time) and after the felling activity. The 'before' sampling will be conducted within 4-weeks of the felling activity commencing, preferably in medium-to-high water flow conditions. The 'during' sampling will be undertaken once a week or after rainfall events. The 'after' sampling will comprise as many samplings as necessary to demonstrate that water quality has returned to pre-activity status (i.e. where an impact has been shown).</p> <p>Details of the proposed surface water quality monitoring programme are outlined in the Water Quality Monitoring Plan (Annex 5 of this CEMP).</p> <p>The surface water sampling locations used in this EIAR for the project site and grid connection (i.e. SW1 – SW4) will also be used as sampling locations during felling activities.</p> <p>Also, daily surface water monitoring forms (for visual inspections and field chemistry measurements) will also be utilised at every works site near any watercourse. These will be taken daily and kept on site for record and inspection.</p>
<p>Biodiversity</p> <p>EIAR Chapter 5, Section 5.6.1.4</p>	<p>Invasive species biosecurity</p> <ul style="list-style-type: none"> • Prior to working on the Site, all contractors will be briefed on invasive species and will be provided with information on identification, and of the need to prevent further spread of invasive species, as well as details of the biosecurity protocol. • Any additional positive or suspected identification of invasive non-native species during Site works shall be reported to an ecologist for verification, so that appropriate advice can be given. • Cleaning operations will take place in a designated area to prevent further spread. • Mud and organic debris will not be allowed to accumulate on tracks, tyres or under wheel arches. • Personnel shall check and clean their footwear and tools each day before leaving the area to work on other Sites, or other parts of the Site.

Topic and source	Construction mitigation and monitoring measures
Biodiversity EIAR Chapter 5, Section 5.6.1.5	Nesting birds and vegetation clearance <p>The following will be implemented to reduce the possibility of damage and destruction (and disturbance to sensitive species) to occupied bird nests:-</p> <ul style="list-style-type: none"> • clearance of woodlands and uncultivated vegetation i.e. trees and hedgerows (including vegetation removal for creation/maintenance of bat mitigation buffers), will be undertaken outside the main breeding season from March to August inclusive; • if other site clearance and construction activities are required to take place during the main breeding bird season, pre-commencement survey work will be undertaken to ensure that nest destruction and disturbance is avoided; • once vegetation has been removed from the works corridor, these areas will be retained in a condition that limits suitability for nesting birds for the remainder of the construction phase e.g. vegetation cover for ground nesting species will be kept short by cutting or tracking over with an excavator; and • a suitably experienced Ecologist will be employed for the duration of the construction period to make contractors aware of the ornithological sensitivities of the Project and to undertake surveys for nesting birds throughout the construction period, enforcing exclusion areas as required.
Biodiversity EIAR Chapter 5, Section 5.6.1.5	Breeding wader buffers <p>In addition to the general measures set out above, species-specific disturbance-free buffers will be applied around any active nests of northern lapwing, common snipe and common ringed plover identified through pre- construction survey, reflecting the confirmed or probable breeding presence of these species within or adjacent to the site during baseline surveys.</p> <p>Accordingly, where pre-commencement or construction-phase survey identifies an active nest or breeding territory of these species within 500m of proposed works, a buffer will be established around the confirmed nest location, informed by the published disturbance distances applicable to each species (108m for northern lapwing (Hoetker et al., 2006) and 100–200m for common ringed plover (Goodship et al., 2022)). No published disturbance buffer exists for common snipe; in the absence of a quantified figure, a precautionary buffer of 100m will be applied, informed by the species' documented tolerance of close approach and the concentration of recorded foraging movements by incubating birds within 70m of the nest (Green, 1988). No construction activity will take place within the relevant buffer until breeding has concluded or the nest is confirmed to have failed, as determined by the site ECoW.</p>
Bird Protection Natura Impact Statement, Section 5.6.1 — General Pre-Construction Confirmation Surveys	Pre-construction and seasonal bird checks <p>Checks for nesting birds and/or wintering birds will be required for construction undertaken during the bird breeding season and/or winter season, respectively. If nests/wintering birds are recorded, ongoing monitoring and appropriate exclusion zones will be implemented to determine when and where works can proceed. If exclusion zones cannot be implemented, NPWS will be contacted and based on their advice, additional avoidance and mitigation measures will be implemented, with relevant licences applied for, if required.</p>
Biodiversity EIAR Chapter 5, Section 5.6.1.6	Protected mammals <p>Habitat features important for mammals will be retained as much as possible (e.g. hedgerows, treelines and scrub).</p> <p>A pre-construction walkover survey of the project will be undertaken. This will</p>

Topic and source	Construction mitigation and monitoring measures
	<p>search for mammal resting/breeding places, which could change over time. If any are identified, then appropriate exclusion zone(s) will be implemented and construction activities timed to avoid sensitive periods, such as the breeding season or hibernation, as relevant.</p> <p>The following will be implemented to reduce the possibility of direct and indirect effects on mammals:-</p> <ul style="list-style-type: none"> • limiting constructions works to daylight hours. Proposed construction hours are 07:00 and 19:00 Monday to Friday, excluding public holidays, and between 07:00 and 13:00 on Saturdays. Should these fall outside daylight hours, cowl and directional lighting will be used to avoid light spillage beyond the footprint of works; • providing exit points for any excavations (e.g. escape planks or spoil runs) so mammals do not become trapped; and • a suitably qualified Ecologist will be employed for the duration of the construction period to make contractors aware of the mammalian sensitivities of the Project and to undertake surveys for breeding or resting mammals throughout the construction period, enforcing exclusion areas as required. Though currently not required based on the baseline data, if this changes during pre-construction surveys, these are 50m for red squirrel, 100m for pine marten, 150m for otter and 50m for badger. • Vegetation/brush clearance will be undertaken outside November-March to avoid the hibernation period.
<p>Otter Protection</p> <p>Natura Impact Statement, Section 5.5.1.2 — Otters</p>	<p>Otter surveys and safeguards</p> <p>A pre-construction walkover survey of the project will be undertaken. This will search for otter holts/couches, which could change over time. If any are identified, then appropriate exclusion zone(s) will be implemented and construction activities timed to avoid sensitive periods, such as the breeding season.</p> <p>The following will be implemented to reduce the possibility of direct and indirect effects on otters:</p> <ul style="list-style-type: none"> • limiting construction works to daylight hours; • providing exit points for any excavations (e.g. escape planks or spoil runs) so otters do not become trapped; and • a suitably qualified Ecologist will be employed for the duration of the construction period to make contractors aware of the otter sensitivities of the project and to undertake surveys for breeding or resting otters throughout the construction period, enforcing exclusion areas (150 m) as required. If in the unlikely event that exclusion zones cannot be implemented, advice will be sought from NPWS, and appropriate avoidance and mitigation measures will be put in place and an application will be made to NPWS for a derogation licence if required.
<p>Biodiversity</p> <p>EIAR Chapter 5, Section 5.6.1.7</p>	<p>Bats and roost safeguards & Lighting</p> <p>Similarly, trees within the works corridor will be re-assessed for bat roosting potential, with any emergence surveys carried out as required.</p> <p>Along the grid connection, immediately in advance of construction works, an ecologist will undertake a comprehensive survey of bridges / structures / trees with bat roosting potential (see Annex 5. 6) and emergence surveys will be carried out to determine if bats are present following Collins (2023) guidelines.</p> <p>No destruction or disturbance of active bat roosts is predicted to be required. While one PRF-I tree was recorded within the UGL study area, this was located c.</p>

Topic and source	Construction mitigation and monitoring measures
	<p>11m from the proposed UGL and will be retained. No roosting bat, nor evidence of use by bats was observed. Regardless, 'soft felling' measures will still be implemented (BCT,2018). This will be carried out in suitable weather conditions and at appropriate times of year. Briefly, this involves the following:-</p> <ul style="list-style-type: none"> • removal of the tree in sections, starting with the top branches and working down the trunk avoiding cutting through cavities; • lowering of any sections with potential roost features with care, positioning them on the ground with potential entrances to roosts facing upwards to allow bats to exit the roost; and • leaving these sections in place for at least 24 hours in suitable weather. • The following will also be implemented to reduce the possibility of direct and indirect effects on bat species: lighting will be limited to daylight hours. However, where this cannot be avoided, directional lighting and cowlings will be used, avoiding light spill onto linear habitats and trees.
<p>Biodiversity EIAR Chapter 5, Section 5.6.1.8</p>	<p>Amphibian safeguards</p> <p>Pre-construction checks will be undertaken for spawning frogs if construction works are undertaken in February.-April Adults and spawn will be translocated under NPWS licence (currently available without application as licence no. 04/2026 and this would be revised in 2027, as available) to suitable alternative locations if present. Pitfall traps and drift fences will be used to capture adult frogs.</p> <p>Amphibian-proof fencing close to any waterbodies will be used to prevent frogs or smooth newts from accessing any parts of the Project most hazardous to amphibians during the construction phase.</p>
<p>Biodiversity EIAR Chapter 5, Section 5.6.2.3 and Table 5.19; EIAR Annex 5.7 — construction buffer constraints</p>	<p>Bat buffers</p> <p>NatureScot (2021) guidelines state that a 50m distance from the blade tips of the turbine to the nearest habitat feature must be maintained free of trees and shrubs for the duration of wind farm operation.</p> <p>The turbine buffer areas are already open, and no initial vegetation clearance is required. Their management will maintain separation between turbine blades and surrounding bat commuting and foraging habitat features and prevent the establishment of trees or scrub closer to the turbines. No reduction in recorded bat activity arising from initial vegetation clearance has therefore been assumed.</p> <p>Bat mitigation buffers will be established as specified in Chapter 5 (of the project EIAR) and the Habitat and Species Management Plan before the relevant turbines enter operation. The buffer geometry will reflect the selected turbine dimensions within the assessed range.</p>
<p>Biodiversity EIAR Chapter 5, Sections 5.6.1.2, 5.7.1 and 5.7.2; Tables 5.18, 5.20 and 5.21; EIAR Annex 5.7</p>	<p>Replacement planting and enhancement</p> <p>Any treelines or hedgerows removed will be replaced in-situ or elsewhere in the Project at appropriate locations (i.e. designed to maximise ecological connectivity and outside of bat mitigation buffers). All new treelines or hedgerows will be planted using native species and in a similar composition to treelines or hedgerows lost. Temporary habitat losses and reinstatement requirements are set out in EIAR Chapter 5 — Biodiversity, Table 5.18: Mitigation for Temporary Habitat Loss.</p> <p>To compensate for permanent habitat loss, compensation planting will be carried out within the Project site. The placement of these will be designed to ensure connectivity between habitat features at the project is maintained and</p>

Topic and source	Construction mitigation and monitoring measures
	<p>enhanced. The replacement of treelines and hedgerows will also ensure that there is no net loss as a result. The placement of these replacement hedgerows will also be used to help enhance biodiversity (see EIAR Chapter 5 — Biodiversity, Section 5.7.2). A balance sheet is presented in EIAR Chapter 5 — Biodiversity, Table 5.20: Compensation for Habitat Loss.</p> <p>Enhancement measures are detailed in the Habitat and Species Management Plan, EIAR Annex 5.7, with a balance sheet presented in EIAR Chapter 5 — Biodiversity, Table 5.21: Enhancement Measures – Habitats.</p>
<p>Land & Soils EIAR Chapter 6, Sections 6.5.1.1 and 6.5.1.2</p>	<p>Excavation and erosion control</p> <p>The excavation and long term storage of materials will be completed in accordance with best practice for the management and treatment of such materials.</p> <ul style="list-style-type: none"> • Mats will be used, as necessary, to support construction plant and machinery on soft ground, thus reducing the likelihood of soil and subsoil erosion and avoiding the formation of rutted areas. This will substantially reduce the likelihood for surface water ponding to occur; • Excavated material required for reinstatement or landscaping will be temporarily stored only in locations identified as suitable in the Peat Stability Assessment and Peat and Spoil Management Plan, outside identified peat-stability exclusion areas and applicable surface-water buffers. Material not required for reinstatement or landscaping will be transported directly to the designated spoil deposition areas; • Silt fences, and all necessary surface water management measures (including upslope interceptor drains), will be installed around all temporary stockpiles to limit movement of entrained sediment in surface water runoff. All slopes will be sealed with the bucket of an excavator; • In order to minimise erosion during the construction phase, works will not take place during periods of intense or prolonged rainfall (to prevent increased silt laden runoff). Drainage systems, as outlined in Chapter 7, will be implemented to limit runoff effects during the construction phase; • At the designated spoil deposition areas, material will be placed in layers to ensure stability is maintained and works will be undertaken in accordance with best practice construction methodologies. Works at the spoil deposition areas will be monitored, on a weekly basis during the construction phase and monthly for a 6 no. month period thereafter, by an appropriately qualified Geotechnical Engineer. In the event that any ground stability issues arise, the Engineer will have the power to cease works until such time as remedial works have been completed to his/her satisfaction; • Permanently mounded spoil; for example, berms surrounding turbines and hardstands, berms located along access tracks and at the spoil deposition areas; will be seeded and grassed over at the earliest opportunity to prevent erosion; and, • The underground electricity line trench will be reinstated to the required specification and in accordance with landowner requirements and will be reseeded or allowed to vegetate naturally (on agricultural land) or topped with tarmacadam (or similar along public roads) at the earliest opportunity to prevent erosion.
<p>Land & Soils EIAR Chapter 6, Section 6.5.1.3</p>	<p>Fuel, chemicals and spill protection</p> <ul style="list-style-type: none"> • The volume of fuel and oil stored on site will be minimised. Fuel and oil will be stored within appropriately bunded areas at the temporary construction compounds permitted as part of Cush Wind Farm Phase I and used during construction of the project. The bunded areas will be roofed to prevent rainfall

Topic and source	Construction mitigation and monitoring measures
	<p>ingress and will have a capacity of at least 110% of the volume stored;</p> <ul style="list-style-type: none"> • Refuelling of plant and machinery will be undertaken using a mobile double-skinned fuel bowser operated by trained and competent personnel. The bowser will be filled and stored at the construction compounds when not in use. Drip trays, absorbent mats and spill-response materials will be used during refuelling. Fuel and chemicals will not be stored or handled, and refuelling will not take place, within 50m of a surface-water feature; • All plant and machinery used during construction will be regularly inspected for leaks and fitness for purpose; • Spill kits will be available to deal with any accidental spillages within the temporary construction compound and during re-fuelling; • All asphalt or other road-cutting material arising from the haul-route accommodation works will be removed from the site and delivered to an appropriately authorised waste facility. This material will not be used for reinstatement or deposited within the spoil deposition areas; and • An emergency plan for the construction phase to deal with accidental spillages is contained within the Planning-Stage Construction and Environmental Management Plan (Annex 1 of this CEMP). This emergency plan will be further developed by the contractor prior to the commencement of construction.
Land & Soils EIAR Chapter 6, Section 6.5.1.4	Reinstatement <p>Areas of temporarily disturbed or levelled soil will be reinstated and allowed to revegetate. Silt fencing will be installed, where required, to prevent the mobilisation of soil into surrounding drains while vegetation becomes established.</p>
Land & Soils EIAR Chapter 6, Section 6.5.1.5; EIAR Annex 6.1	Peat stability controls <p>Sections of access roads to the nearest infrastructure element will be subject to the same mitigation/control measures that apply to the nearest infrastructure element.</p> <ul style="list-style-type: none"> • Appointment of experienced and competent contractors; • The site will be supervised by experienced and qualified personnel; • Allocate sufficient time for the project (be aware that decreasing the construction time has the potential to increase the risk of initiating a localised peat movement); • Prevent undercutting of slopes and unsupported excavations; • Maintain a managed robust drainage system; • Prevent placement of loads/overburden on marginal ground; • Implementation of safety buffers around deep peat areas; • Adhere to the spoil and peat storage restriction areas detailed in the Peat Stability Assessment (FT, 2026); • Set up, maintain and report findings from monitoring systems as outlined in the Peat Stability Assessment (FT, 2026); • Ensure construction method statements are developed and agreed before commencement of construction and are followed by the contractor; and, • Revise and amend the Construction Risk Register as construction progresses to ensure that risks are managed and controlled for the duration of construction.
Land & Soils EIAR Chapter 6, Section 6.5.1.6	Kilcormac Esker crossing safeguards <p>The following measures will be implemented where the underground electricity</p>

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	<p>line crosses the mapped Kilcormac Esker County Geological Site:</p> <ul style="list-style-type: none"> • The extent of the working area will be clearly demarcated before construction and will be kept to the minimum area required to safely complete the works; • Excavation will be confined to the underground electricity line trench and associated working area, and unnecessary disturbance of the adjoining esker slopes and landform will be avoided; • Topsoil, subsoil and underlying geological material will be excavated and stored separately to prevent mixing; • Excavated material will be reused within the trench, where technically suitable, and reinstated in its original sequence so far as practicable. Imported material will be limited to any bedding and surround required for the laying of the underground electricity line; • Excavated material will not be permanently deposited within the mapped geological heritage site; • Following installation of the underground electricity line, the trench and working area will be reinstated to the original ground levels, contours and surface condition as soon as practicable; • The works will be carried out in accordance with a site specific method statement reviewed by a suitably qualified geotechnical engineer or engineering geologist before construction; and • A photographic record of the crossing locations will be prepared before, during and following completion of the works to confirm that the landform and surface profile have been appropriately reinstated.
<p>Land & Soils EIAR Chapter 6, Section 6.5.4</p>	<p>Geotechnical monitoring</p> <p>Monitoring of land, soils and peat stability will be undertaken during the construction phase and for a six-month period following completion of construction. All excavated or raised areas, including cut-and-fill areas, reinstated or landscaped ground and the spoil deposition areas, will be inspected for signs of erosion or instability by an appropriately qualified Geotechnical Engineer appointed by the Developer. Inspections will be undertaken weekly during the construction phase and monthly for six months following completion of construction. The monitoring systems specified in the Peat Stability Assessment (Annex 6.1 of the project EIAR) will also be installed and maintained, with the findings recorded and reported in accordance with the requirements of that assessment. Where signs of erosion or instability are identified, appropriate remedial measures will be implemented under the direction of the Geotechnical Engineer.</p>
<p>Water EIAR Chapter 7, Section 7.5</p>	<p>Surface water drainage design</p> <p>The SWMP (Annex 4 of this CEMP) has regard to Greenfield runoff rates and is designed to mimic same and is sufficient to accommodate a 1-in-100 year rainfall event.</p> <ul style="list-style-type: none"> • All surface water runoff will be directed to specially constructed swales surrounding all areas of ground proposed to be disturbed (including the area for the temporary storage of material); • The swales will direct runoff into settlement ponds/silt traps where silt/sediment will be allowed to settle; • Following treatment, clean water will be discharged indirectly to the local drainage network via buffered outfalls thus ensuring that no scouring occurs; and, <p>The suite of proposed surface water drainage infrastructure will include</p>

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	interception drains, collector drains swales, sedimats, flow attenuation and filtration check dams, settlement ponds/silt traps, and buffered outfalls.
Water EIAR Chapter 7, Section 7.5.1.1; Natura Impact Statement, Section 5.5.1.1	<p>Watercourse buffers</p> <p>The key mitigation measure during the construction phase is the avoidance of sensitive aquatic areas by using a 50m buffer. From the constraints map (Annex 7.4 of the project EIAR) it is evident that only the underground electricity line is within a 50m buffer zone. In relation to hydrological constraints, a 50m hydrological buffer has been applied to natural watercourses within the wind farm site. All wind farm infrastructure is located outside this buffer. Sections of the underground electricity line necessarily pass within 50m of the Rapemills River and cross beneath it at two locations using HDD; the specific controls set out in Chapter 7 of the EIAR will apply to those works. Artificial bog and field drains are not treated as natural-watercourse constraints and will be maintained using appropriately sized culverts or cross-drains where crossed.</p> <p>As described above and at Chapter 3, specific mitigation measures, incorporated into the design of the project and through implementation of best practice methodologies (discussed below) will be employed where work inside buffer zones is proposed.</p> <ul style="list-style-type: none"> • Avoidance of physical damage to watercourses, and associated release of sediment; • Avoidance of excavations within close proximity to surface water courses; • Avoidance of the entry of suspended sediment from earthworks into watercourses; and, • Avoidance of the entry of suspended sediment from the construction phase drainage system into watercourses, achieved in part by ending drain discharge outside the buffer zone and allowing percolation across the vegetation of the buffer zone.
Water EIAR Chapter 7, Section 7.5.1.1; Natura Impact Statement, Section 5.5.1.1	<p>Sediment source and treatment controls</p> <ul style="list-style-type: none"> • Source controls to limit the likelihood for 'dirty water' to occur; • Interceptor drains, vee-drains, diversion drains, flume pipes, erosion and velocity control measures such as use of sand bags, oyster bags filled with clean washed gravel, filter fabrics, and other similar/equivalent or appropriate systems; • Small working areas, covering stockpiles, weathering off stockpiles, cessation of works in certain areas or other similar/equivalent or appropriate measures. • In-Line controls to ensure appropriate management of silt laden water: • Interceptor drains, vee-drains, oversized swales, erosion and velocity control measures such as check dams, sand bags, oyster bags, straw bales, flow limiters, weirs, baffles, silt bags, silt fences, sedimats, filter fabrics, and collection sumps, temporary sumps/attenuation lagoons, sediment traps, pumping systems, settlement ponds, temporary pumping chambers, or other similar/equivalent or appropriate systems. • Treatment systems to fully attenuate silt laden waters prior to discharge: • Temporary sumps and attenuation ponds, temporary storage lagoons, sediment traps, and settlement ponds, and proprietary settlement systems such as Siltbuster, and/or other similar/equivalent or appropriate systems; and • The existing settlement ponds lagoons on the BnM lands.

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Water EIAR Chapter 7, Section 7.5.1.1; Natura Impact Statement, Section 5.5.1.1	Existing drains and controlled discharge <p>It should be noted for this site that an extensive network of bog drains already exists, and these will be integrated and enhanced as required and used within the wind farm drainage system.</p> <ul style="list-style-type: none"> • Apart from interceptor drains, which will convey clean runoff water to the downstream drainage system, there will be no direct discharge (without treatment for sediment reduction and attenuation for flow management) of runoff from the wind farm drainage into the existing site drainage network. This will reduce the likelihood of any increased risk of downstream flooding or sediment transport/erosion; • Silt traps will be placed in the existing drains upstream of any streams where construction works is taking place, and these will be diverted into proposed interceptor drains, or culverted under/across the works area; and • Buffered outfalls, which will be numerous over the site, will promote percolation of drainage waters across vegetation and close to the point at which the additional runoff is generated, rather than direct discharge to the existing drains of the site.
Water EIAR Chapter 7, Section 7.5.1.1; Natura Impact Statement, Section 5.5.1.1	Additional water treatment and filtration <p>If the discharge water from construction areas fails to be of a high quality, then a filtration treatment system (such as a 'Siltbuster' or similar equivalent treatment train [sequence of water treatment processes]) will be used to filter and treat all surface discharge water collected in the dirty water drainage system. This water treatment train will apply for the entirety of the construction phase.</p> <p>Silt fences will be emplaced within drains down-gradient of all construction areas.</p> <p>Inspection and maintenance of these structures during construction phase is critical to their functioning to stated purpose. They will remain in place throughout the entire construction phase. Double silt fences will be emplaced within drains down-gradient of all construction areas inside the hydrological buffer zones to provide an additional layer of protection in these areas.</p> <p>Silt bags will be used where small to medium volumes of water need to be pumped from excavations. As water is pumped through the bag, most of the sediment is retained by the geotextile fabric allowing filtered water to pass through. Silt bags will be used with natural vegetation filters or sedimats (sediment entrapment mats, consisting of coir or jute matting) placed at the silt bag location to provide further treatment of the water outfall from the silt bag. Sedimats will be secured to the ground surface using stakes/pegs. The sedimat will extend to the full width of the outfall to ensure all water passes through this additional treatment measure.</p>
Water EIAR Chapter 7, Section 7.5.1.1; Natura Impact Statement, Section 5.5.1.1	Spoil deposition drainage <p>It is proposed that excavated overburden/spoil will be utilised for reinstatement of excavated areas etc. and for landscaping purposes. Excess material, or material which is unsuitable for this purpose, will be stored, permanently, at 1 no. dedicated spoil deposition area located southeast of proposed turbine T11 as well as smaller deposition areas at each of the 3 no. turbine locations.</p> <p>All proposed spoil deposition areas are located outside the 50m stream buffer zone (refer to Annex 7.4 of the project EIAR).</p> <p>During the initial placement of spoil in the deposition areas, silt fences, straw bales and biodegradable matting will be used to control surface water runoff. Double silt fencing will be placed along the edge of each bog drain that intercepts the</p>

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	<p>deposition areas.</p> <p>Drainage from overburden deposition areas will ultimately be into to the existing bog drain network where it is proposed that check dams will be installed every 20m or so to create a series of settlement ponds, before being discharged.</p> <p>Spoil deposition areas will be sealed with a digger bucket and vegetated as soon possible to reduce sediment entrainment in runoff. Once re-vegetated and stabilised, spoil deposition areas will no longer be a likely source of silt laden runoff. Surface water protection infrastructure will be left in place until the areas have stabilised.</p>
<p>Water</p> <p>EIAR Chapter 7, Section 7.5.1.1; Natura Impact Statement, Section 5.5.1.1</p>	<p>Underground electricity line works</p> <ul style="list-style-type: none"> • All existing dry drains that intercept the works area will be temporarily blocked down-gradient of the works using temporary check dams/silt traps (e.g. straw bales); • Clean water diversion drains will be installed upgradient of the works areas, as required; • Check dams/silt fence arrangements (silt traps or straw bales) will be placed in all existing drains that have surface water flows and also along existing roadside drains; • A double silt fence perimeter will be placed down-slope of works areas that are located inside the watercourse 50m buffer zones; • At drain crossing locations, where open trenching is required, damming and over pumping method will be used to manage flows in the drain.
<p>Water</p> <p>EIAR Chapter 7, Section 7.5.1.1; Natura Impact Statement, Section 5.5.1.1</p>	<p>Horizontal directional drilling</p> <ul style="list-style-type: none"> • Firstly, the crossing works area will be clearly marked out with fencing or flagging tape to avoid unnecessary disturbance of vegetation; • A minimum 10m vegetated buffer will be maintained between the HDD working areas, including launch and receiving pits, and the riverbank. Plant entry into this buffer will be avoided. Where limited access within the buffer is demonstrably unavoidable, ground-protection mats will be used and the duration and extent of access will be minimised. There will be no storage of material/equipment, excavated material or overnight parking of machinery inside the 10m buffer zone; • Double silt fencing will be placed upslope of the buffer zone on each side of the watercourse. • Mats will be used underneath the excavator, inside the 10 metre vegetative buffer zone, to prevent soil erosion/rutting and potential surface water quality impacts from localised surface water runoff; • Temporary storage of excavated material will be undertaken outside of the 10m buffer on flat ground or within a local hollow area. A containment berm will be placed downslope of the excavated material which in turn will be surrounded by secondary silt fence protection to prevent saturated soil from flowing back into the watercourse; • Operation of machinery and use of equipment within the 10m buffer will be kept to a minimum to avoid any unnecessary disturbance; • There will be no refuelling allowed within 50m of the watercourse crossing; • All plant will be checked for purpose of use prior to mobilisation at the watercourse crossing; and, • Works shall not take place during periods of heavy rainfall and will be scaled back or suspended if heavy rain is forecasted.

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Water EIAR Chapter 7, Section 7.5.1.1; Natura Impact Statement, Section 5.5.1.1	Drilling fluid containment <p>Mitigation Measures relating to the use of a mixture of a natural, inert and fully biodegradable drilling fluid such as Clear Bore™ and water for directional drilling include:</p> <ul style="list-style-type: none"> • The area around the Clear Bore™ batching, pumping and recycling plants will be bunded using terram and sandbags in order to contain any spillages; • One or more lines of silt fences will be placed between the works area and adjacent rivers and streams on both banks; • Accidental spillage of fluids will be cleaned up immediately and transported off site for disposal at a licensed facility; and, • Adequately sized skips will be used for temporary storage of drilling arisings during directional drilling works. This will ensure containment of drilling arisings and drilling flush.
Water EIAR Chapter 7, Section 7.5.1.1; Natura Impact Statement, Section 5.5.1.1	Frac-out prevention and response <p>A Fracture Blow-out (Frac-out) Prevention and Contingency Plan will be prepared by the drilling contractor prior to construction and will include the following measures:</p> <ul style="list-style-type: none"> • The drilling fluid/bentonite will be non-toxic and naturally biodegradable (i.e., Clear Bore Drilling Fluid or similar will be used); • The area around the drilling fluid batching, pumping and recycling plants will be bunded using terram and/or sandbags to contain any potential spillage; • A double row of silt fencing will be placed between the works area and the adjacent river; • Spills of drilling fluid will be cleaned up immediately and transported off-site for disposal at a licensed facility; • Adequately sized skips will be used where temporary storage of arisings are required; • The drilling process/pressure will be constantly monitored to detect any possible leaks or breakouts into the surrounding geology or local watercourse; • This will be gauged by observation and by monitoring the pumping rates and pressures. If any signs of breakout occur then drilling will be immediately stopped; • Any frac-out material will be contained and removed off-site; • The drilling location will be reviewed, before re-commencing with a higher viscosity drilling fluid mix; and, • If the risk of a further inadvertent return remains high, the drilling methodology and alignment will be reviewed within the assessed works corridor before drilling recommences.
Water EIAR Chapter 7, Section 7.5.1.1; Natura Impact Statement, Section 5.5.1.1	Weather controls and suspension thresholds <p>The works programme for the initial construction stage of the development will also take account of weather forecasts, and predicted rainfall in particular. Large excavations and movements of soil/subsoil or vegetation stripping will be suspended or scaled back if prolonged or intense rain is forecast. The extent to which works will be scaled back or suspended will relate directly to the amount of rainfall forecast.</p> <p>The following forecasting systems are available and will be used on a daily basis at the site to direct proposed construction activities:</p> <ul style="list-style-type: none"> • General Forecasts

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	<ul style="list-style-type: none"> • Meteo Alarm • 3 hour Rainfall Maps • Rainfall Radar Images • Consultancy Service <p>Works will be suspended if forecasting suggests either of the following is likely to occur:</p> <ul style="list-style-type: none"> • >10 mm/hr (i.e. high intensity local rainfall events); • >25 mm in a 24-hour period (heavy frontal rainfall lasting most of the day); or, • >half monthly average rainfall in any 7 days. <p>Prior to works being suspended the following control measures will be completed:</p> <ul style="list-style-type: none"> • Secure all open excavations; • Provide temporary or emergency drainage to prevent back-up of surface runoff; and, • Avoid working during heavy rainfall and for up to 24-hours after heavy events to ensure drainage systems are not overloaded.
<p>Water</p> <p>EIAR Chapter 7, Section 7.5.1.1; Natura Impact Statement, Section 5.5.1.1</p>	<p>Drainage installation and water quality monitoring</p> <p>The construction of the site drainage system will be carried out, at the respective locations, prior to other activities being commenced. The construction of the drainage system will only be carried out during periods of, where possible, no rainfall, therefore avoiding runoff. This will avoid the risk of entrainment of suspended sediment in surface water runoff, and transport via this pathway to surface watercourses. Construction of the drainage system during this period will also ensure that attenuation features associated with the drainage system will be in place and functional for all subsequent construction works.</p> <p>Prior to the commencement of development, a detailed Site Drainage Plan and SWMP will be prepared to detail the siting and composition of the surface water management measures. The respective plans, which will form part of a detailed Construction Environmental Management Plan (CEMP), will be prepared prior to the commencement of development.</p> <p>The CEMP will also include a detailed Water Quality Monitoring Plan for the monitoring of surface waters in the vicinity of the construction site by a designated Environmental Manager. The monitoring programme will comprise field testing and laboratory analysis of a range of agreed parameters. The civil works contractor, who will be responsible for the construction of the site drainage system, and Environmental Manager will undertake regular inspections of the drainage system to ensure that all measures are functioning effectively. The surface water sampling locations used in this EIAR (i.e. SW1 – SW4) will be used during construction activities. Regular inspections of all installed drainage systems will be undertaken, especially after heavy rainfall, to check for blockages, and ensure there is no build-up of standing water in parts of the systems where it is not intended.</p> <p>Any excess build-up of silt levels that may decrease the effectiveness of the drainage feature, will be removed and disposed of in an appropriate manner.</p>
<p>Water</p> <p>EIAR Chapter 7, Section 7.5.1.2</p>	<p>Excavation dewatering</p> <ul style="list-style-type: none"> • Appropriate interceptor drainage, to prevent upslope surface runoff from entering excavations, will be put in place; • The interceptor drainage will be discharged to the site constructed drainage system or onto natural vegetated surfaces and not directly to surface waters

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	<p>to ensure that Greenfield runoff rates are mimicked;</p> <ul style="list-style-type: none"> • If required, pumping of excavation inflows will prevent build-up of water in the excavation; • The pumped water volumes will be discharged via volume and silt/sediment ponds and settlement lagoons adjacent to excavation areas, or via specialist treatment systems such as a Siltbuster unit; • There will be no direct discharge to surface watercourses, and therefore no risk of hydraulic loading or contamination will occur; • Daily monitoring of wind farm excavations by the Environmental Manager will occur during the construction phase. If high levels of seepage inflow occur, excavation work at this location will cease immediately and a geotechnical assessment undertaken; and, • A mobile 'Siltbuster' or similar equivalent specialist treatment system will be available on-site for emergencies. • They will be used as final line of defence if needed.
<p>Water ElAR Chapter 7, Section 7.5.1.3</p>	<p>Fuel storage, refuelling and spills</p> <ul style="list-style-type: none"> • The volume of fuels or oils stored on site will be minimised. All fuel and oil will be stored in an appropriately bunded area within the temporary construction compound. Only an appropriate volume of fuel will be stored at any given time. The bunded area will be roofed to avoid the ingress of rainfall and will be fitted with a storm drainage system and an appropriate oil interceptor; • All bunded areas will have 110% capacity of the volume to be stored; • On site refuelling of machinery will be carried out using a mobile double skinned fuel bowser. The fuel bowser, a double-axel custom-built refuelling trailer will be re-filled at the temporary compound and will be towed around the site by a 4x4 jeep to where plant and machinery is located. No refuelling will be permitted at works locations within the 50m hydrological buffer. The 4x4 jeep will also be fully stocked with fuel absorbent material and pads in the event of any accidental spillages. The fuel bowser will be parked on a level area in the construction compound when not in use and only designated trained and competent operatives will be authorised to refuel plant on site. Mobile measures such as drip trays and fuel absorbent mats will be used during all refuelling operations to avoid any accidental leakages; • All plant and machinery used during construction will be regularly inspected for leaks and fitness for purpose; • Spill kits will be readily available to deal with and accidental spillages; • All waste tar material arising from road cuttings (from trenching or other works in public roads) will be removed off-site and taken to a licensed waste facility. Due to the potential for contamination of soils and subsoils, it is not proposed to utilise this material for any reinstatement works; and • An outline emergency plan for the construction phase to deal with accidental spillages is contained within the Planning-Stage CEMP (Annex 1 of this CEMP). This emergency plan will be further developed prior to the commencement of development, and will be agreed with the Planning Authority as part of the detailed CEMP.
<p>Water ElAR Chapter 7, Section 7.5.1.4</p>	<p>Concrete and cement controls</p> <ul style="list-style-type: none"> • No batching of wet-cement products will occur on site. Ready-mixed concrete will be brought to site as required and, where possible, emplacement of pre-cast products, will take utilised; • All drain crossings will utilise pre-cast products and the use of wet-cement products within the hydrological buffer will be avoided;

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	<ul style="list-style-type: none"> Where concrete is delivered on site, only the chute will be cleaned, using the smallest volume of water practicable. Chute cleaning will be undertaken at lined cement washout ponds with waters being stored in the temporary construction compound, removed off site and disposed of at an approved licensed facility. No discharge of cement contaminated waters to the construction phase drainage system or directly to any artificial drain or watercourse will be allowed; Weather forecasting will be used to ensure that prolonged or intense rainfall is not predicted during concrete pouring activities; and, The concrete pour site will be kept free of standing water and plastic covers will be ready in case of sudden rainfall event.
Water EIAR Chapter 7, Section 7.5.1.6	Receiving water treatment standards <p>With regard to treatment standards, the drainage system has been designed to achieve compliance with surface water Environmental Quality Standards (EQS) in the downstream receiving waters. Details of monitoring proposals, to ensure this compliance, is described in the Planning-Stage SWMP (Annex 4 of this CEMP).</p>
Water EIAR Chapter 7, Section 7.5.1.7	Rath Group Water Scheme source protection <p>No refuelling or handling of fuels/oil/lubricants/chemicals will be permitted within 100m of the mapped source protection area boundary.</p> <p>In addition, to prevent potential leaching of cement from the electricity cable trenching, a geotextile liner will be placed around the founding layer (lean mix concrete) where concrete is to be poured.</p> <p>Also, there will be clear signage in place inside the source protection area to remind construction workers that the area is inside a drinking water protection area and that there are restrictions around the use of fuels/oil/lubricants/chemicals.</p>
Water EIAR Chapter 7, Section 7.5.1.8	Flood warnings and managed retreat <p>The first point of mitigation is ongoing monitoring of weather forecasts and weather warnings. The project Environmental Manager (EM) or the site Ecological Clerk of Works (ECoW) will be responsible for monitoring weather forecasts during the construction phase.</p> <p>When the forecast indicates rainfall exceeding any of the works-suspension thresholds set out above, or where a Met Éireann Status Yellow or higher rainfall warning is issued, the planned responses detailed below will be implemented.</p> <p>A managed retreat from the fluvial flood zone will be implemented in the event of a forecasted high intensity rainfall event and/or weather warning related to rainfall. This will include the following:</p> <ul style="list-style-type: none"> Any areas where soil/subsoil is exposed at the surface will be compacted firmly with a digger bucket of a suitably sized excavator. Open trenches will be backfilled and compacted. Existing sediment control measures will be removed, as these may be washed away and deposited elsewhere by the floodwaters. All plant, machinery and equipment will be removed from the flood zones. Works will be postponed in the event of flood or high flows in the river. <p>Exposed soils/peat (exposed temporary stockpiles) will be covered with plastic sheeting during all relatively heavy rainfall events and during periods where works have temporarily ceased before completion at a particular area (e.g., overnight</p>

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	<p>and weekends).</p> <p>Cessation of all construction works until the storm event, including the storm runoff has passed. All construction works will cease during storm events such as yellow warning rainfall events. Following heavy rainfall events, and before construction works recommence, the project site will be inspected and corrective measures implemented to ensure safe working conditions e.g. dewatering of standing water in open excavations, etc.</p>
<p>Water</p> <p>ElAR Chapter 7, Section 7.5.2.2 — drainage installation requirements</p>	<p>Operation drainage</p> <ul style="list-style-type: none"> • Interceptor drains will be installed up-gradient of all infrastructure to collect clean surface runoff, in order to minimise the amount of runoff reaching areas where suspended sediment could become entrained. It will then be directed to areas where it can be re-distributed over the ground by means of a level spreader; • Swales/road side drains will be used to collect runoff from access tracks, turbine hardstanding areas and switch room compound areas which may contain entrained suspended sediment, and channel it to settlement ponds for sediment settling; • Transverse drains ('grips') will be constructed, where appropriate, in the surface layer of access tracks to divert any runoff into swales/track side drains; • Check dams will be used along sections of access tracks drains to intercept silts at source. Check dams will be constructed from a 40mm non-friable crushed rock or similar; • Swales and check dams will buffer volumes of runoff discharging from the drainage system during periods of high rainfall, by retaining water until the storm hydrograph has receded, thus reducing the hydraulic loading to watercourses; and, • Settlement ponds will be designed in accordance the greenfield runoff rate requirements; and, • Imported rock for construction purposes and road surfacing will be strong, well-graded limestone which will be resistant to erosion and have a low likelihood to generate fines in hardstand runoff.
<p>Air Quality</p> <p>ElAR Chapter 8, Sections 8.5.1.1 and 8.5.1.2</p>	<p>Communications and complaints</p> <ul style="list-style-type: none"> • Display the name and contact details of person(s) accountable for air quality and dust issues on the site boundary. This may be the environment manager/engineer or the site manager. • Display the head or regional office contact information. • Record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner, and record the measures taken. • Make the complaints log available to the local authority when asked. • Record any exceptional incidents that cause dust and/or air emissions, either on- or offsite, and the action taken to resolve the situation in the logbook.
<p>Air Quality</p> <p>ElAR Chapter 8, Section 8.5.1.3</p>	<p>Site layout, maintenance and stockpiles</p> <ul style="list-style-type: none"> • Plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible. • Use localised screening or enclosure around specific dust-generating activities where necessary and practicable. • Avoid site runoff of water or mud.

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	<ul style="list-style-type: none"> • Keep site fencing, barriers and scaffolding clean using wet methods. • Remove materials that have a potential to produce dust from site as soon as possible, unless being re-used on site. If they are being re-used on-site cover as described below. • Cover, seed or fence stockpiles to prevent wind whipping.
Air Quality EIAR Chapter 8, Section 8.5.1.4	Vehicles and machinery <ul style="list-style-type: none"> • Ensure all vehicles switch off engines when stationary – no idling vehicles. • Avoid the use of diesel- or petrol-powered generators and use mains electricity or battery powered equipment where practicable. • Impose and signpost a maximum-speed-limit of 25kph on surfaced and 15kph on unsurfaced haul roads and work areas (if long haul routes are required these speeds may be increased with suitable additional control measures provided, subject to the approval of the nominated undertaker and with the agreement of the local authority, where appropriate).
Air Quality EIAR Chapter 8, Section 8.5.1.5	Dust-generating operations <ul style="list-style-type: none"> • Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g. suitable local exhaust ventilation systems • Ensure an adequate water supply on the site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible and appropriate • Use enclosed chutes and conveyors and covered skips. • Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate. • Ensure equipment is readily available on site to clean any dry spillages and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods.
Air Quality EIAR Chapter 8, Section 8.5.1.6	Waste burning <ul style="list-style-type: none"> • Bonfires and burning of waste materials are legally prohibited.
Air Quality EIAR Chapter 8, Section 8.5.1.7	Earthworks <ul style="list-style-type: none"> • Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable • Use Hessian, mulches or trackifiers where it is not possible to re-vegetate or cover with topsoil, as soon as is practicable. • Only remove the cover in small areas during work and not all at once.
Air Quality EIAR Chapter 8, Section 8.5.1.8	Construction materials <ul style="list-style-type: none"> • Avoid scabbling (roughening of concrete surfaces) if possible. • Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place. • Ensure bulk cement and other fine powder materials are delivered in enclosed tankers and stored in silos with suitable emission control systems to prevent escape of material and overfilling during delivery.

Topic and source	Construction mitigation and monitoring measures
	<ul style="list-style-type: none"> For smaller supplies of fine powder materials, ensure bags are sealed after use and stored appropriately to prevent dust.
Air Quality EIAR Chapter 8, Section 8.5.1.9	Trackout <ul style="list-style-type: none"> Use water-assisted dust sweeper(s) on the access and local roads, to remove, as necessary, any material tracked out of the site. This may require the sweeper being continuously in use. Avoid dry sweeping of large areas. Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport. Inspect on-site haul routes for integrity and instigate necessary repairs to the surface as soon as reasonably practicable. Record all inspections of haul routes and any subsequent action in a site logbook. Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable). Access gates to be located at least 10m from receptors where possible.
Air Quality EIAR Chapter 8, Section 8.6.1	Dust inspections <ul style="list-style-type: none"> Undertake daily on-site and off-site visual inspections, where receptors (including roads) are nearby, to monitor dust, record inspection results in the site inspection log. This should include regular dust soiling checks of surfaces such as street furniture, cars and windowsills within 100m of construction works, with cleaning to be provided if necessary. Increase the frequency of site inspections by the person accountable for air quality and dust issues on site when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions.
Climate EIAR Chapter 9, Section 9.6.1	Plant and material efficiency <ul style="list-style-type: none"> Prevention of on-site or delivery vehicles from leaving engines idling, even over short periods. Ensuring that fossil fuel powered plant and equipment meet the Euro Stage V emission standard. Ensure all plant, machinery and vehicles are well maintained and inspected regularly. Ensuring, that site vehicles and delivery vehicles meet the Euro VI/Euro 6 standards for emissions. Excavated material will be reused within the project where suitable, with remaining peat and spoil managed within the designated peat/spoil deposition areas in accordance with the Peat and Spoil Management Plan. Specifying electrically powered plant and equipment where practicable and using grid connections for electric power when practicable instead of fossil fuel powered generators. On-site segregation of all waste materials into appropriate categories including, for example, topsoil, bedrock, concrete, bricks, tiles, oils /diesels, metals, dry recyclables e.g. cardboard, plastic, timber. Sourcing materials locally will be prioritised. This will help to reduce transport related CO₂ emissions and helps support local suppliers, further promoting economic sustainability.

Topic and source	Construction mitigation and monitoring measures
Climate ElAR Chapter 9, Section 9.6.1	Low carbon procurement <ul style="list-style-type: none"> For procurement of low carbon materials, the following low carbon material choices will be implemented unless there is a specific design practicality that prohibits it: <ol style="list-style-type: none"> Concrete: GGBS (Ground granulated blast-furnace slag), 30% lower clinker content cement, or better, where practicable; Fibre reinforced concrete or similar instead of steel reinforcement Steel: recycled or electric arc foundry steel, cross laminated timber; Bricks and aggregates: reclaimed or recycled.
Climate ElAR Chapter 9, Section 9.7.1	Climate resilience in design <ul style="list-style-type: none"> The wind farm drainage system has been designed to accommodate a 1-in-100-year rainfall event, as described in Chapter 7. The proposed turbines to be installed, are designed to the appropriate standards to account for the high wind loadings. High quality, durable building materials will be selected for the proposed project to reduce their sensitivity to extreme temperatures. Lightning protection conduits are integral to the construction of the blades. <p>The Proposed Project will be constructed having taken the most up to date Eurocodes, design practices and climate data into account prior to maximise resilience of the project against climate change hazards.</p>
Climate ElAR Chapter 9, Section 9.7.2	Construction weather hazards <p>In terms of impact on the proposed project due to climate change, during construction the Contractor will be required to mitigate against the effects of extreme rainfall/flooding, extreme temperatures and wind and storms through site risk assessments, method statements and good site management practice. All materials used during construction will be accompanied by certified datasheets which will set out the limiting operating temperatures. Temperatures can affect the performance of some materials, and this will require consideration during construction.</p>
Climate ElAR Chapter 9, Section 9.7.5	Carbon and weather monitoring <p>Monitoring and reporting of the embodied carbon in the construction phase will be conducted. The aim of monitoring will be to seek further ways to minimise climate impacts. Monitoring will include contractual obligations, in line with the most recent Climate Action Plan and sectoral targets, for the successful tenderer to ensure that the proposed development stays in line with updated aims. Commitments to monitor GHG emissions during the construction phase will also be secured through the final Construction Environmental Management Plan (CEMP). Monitoring will include embodied carbon of construction materials, water usage, power and fuel usage, and waste generation (including reuse and recycling rates). Where monitoring shows that the proposed development is not meeting its targets, further mitigation will be put in place.</p> <p>Monitoring should also include reviewing potential for extreme weather events which may cause damage during construction. Contractors' Environmental Management System (EMS) will include measures to address risks during such events i.e. flooding.</p>

Topic and source	Construction mitigation and monitoring measures
Landscape EIAR Chapter 10, Section 10.5.1	Embedded landscape measures <ul style="list-style-type: none"> • The colour will be industry standard off-white/light grey semi-matt non-reflective finish; • All internal wind farm electrical and communications cabling, together with the proposed c.5km underground electricity line, will be installed underground; • Special care will be taken to preserve any features, insofar as possible, which contribute to the landscape character of the study area; and, • Counter rotation of blade sets will be avoided.
Landscape EIAR Chapter 10, Section 10.5.2	Construction management and reinstatement <p>All construction activities will follow best practice methods to reduce effects on the environment, as outlined in the Construction and Environmental Management Plan (CEMP) which will manage the environmental commitments of the project through the construction phase. It is noted that an Environmental Manager (EM) and Ecological Clerk of Works (ECoW) with appropriate experience will be appointed for the duration of the construction phase to ensure that the CEMP is effectively implemented.</p> <p>The appropriate management and reinstatement of excavations in a timely manner will ensure that any adverse effects caused, for example at site entrances or road upgrade locations, are minimised insofar as possible.</p> <p>Temporary construction working areas will be reinstated to their original condition, with all vegetation lost to facilitate works replaced. Replacement planting of hedgerows and treelines will be undertaken in accordance with the measures set out in Chapter 5 of the project EIAR and the Habitat and Species Management Plan at Annex 5.7, under the supervision of the ECoW. All hedgerows and treelines lost during construction will be replaced within the Project, ensuring no net loss, with additional hedgerow planting providing a net gain. Planting locations will maintain and enhance connectivity between habitat features.</p> <p>The following standards are widely adopted as representing best practice in landscape operations:-</p> <ul style="list-style-type: none"> • BS 4428:1989 Code of practice for general landscape operations (excluding hard surfaces); • BS 5837:2012 – Trees in Relation to design, demolition and construction; • BS 8545 Trees: from nursery to independence in the landscape – Recommendations; and, • BS 3936 – Part 1: Nursery stock specification for trees and shrubs.
Landscape EIAR Chapter 10, Section 10.5.5	Landscape management and maintenance <p>It is reiterated that an EM and ECoW with appropriate experience will be appointed for the duration of the construction phase so that the CEMP is effectively implemented and that all landscape works will be subject to ongoing management and maintenance.</p>
Cultural Heritage EIAR Chapter 11, Section 11.6.1	Advance archaeological testing <ul style="list-style-type: none"> • Post-consent pre-construction test trenching shall be carried out within the footprint of the three turbine bases and hardstand areas. Test trenching will be carried out under licence to the Department of Housing, Local Government and Heritage and the National Museum of Ireland, and to the satisfaction of Offaly County Council. Provision will be made for the full excavation and

Topic and source	Construction mitigation and monitoring measures
	<p>recording of any archaeological features or deposits that may be exposed during test trenching.</p>
<p>Cultural Heritage ElAR Chapter 11, Section 11.6.1</p>	<p>Archaeological monitoring and boundary records</p> <ul style="list-style-type: none"> Archaeological monitoring of all excavations associated with construction of the wind farm shall be carried out. Monitoring will be carried out under licence to the Department of Housing, Local Government and Heritage and the National Museum of Ireland, and to the satisfaction of Offaly County Council. Provision will be made for the full excavation and recording of any archaeological features or deposits that may be exposed during monitoring; Archaeological monitoring of all excavations associated with construction of the underground electricity line shall be carried out. Monitoring will be carried out under licence to the Department of Housing, Local Government and Heritage and the National Museum of Ireland, and to the satisfaction of Offaly County Council. Provision will be made for the full excavation and recording of any archaeological features or deposits that may be exposed during monitoring; Archaeological monitoring of all excavations at townland, parish and barony boundaries shall be carried out. Monitoring will be carried out under licence to the Department of Housing, Local Government and Heritage and the National Museum of Ireland, and to the satisfaction of Offaly County Council. Provision will be made for the full excavation and recording of any archaeological features or deposits that may be exposed during monitoring; Written and photographic records will be created of any townland, parish and barony boundaries that may be impacted on. The written and photographic records will be created in advance of excavations commencing on site.
<p>Cultural Heritage ElAR Chapter 11, Section 11.6.2</p>	<p>Micrositing restriction</p> <p>It is recommended that micrositing associated with construction of the underground electricity line not be allowed within the historic garden recorded on the National Inventory of Architectural Heritage.</p>
<p>Noise & Vibration ElAR Chapter 12, Section 12.7.1; existing CEMP construction control schedule</p>	<p>Construction controls</p> <ul style="list-style-type: none"> The contract documents will specify that the Contractor undertaking the construction works will be obliged to adopt best practice noise abatement measures contained in British Standard BS 5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Noise and BS 5228-2:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Vibration. Evening, night-time, and Sunday working will be required during certain periods to facilitate large turbine component deliveries. The planning of such works will take consideration of sensitive receptors, in particular any nearby residential receptors. Construction activities will be scheduled in a manner that reflects the location of the site and the nature of neighbouring properties. Construction activities / plant items will be considered with respect to their potential to exceed CNTs at NSLs and will be scheduled according to their noise level, proximity to NSLs, and possible options for noise control. In situations where an activity with the potential to exceed CNT is scheduled, other construction activities will be scheduled to not result in significant cumulative noise levels. To ameliorate any potential noise effects that may present during the construction phase, a schedule of noise control measures has been formulated in accordance with best practice guidance, and the contract documents will require the Contractor to implement these measures. These

Topic and source	Construction mitigation and monitoring measures
	<p>are outlined in this CEMP.</p> <p>Construction noise and vibration control schedule</p> <ul style="list-style-type: none"> • Programme activities likely to generate higher noise or vibration within the normal working hours where practicable, and apply the prior-notification and exceptional-working arrangements at Section 4.1; • Establish communication between the Contractor, Developer, local authorities and residents, and appoint a site representative responsible for noise and vibration matters; • Monitor typical noise and vibration during critical activities and at sensitive locations as required by the construction programme, complaints investigation or consent conditions; • Keep site access tracks even and in good condition to minimise vibration and impact noise from HGVs; • Select plant with low inherent noise/vibration, and locate noisy or vibratory equipment as far from sensitive properties as the works permit; • Maintain plant, fit and retain effective silencers and other acoustic components, and avoid unnecessary idling; • Screen or enclose stationary noise sources, such as generators, compressors and pumps, where required, particularly where operation outside normal hours is necessary; • Use temporary acoustic screens or barriers where these are necessary to reduce exposure at nearby sensitive receptors, including at the more sensitive HDD or other local works locations; and • Record noise complaints, investigate the activity and operating conditions involved and implement appropriate corrective measures. The Acoustic Consultant will advise where specialist assessment or monitoring is required. <p>Rock Breaking and Vibration</p> <p>Significant rock breaking is not anticipated on the basis of the ground conditions described in the EIAR. If localised rock breaking is required, the following measures will be used where necessary:-</p> <ul style="list-style-type: none"> • Fit appropriate mufflers or sound-reduction equipment to the tool and seal compressed-air lines; • Use a dampened bit where appropriate to avoid ringing; • Place acoustic screening between the source and sensitive receptors, obscuring direct line of sight where practicable; and • Use a suitable portable/fixed acoustic enclosure with ventilation where required. <p>Construction methods and plant use will remain consistent with the noise and vibration assessment in Chapter 12. The Contractor will review vibration-generating activities near receptors with the Engineer and Acoustic Consultant where necessary.</p>
<p>Material Assets Transport & Access</p> <p>EIAR Chapter 14, Section 14.2.5.1</p>	<p>Construction hours and traffic controls</p> <ul style="list-style-type: none"> • Traffic movements will be limited to 07:00-19:00 Monday to Friday and 07:00-13:00 on Saturdays with no movements on Sundays or public holidays. It may be occasionally necessary to undertake works outside of these hours to avail of favourable weather conditions or during extended concrete pours. Where construction activities are necessary outside of the normal working hours, local residents and the Planning Authority will receive prior notification; • A wheel washing facility will be provided, as necessary, to prevent any debris being transferred from site to the adjacent public roads. All drivers will be

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	<p>required to ensure that their vehicle is free from dirt and stones prior to departure from the project site. Where conditions exist for dust to become friable, techniques such as damping down of the affected areas will be employed and vehicles/loads will be covered to reduce dust emissions;</p> <ul style="list-style-type: none"> • A Traffic Management Plan shall be agreed as part of the Construction Environmental Management Plan (CEMP) with the Local Authority prior to the commencement of development. The Traffic Management Plan shall include inter alia confirmed details of construction material haul routes; confirmed details of vehicle specifications; a materials delivery programme; traffic management measures including details of 'Stop/Go' systems, signage, road closures and diversionary routes; and road reinstatement details; • All works to the public road shall be undertaken in consultation with, and agreed in advance with, the relevant local authority; and • All reasonable steps shall be taken to ensure that only national and regional routes are used to transport all materials to the site, in so far as is possible.
<p>Material Assets Transport & Access</p> <p>ElAR Chapter 14, Section 14.2.5.2</p>	<p>Road surveys and repairs</p> <p>As described above; prior to and post construction, pavement condition surveys will be undertaken along all non-national access routes proposed to be utilised in the delivery of construction materials. Following the completion of the pre-construction survey, any works (additional to those which have been identified and described at Chapter 3) which are assessed as necessary to facilitate the delivery of components and materials to the project site shall be undertaken. Any deterioration of carriageways or structures identified in the post-construction survey shall be put right at the expense of the Developer and to the satisfaction of the relevant local authority.</p>
<p>Material Assets Transport & Access</p> <p>ElAR Chapter 14, Section 14.2.5.1</p>	<p>Signage, parking and access</p> <ul style="list-style-type: none"> • Adequate signage shall be provided at entrances providing access, safety and warning information; • Speed limit compliance; particularly along the local roads (including the L300321 local road); will be emphasised to all staff and contractors prior to the commencement of construction during site induction, and will be strictly enforced throughout the construction phase; • Sufficient car parking spaces will be available at the temporary construction compound during the construction phase. Additionally, during construction of the proposed grid connection, it is likely that agricultural premises will be used for the temporary storage of materials (e.g. ducting, cabling, etc.) and for the parking of construction plant, machinery, and work vehicles (cars, vans, etc.). No parking of cars by persons associated with the project will be permitted on any part of the public road that is not closed to traffic. All staff will be instructed to ensure that private entrances remain unobscured (particularly along the grid connection route); • Road sweeping, particularly along the proposed grid connection route, will be carried out as appropriate to ensure construction traffic does not adversely affect road conditions; • Traffic restrictions shall be kept to minimum duration and extent; • Appropriate traffic management; including maintenance of local access, pedestrian access (where safe to do so) and diversions (where required); shall be implemented to facilitate continued public use of roads where temporary traffic restrictions have to be put in place. Precise details of these measures will be detailed in the Traffic Management Plan to be agreed with the Planning Authority prior to the commencement of development.

Topic and source	Construction mitigation and monitoring measures
Material Assets Transport & Access EIAR Chapter 14, Section 14.2.5.1	Abnormal loads and coordination <ul style="list-style-type: none"> • The timing of oversized/abnormal loads shall be agreed with the relevant local authorities and An Garda Síochána, and all relevant licenses and permits shall be obtained in advance. All oversized/abnormal loads shall be accompanied by escort vehicles to ensure the maintenance of public safety; • Maximum axle loadings for abnormal/oversized loads shall be strictly enforced in accordance with the Road Traffic (Construction and Use of Vehicles) Regulations 2003 (S.I. No. 5 of 2003); • A designated contact point and coordinator will be put in place to manage all access arrangements and to interface with the public and the respective local authorities; and • The site shall be closed, and strictly secured, to the public during the construction phase.
Material Assets Aviation EIAR Chapter 14, Section 14.3.7.1	Crane notification and lighting As requested by the IAA in its consultation response, a minimum of 30-days prior notification will be provided regarding the commencement of crane operations at the project site. Additionally, as is best practice and implemented as standard, warning lights will be fitted to cranes during the erection of the wind turbines.
Material Assets Aviation EIAR Chapter 14, Section 14.3.7.2 — installation and completion requirements	Turbine lighting and as-constructed information The proposed wind turbines will, as requested by the IAA in their consultation response and implemented as standard, be fitted with aviation warning lighting in accordance with specification to be agreed with the IAA and the Planning Authority prior to the commencement of development. At a maximum of 30-days following the installation of all proposed turbines, 'as-constructed details' will be provided to the IAA to allow for the updating of mapping charts, including:- <ul style="list-style-type: none"> • The number of wind turbines; • WGS-84 coordinates of each turbine; • Ground elevation of each turbine (Malin Head OD); • Blade tip elevation of each turbine (Malin Head OD); • Height of Turbine; • Contour maps at the requisite scale; and • A note of which turbines have been fitted with obstacle warning lights.
Material Assets Telecommunications EIAR Chapter 14, Section 14.4.4.2; existing CEMP construction coordination	ESB link protection The developer will continue to consult with ESB to ensure that interference and degradation of any ESB link does not occur. The Developer will continue detailed coordination with ESB Networks using the proposed turbine details to agree measures safeguarding its radio links, including the line-of-sight interaction identified in relation to T11. Required measures will be agreed and implemented before erection of the affected turbine. The Project Manager will retain the coordination records and communicate the agreed requirements to the turbine supplier and Contractor. The relevant construction provisions in the Radio Telescope Impact Assessment at Annex 14.2 will be implemented. The Developer will maintain liaison with affected telecommunications operators during construction. The 2n protocol and consultation response at Annex 14.3 identify the arrangements applicable to

Topic and source	Construction mitigation and monitoring measures
	<p>Phase II for investigating and remediating attributable television interference; the protocol will remain available to the project team.</p>
<p>Material Assets Resources & Utilities</p> <p>EIAR Chapter 14, Section 14.5.4; existing CEMP utility protection procedures</p>	<p>Existing services and aggregate sourcing</p> <p>As identified above, accidental collision with overhead wires, sub-surface cables/pipes and/or forestry will be mitigated through the implementation of good construction practice and procedures.</p> <p>The sourcing of aggregates locally and from facilities which have been subject to EIA, will mitigate against the likelihood of significant effects during the construction phase.</p> <p>Additionally, during the process of connecting the project to the national grid, EirGrid will balance the loading on the network to ensure that no significant disruption occurs, and likely significant effects do not arise.</p> <ul style="list-style-type: none"> • Confirm existing underground and overhead service locations before excavation, using the relevant utility records and on-site verification appropriate to the work; • Agree required protection, crossing, clearance and safe-working arrangements with utility owners before the affected construction begins; • Obtain the necessary approvals before service diversions or connections and avoid unplanned interruption of existing services; • Construct the switch room water connection in accordance with the Eglis, Rath & Drumcullen Ltd Group Water Scheme requirements and the approved layout; and • Apply the waste, fuel, chemical and wastewater arrangements set out above to all utility and switch-room construction works.
<p>Material Assets Waste Management</p> <p>EIAR Chapter 3, waste management provisions; EIAR Chapter 14, Section 14.5.4; CEMP Waste Management Plan</p>	<p>Construction waste</p> <p>Construction waste will be segregated and stored in suitable receptacles within designated areas of the construction compounds. Materials will be reused or recycled where practicable, while waste requiring removal from site will be transported by appropriately permitted contractors to suitably authorised waste facilities. Records of waste removed from site will be maintained in accordance with applicable requirements. Further details are provided in the Waste Management Plan at Annex 2 of this CEMP.</p> <p>In the event that material is generated which is unsuitable for the deposition areas (e.g. asphalt) or excess material arises which cannot be accommodated on-site, it will be removed from the site to an appropriately licensed waste facility.</p> <p>The Contractor will implement the accompanying Waste Management Plan and apply the waste hierarchy throughout construction. Waste prevention, material reuse and recycling will be prioritised, with disposal used for residual material that cannot be appropriately recovered.</p> <ul style="list-style-type: none"> • Segregate waste at source into the appropriate streams, including packaging, timber, metals, cabling, concrete, general welfare waste and hazardous materials; • Provide clearly identified and secure storage facilities/skips, with covers and bunding/containment as appropriate to the waste type. Keep containers within capacity and arrange collection at suitable intervals; • Use appropriately authorised waste collectors and receiving facilities, retain transfer/collection records and maintain the waste inventory identifying the waste type, quantity, destination and relevant authorisation; • Store and handle oils, chemicals, used absorbents and other hazardous waste

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	<p>separately so that there is no leakage to soil, drains or watercourses;</p> <ul style="list-style-type: none"> • Manage construction welfare effluent through sealed units and authorised servicing; no discharge to ground or surface waters is permitted; • Manage excavated peat/spoil under the Peat & Spoil Management Plan, maximising suitable reuse and retaining surplus only within the assessed deposition arrangements; • Remove asphalt/road cuttings and other material unsuitable for on-site reuse/deposition to an appropriately authorised facility; • Do not burn waste on site. Brief personnel on the waste arrangements at induction and through toolbox talks; and • Inspect waste facilities and maintain records of collections, incidents and corrective actions in accordance with the Waste Management Plan.

Table C.1: Construction Phase Environmental Mitigation & Monitoring Measures

5.0 IMPLEMENTATION OF ENVIRONMENTAL MANAGEMENT MEASURES

In the first instance, the construction phase of the project shall be undertaken in strict compliance with all relevant measures set out in the EIAR, Natura Impact Statement and this CEMP, except where such measures are required to be updated or supplemented in order to comply with a condition of planning permission. All relevant conditions of consent shall be inserted at **Table C.2** below.

Planning Conditions		
Condition No.	Content	Relevance to Construction Phase (Yes/No)

Table C.2: Construction Related Conditions of Consent Table

This CEMP, which will be further developed prior to the commencement of construction, and all associated documentation, construction management plans, and construction method statements shall be prepared to ensure strict accordance with each of the measures of the EIAR, NIS, and conditions of consent. As stated at **Section 1.4** above, it will be the responsibility of the EM to ensure coordination between this CEMP, all associated construction management plans & method statements, and the requirements set out in relation to the project.

6.0 COMMUNICATION PLAN

Given the multitude of stakeholders to be involved in the construction phase of the project, a clear and concise communications plan will be implemented to ensure that all matters arising are appropriately reported and recorded. The Communications Plan, which will be developed by the contractor will include a reporting strategy including, but not limited to, the following personnel: -

- Cush Wind Limited Project Manager;

- Contractor Project Manager;
- Cush Wind Limited Project Supervisor for the Construction Stage (PSCS);
- Contractor Site Foreman;
- Environmental Manager;
- Ecological Clerk of Works;
- Geotechnical Clerk of Works; and
- Archaeological Clerk of Works.

Additionally, Cush Wind Limited shall appoint a designated person who shall be responsible for engaging with members of the local community regarding the provision of project updates, etc., and shall also be responsible for relaying any matters raised to the project team.

A list of project contacts, to be developed prior to the commencement of construction and included within the detailed CEMP, shall be made available to all construction staff while a copy shall also be provided at the site offices.

7.0 STAFF TRAINING & ENVIRONMENTAL AWARENESS

Only staff who have received appropriate training and have the necessary safety training/certification shall be permitted on-site.

All construction phase personnel will receive environmental awareness information as part of their initial site induction. The extent of their induction shall be tailored to the scope of their work; however, as a minimum, all environmental protection matters will be addressed in full. This will ensure that staff are familiar with environmental obligations associated with the construction process and the procedures and measures to be implemented. Staff will also be advised of the likely effects of any non-compliance with the relevant environmental measure.

As described at **Section 1.4**, the EM shall provide regular environmental updates to personnel and shall advise of any improvements which can be implemented.

Toolbox talks will be held by the EM, or other relevant personnel at the commencement of each day or at the commencement of new activities. The aims of the toolbox talks are to identify the specific work activities that are scheduled for that day or phase of work. In addition, the necessary work method statements will be identified and discussed. Additionally, any non-compliance with a measure in this CEMP will also be discussed with the aim of avoiding a re-occurrence of the same non-compliance.

8.0 EMERGENCY RESPONSE PROCEDURES

Prior to the commencement of construction, the Contractor shall prepare a comprehensive emergency response procedure to be implemented by on-site personnel. This on-site procedure shall be incorporated within the Environmental & Emergency Response Plan to ensure that appropriate procedures are in place to manage any incident and report same to the relevant stakeholders.

Planning Stage emergency and environmental incident reporting procedures are set out in the Environmental & Emergency Response Plan (see **Annex 1** hereto).

9.0 RECORDING & REPORTING

Over the course of the construction phase, a significant volume of reporting will be undertaken to record the activities, methodologies, and measures implemented during the construction phase. With regard to environmental recording, the following is a non-exhaustive list of reports/records which are likely to be appended to the CEMP as the construction phase progresses: -

- Site Sign-In Records;
- Weekly Environmental Reports;
- Monthly Environmental Reports;
- Site Visual Inspection Checklists;
- Environmental Audits;
- Ecological Survey Reports;
- Water Quality Monitoring Reports;
- Archaeological Monitoring Reports;
- Geotechnical Monitoring Reports;
- Traffic Management Plans;
- Waste management documentation;
- All relevant licences, consents, and permits;
- All correspondence (internal and external) regarding environmental matters; and,
- Staff Training Records.

10.0 COMPLIANCE & REVIEW PROCEDURES

10.1 SITE INSPECTIONS & ENVIRONMENTAL AUDITS

Routine inspections of construction activities will be carried out on a daily and weekly basis by the Contractor Project Manager, PSCS, Contractor Site Foreman, EM, and ECoW to ensure all environmental controls, relevant to the construction activities taking place at the time, are in place. Environmental inspections will ensure that the works are undertaken in accordance with this CEMP and all other relevant documentation.

10.2 AUDITING

The contractor will be responsible for ensuring that all construction staff are aware of the requirement to, and understand the importance of, strictly implementing the procedures of the CEMP. Environmental audits will be undertaken during the construction phase of the project. In contrast to monitoring and inspection activities, audits are designed to identify the underlying causes of non-compliances, and not to merely detect the non-compliance itself.

Moreover, audits are the means by which system and performance improvement opportunities may be identified. Environmental audits will be carried out by the contractor or by external personnel acting on their behalf. The impartiality and objectivity of the audit process is crucial in the identification of improvements to the activities being undertaken at the project site. Environmental audits will be scheduled and conducted at regular intervals to determine whether the CEMP is being

appropriately implemented. The findings of the audits will be provided to the Cush Wind Limited Project Manager, Contractor Project Manager, PSCS, EM, and ECoW.

A sample Environmental Audit is included within the accompanying Environmental & Emergency Response Plan.

10.3 ENVIRONMENTAL COMPLIANCE

As has been set out in the preceding sections, construction activities will be continuously and rigorously assessed to ensure that works are undertaken in accordance with the provisions of the detailed CEMP (to be prepared prior to construction). Where an environmental 'event/occurrence' has been identified, the following definitions shall apply: -

- Near-Miss: An event which has not resulted in an adverse environmental effect but which, if not addressed, could re-occur and result in adverse effects;
- Incident: An event which has occurred and which, if un-controlled, could result in substantial effects; however, on-site measures/procedures avoided such effects;
- Exceedance Event: Where an event has resulted in identifiable adverse effects which exceed the appropriate limit value (e.g. a deterioration of downstream water quality below acceptable limits). An exceedance event usually triggers the cessation of particular activities until an investigation has been completed and additional measures implemented; and,
- Non-Compliance: The identification of an un-agreed deviation from prescribed procedures/measures set out in this CEMP.

10.4 CORRECTIVE ACTIONS

A corrective action relates to the implementation of revised measures/procedures to rectify an identified environmental matter/concern/issue. Corrective actions will be implemented by the Contractor Project Manager, as advised by the PSCS and EM.

Corrective actions may be required as a consequence of: -

- Environmental Audits;
- Environmental Inspections; Environmental Monitoring;
- Environmental Incidents; and,
- Environmental Complaints.

A Corrective Action Notice will be used to communicate the details of the action required. A Corrective Action Notice will describe the cause and effect of the environmental issue/concern and will detail the recommended corrective action to be implemented.

If an environmental matter/concern/issue arises which requires immediate intervention; direct communications between the Contractor Project Manager, PSCS and EM will be conducted. A Corrective Action Notice will be completed subsequently.

ANNEX 1 – ENVIRONMENTAL & EMERGENCY RESPONSE PLAN





Cush Wind Farm
Phase II

Planning-Stage Construction Environmental Management Plan

Annex 1: Environmental & Emergency Response Plan

Cush Wind Limited

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DOCUMENT CONTROL

Stage	Date	Name
Content	19/10/2026	Declan Owens
Approval	19/10/2026	Gavin Daly

RECORD OF CHANGES

Revision	Issue Date	Summary of Changes	Approved
00	19/10/2026	Content	Declan Owens
01			
02			

DISTRIBUTION LIST

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1	Review	Cush Wind Limited	James Carville
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1.0 INTRODUCTION

Galetech Energy Services (GES), on behalf of Cush Wind Limited, has prepared this Environmental and Emergency Response Plan (EERP) which should be instigated if an emergency or environmental incident occurs either within the project site or elsewhere linked to the construction of the project.

1.1 PURPOSE OF THIS REPORT

Many construction and industrial sites have the potential to cause environmental harm which could pose threat to public health, water supplies and wildlife in the event of an environmental incident. The purpose of this report is to outline how, in the event of an emergency, effects on humans and the local environment can be limited through quick action.

This EERP forms part of the pre-commencement requirement for the works and outlines conditions of work for staff, and for every contractor or sub-contractor at the site.

This document is a live document which will be updated regularly and forms part of the Planning-Stage Construction Environmental Management Plan (CEMP) for the Cush Wind Farm. Consequently, the majority of specific details can only be provided prior to the commencement of construction activities.

It contains details of: -

- Who should be contacted in an emergency;
- Procedures to be followed in an emergency; and
- Staff responsibilities in an emergency.

1.2 ENVIRONMENTAL INCIDENT

This EERP should be implemented once there has been an emergency or environmental incident on site or elsewhere linked to the construction of the Cush Wind Farm. Incidents can be a discharge to air, land or water that could cause environmental damage. Causes of environmental incidents on site include:-

- Land Slide;
- Vandalism;
- Fire;
- Leaking plant or equipment;
- Containment Failure;
- Overfilling of containment vessels;
- Discharge of raw or partially treated effluent;
- Inadvertent return of drilling fluid during HDD works;
- Wind-blown waste, litter or dust;
- Flooding on site;
- Leaking Portaloo;
- Fuel drips or spills during refuelling;
- Leak from fuel or chemical containers;

- Failure of pumps and pipelines; and
- Contaminated water or sediment/silt entering a water course or drain.

Any of these incidents could affect drainage systems, surface waters, ecosystems, groundwater and soil. The production of toxic fumes and airborne pollutants could affect air quality which may damage human health, wild and domestic animals and ecosystems.

For each incident the response schedule will include; stop-work trigger, evacuation arrangements, responsible specialist, notification requirements and authority to restart.

1.3 REFERENCE DOCUMENTS

The production of this EERP has been supported by current legislation and will be accounted for in the further development of the appointed contractor's detailed CEMP.

Other guidance documents have been used to develop this EERP; including a Planning-Stage Construction & Environmental Management Plan, Waste Management Plan, Peat & Spoil Management Plan and Surface Water Management Plan.

2.0 REQUIREMENTS OF AN EERP

This EERP provides guidance for environmental incidents and includes:-

- Summaries of local environmental sensitivities;
- An outline of the construction works and sources to relevant existing environmental plans;
- Key mapping reference points for the site;
- Contact information for key external bodies and emergency response numbers who will assist in the event of an emergency;
- An identification of key staff and 24-hour contact details for those who will assist in the event of an emergency;
- An identification of Inventory of Pollution Prevention Equipment;
- Details of an Inventory of Chemical Products and Waste Inventory on Site;
- Details of reporting requirements;
- Details of staff who are trained in the use of spill kits and booms etc.;
- Procedures to be followed in the event of an emergency and an identification of those responsible for re-positioning and moving the plant; and
- A widely available summary sheet for operatives that outlines the key procedures in the event of an emergency.

3.0 DESCRIPTION OF THE PROJECT

Cush Wind Limited intends to construct **Cush Wind Farm Phase II**, comprising a 3 no. wind turbine extension to the permitted Cush Wind Farm Phase I. The project will consist of:-

- 3 no. wind turbines with overall tip heights within the range of 199.1 m to 200 m, rotor diameters within the range of 158 m to 175 m and hub heights within

the range of 111.6 m to 120.9 m;

- all associated turbine foundations and crane hardstanding areas;
- construction of approximately 1.7km of new internal site access tracks and upgrading of existing and permitted access tracks and access arrangements;
- use of the construction compounds permitted as part of Cush Wind Farm Phase I;
- 1 no. electrical switch room building and associated compound, including a new site entrance from the L300321 local road;
- underground electrical and communications cabling within the wind farm site;
- storage of excavated peat and spoil within designated peat and spoil deposition areas;
- site drainage, surface water management and environmental protection measures;
- reinstatement, environmental stabilisation and drainage management works, having regard to the wider rehabilitation objectives for Galros Bog;
- a c.5 km underground electricity line extending from the proposed electrical switch room to facilitate connection of the proposed wind farm to the national electricity network;
- temporary and permanent accommodation works along the turbine component haul route to facilitate the delivery of turbine components; and
- all associated and ancillary site development, excavation, construction, landscaping, reinstatement and environmental mitigation works.

The wind farm site is located in rural County Offaly, approximately 4 km north of Birr and c.28 km south-west of Tullamore. It extends across the townlands of Galros East, Whigsborough, Ballycollin, and Eglish, County Offaly.

The c.5 km underground electricity line will extend from the proposed electrical switch room, located on the southern side of the wind farm site, to the connection point at the proposed Mullanafawnia 110 kV substation. The Mullanafawnia 110 kV substation is third-party infrastructure that is subject to a separate consenting process and does not form part of the project.

The turbine component haul route and associated accommodation works extend through Counties Galway, Roscommon, Westmeath and Offaly. Turbine components will be transported from the Port of Galway through Counties Galway, Roscommon and Westmeath to the wind farm site in County Offaly.

Various environmental reports have been prepared in respect of the project and have been utilised in the preparation of this EERP, including:-

- Environmental Impact Assessment Report (Galetech Energy Services);
- Biodiversity Chapter (SLR Consulting);
- Land & Soil Chapter (Hydro Environmental Services);
- Water Chapter (Hydro Environmental Services); and
- Natura Impact Statement (SLR Consulting).

4.0 INCIDENT & HAZARD REPORTING

To ensure that all environmental incidents or hazards are accurately recorded, a reporting system has been developed. The logging of environmental incident reports will ensure that regular revisions and reviews can be made. In the event of an accident/incident, a blank environmental incident report has been provided, at **Section 8.6** of this report, that includes details of all non-compliance and corrective actions carried out as a result of any incidents.

5.0 WASTE DISPOSAL AFTER ENVIRONMENTAL INCIDENTS

In the event of a pollution incident where a spill kit etc. may be used, operatives must dispose of the used equipment by placing them into a sealed bag or container. Used equipment will then be removed from site by a licensed waste contractor to a licensed waste facility.

6.0 SITE INDUCTION & TOOLBOX TALKS

It is crucial that all contractors, sub-contractors and staff on site are fully familiar with this EERP. Toolbox talks will be regularly given to the workforce on the aspects of health and safety of this project and, during these talks, they will receive regular reminders of the importance of not only the local environment but of the necessary environmental controls that are in place on site.

7.0 SUMMARY SHEET FOR MACHINERY & PLANT OPERATORS

The following procedures are a guide when dealing with incidents. To ensure health and safety for yourself and others, this health and safety guidance should be followed at all times alongside applying common sense:-

1. Identify the source of the spillage and, where safe, stop the release by isolating the equipment, closing a valve or securing the container;
2. Stop the affected works and immediately notify the Project Manager and Environmental Manager. Keep personnel clear of the affected area. Only trained personnel will undertake spill containment, using appropriate protective equipment and where safe to do so;
3. Identify the spillage route. If spillage is in close proximity to a watercourse (drainage/ditch/river), divert spillage away from the watercourse through the use of absorbent materials from the spill kit;
4. Where sediment release or slope failure threatens a watercourse, stop the affected works and notify the Project Manager and Environmental Manager immediately. Contain runoff within the works area using the agreed drainage controls, where safe. The Environmental Manager, ECoW and geotechnical specialist, as appropriate, will direct further measures. Any proposed intervention within a natural watercourse will be assessed and agreed with the relevant authorities before implementation;
5. If there has been an oil spill in the watercourse, do the following:-
 - a. Place flexible absorbent booms across the watercourse, ahead of the contamination within a quiet stretch of water;
 - b. Place absorbent cushions in the water immediately upstream of these booms as well as downstream of the booms; and

- c. Remove and replace saturated absorbent material as required. Please ensure removed cushions are placed in sealed polythene bags/containers and disposed of by the principal waste contractor;
6. Notify all parties in the order listed overleaf. Notification should be made by one member of staff whilst remaining staff present deal with the spill;
7. Contaminated ground will be assessed by the Environmental Manager before recovery works commence. Recovery will take account of ground stability, buried services and ecological constraints. Recovered materials will be segregated, securely contained and removed by an appropriately authorised waste collector to an authorised receiving facility.; and
8. Complete required record of incident and response into reporting system.

For each incident the response schedule will include; stop-work trigger, evacuation arrangements, responsible specialist, notification requirements and authority to restart.

In the event of suspected or actual peat instability, the contingency procedures set out in Section 8.0 of the Peat & Spoil Management Plan (**Annex 3** to the CEMP, provided within EIA Annex 3.4) will be activated. These include cessation of activities within the affected area, increased monitoring, notification of the relevant authorities and assessment of appropriate stabilisation measures.

On detection of a suspected drilling-fluid breakout, drilling will stop immediately and the HDD contractor's Frac-out Prevention and Contingency Plan will be activated. Drilling will recommence only following the review and corrective measures specified in that plan.

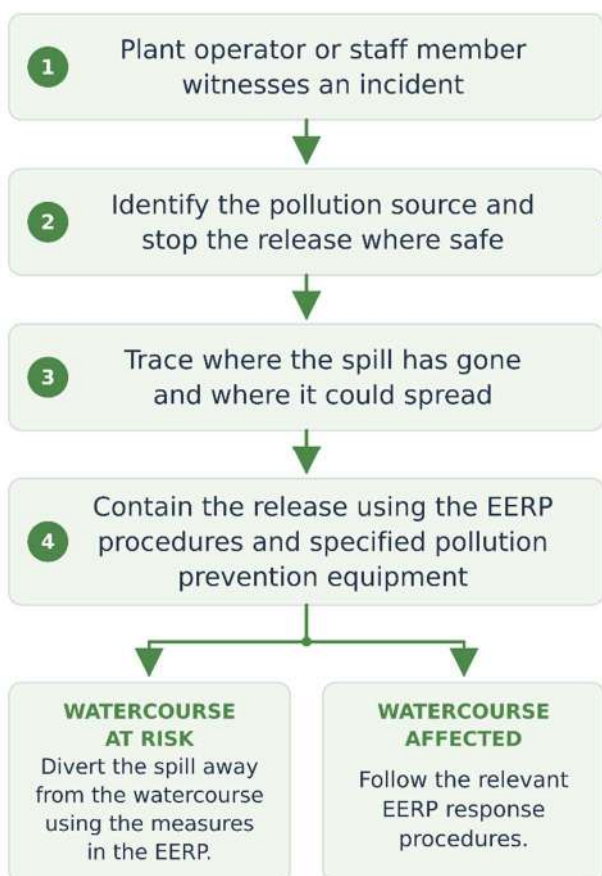
8.0 COMMUNICATION PLAN

A detailed Communication Plan will be provided by the Contractor, in liaison with relevant stakeholders, and will be included in the updated EERP prior to the commencement of construction. An outline Communication Plan is set out below.

Environmental incident response

CUSH WIND FARM PHASE II / ENVIRONMENTAL & EMERGENCY RESPONSE PLAN

IMMEDIATE SITE RESPONSE



REPORTING AND NOTIFICATION



PROCEDURES AND EQUIPMENT

Response procedures and pollution prevention equipment are detailed in the Environmental and Emergency Response Plan (EERP).

8.1 ENVIRONMENTAL RESPONSE PLAN

Incident Response Plan for the Cush Wind Farm Based on template provided in GPP 21 – Guidance for Pollution Prevention	
Site Address: Galros East, Whigsborough, Ballycollin, and Eglis, Co. Offaly.	Coordinates:
Official Company Address: Cush Wind Limited Greaghcrota Tullyco Cootehill Co. Cavan	Map references:
Key Holders for site (Name and Contact numbers):	
Overview of the activities on site:	

Include number of employees at different times of the day:	
Daylight hours:	
Dusk to Dawn	
Weekend Dusk to Dawn:	
Bank Holidays:	
Description of surrounding area:	
Date and Version of the plan:	Name & position of person responsible for compiling/approving the plan:
Review date:	Date of next exercise:
Objectives of the plan:	
List of external organisations consulted in the preparation of this plan with contact details:	
Distribution list of who has received this plan and which version: <i>Please note that it is recommended that you review and revise this plan regularly</i>	

8.2 EXTERNAL CONTACTS

External Contacts		
Contact	Office Hours	Out of Office
Emergency Services (Fire/Police/Ambulance)	999 or 112	999 or 112
Local Garda Station	Birr: +353579169710	
Local Hospital: Midland Regional Hospital, Tullamore	057 932 1501	
Environment Section Offaly County Council Áras an Chontae, Charleville Road, Tullamore, Co. Offaly R35 F893	057 934 6800	
EPA Regional Inspectorate Seville Lodge Callan Road Kilkenny	056 779 6700	
Inland Fisheries Ireland	01 8842600	0818 34 74 24 (24hr pollution reporting)
ESB	01 8529534	1800 372 999 (24hr emergency service)
Telecommunications – Eircom/Eir	1800 475475	

8.3 INTERNAL CONTACTS

Internal Contacts		
Names and position of staff authorised and trainers to activate and co-ordinate the plan. Staff to be contacted if needed to move or evacuate the site		
Other Staff:		
Managing Director		
Project Manager		
Environmental Manager		

8.4 CHEMICAL PRODUCT & WASTE INVENTORY

Chemical Product & Waste Inventory						
Trade name/ substance	Solid/liquid/gas or powder	UN number	Max amount	Location marked on site plan	Type of Containment	Relevant health & Environmental properties

8.5 POLLUTION PREVENTION EQUIPMENT INVENTORY

Pollution Prevention Equipment Inventory (On/Off-Site Resources)			
Type	Location	Amount	Staff contact

8.6 SITE ENVIRONMENTAL INCIDENT REPORT FORM

Site:		Date:	
Time:		Weather:	
Report By:		Position:	
Cush Wind Limited personnel present:		Position:	
Contractor personnel present:		Position:	
Description of Incident:			
Item Spilled:			
Estimate of Volume of Spillage:			

List of actions followed once incident was noted	Time:	Corrective Action	
		Action:	By:
Who first observed incident?			
First action			
Next action			
Time Pollution Hotline was contacted			
Other			
Details of Clean-Up contractor or how contamination was removed from site:			
Details of how this could be avoided in future:			
Details of review of internal procedures as result of this incident:			
Date of Report Completion:			

8.7 SITE ENVIRONMENTAL AUDIT FORM

Mark Yes or No. Where a check does not apply, record N/A and the reason in the corrective action column.

Item	Questions	Yes	No	Corrective Action	
				Action:	By:
1. Miscellaneous					
1.01	Does the contractor carry out regular internal environmental audits, record recommendations and monitor corrective actions?				
1.02	Have environmental incidents been recorded and reported in accordance with the EERP?				
1.03	Does site induction cover environmental requirements and spill procedures, and are attendance records maintained?				
2. Land					
2.01	Are hardstanding areas drained in accordance with the approved drainage design, with separate controls for bunded and refuelling areas?				
2.02	Have local roads been inspected and cleaned where necessary?				
2.03	Have archaeological monitoring and other required measures been implemented in accordance with Chapter 11 and applicable permission conditions?				
2.04	Have site clearance areas been checked by the ECoW before works, in accordance with the ecological mitigation requirements?				
3. Materials and Equipment					
3.01	Are relevant personnel familiar with the IFI construction guidelines (2016), the applicable OPW guidance and the project-specific water protection measures?				
3.02	Are transformers and generators provided with the secondary containment specified in the CEMP and drainage design?				
3.03	Do bunds meet the specified containment requirements, including the 110% capacity requirement stated in Chapter 7?				

Item	Questions	Yes	No	Corrective Action	
				Action:	By:
3.04	Is refuelling undertaken in the designated area or under the approved mobile-bowser procedure, with trained personnel, drip trays and spill equipment?				
3.05	Are drainage and hydrocarbon-interception measures installed and maintained in accordance with the approved drainage design?				
3.06	Are fuel, oil and chemical storage areas located within designated areas and managed in accordance with the project constraints, bunding requirements and drainage plans?				
3.07	Are bund integrity and rainwater levels checked, with any required action recorded and contaminated water managed appropriately?				
3.08	Are contaminated bund water, oil residues and used absorbents securely contained, assessed for hazardous properties and managed through authorised waste routes, without discharge to land or water?				
3.09	Are drums and mobile plant provided with the specified drip trays or secondary containment and located in accordance with the project constraints and drainage plans?				
3.10	Is plant maintained in good condition and free from leaks, with inspection and maintenance records available?				
3.11	Are adequate spill kits readily available close to potential pollution sources, inspected and replenished after use?				
3.12	Are refuelling bowsters double-skinned, locked when not in use and maintained in good condition?				
3.13	Is the site free from unmanaged or unrecorded fuel and oil spillages?				
3.14	Are the specified wheel-cleaning facilities operational and effective?				
3.15	Where wet wheel washing is used, is it a closed system with no discharge to the water environment?				
3.16	Are source and quality records available for imported stone and aggregate, including contamination assessment and accredited laboratory results where required?				

Item	Questions	Yes	No	Corrective Action	
				Action:	By:
3.17	Is refuelling excluded from works locations within the 50m hydrological buffer, in accordance with Chapter 7?				
3.18	Is refuelling and handling of fuels, oils, lubricants and chemicals excluded within 100m of the mapped Rath GWS source protection area boundary?				
4. Noise, Dust & Light					
4.01	Are stockpiles, working areas and site roads dampened where required to control dust?				
4.02	Are vehicles carrying loose material appropriately sheeted to prevent dust and material loss?				
4.03	Are construction activities and deliveries consistent with the permitted working hours, applicable noise criteria and specified mitigation measures?				
4.04	Does construction lighting comply with the specified lighting and ecological controls and applicable permission conditions?				
5. Waste					
5.01	Is the site tidy and free from litter?				
5.02	Is the area beyond the site boundary free from waste arising from the works?				
5.03	Is waste segregated and securely stored in containers within clearly designated areas?				
5.04	Are waste collection permits, transfer records and receiving-facility authorisations available for waste leaving the site?				
5.05	Is waste sent only to facilities authorised to accept the relevant waste types?				
5.06	Are hazardous-waste movements within Ireland accompanied by the required Waste Transfer Form and consigned to an appropriately authorised receiving facility?				
5.07	Is material reused or recycled only where suitable and consistent with the project plans and applicable waste requirements?				
5.08	Are waste management practices consistent with the project Waste Management Plan?				

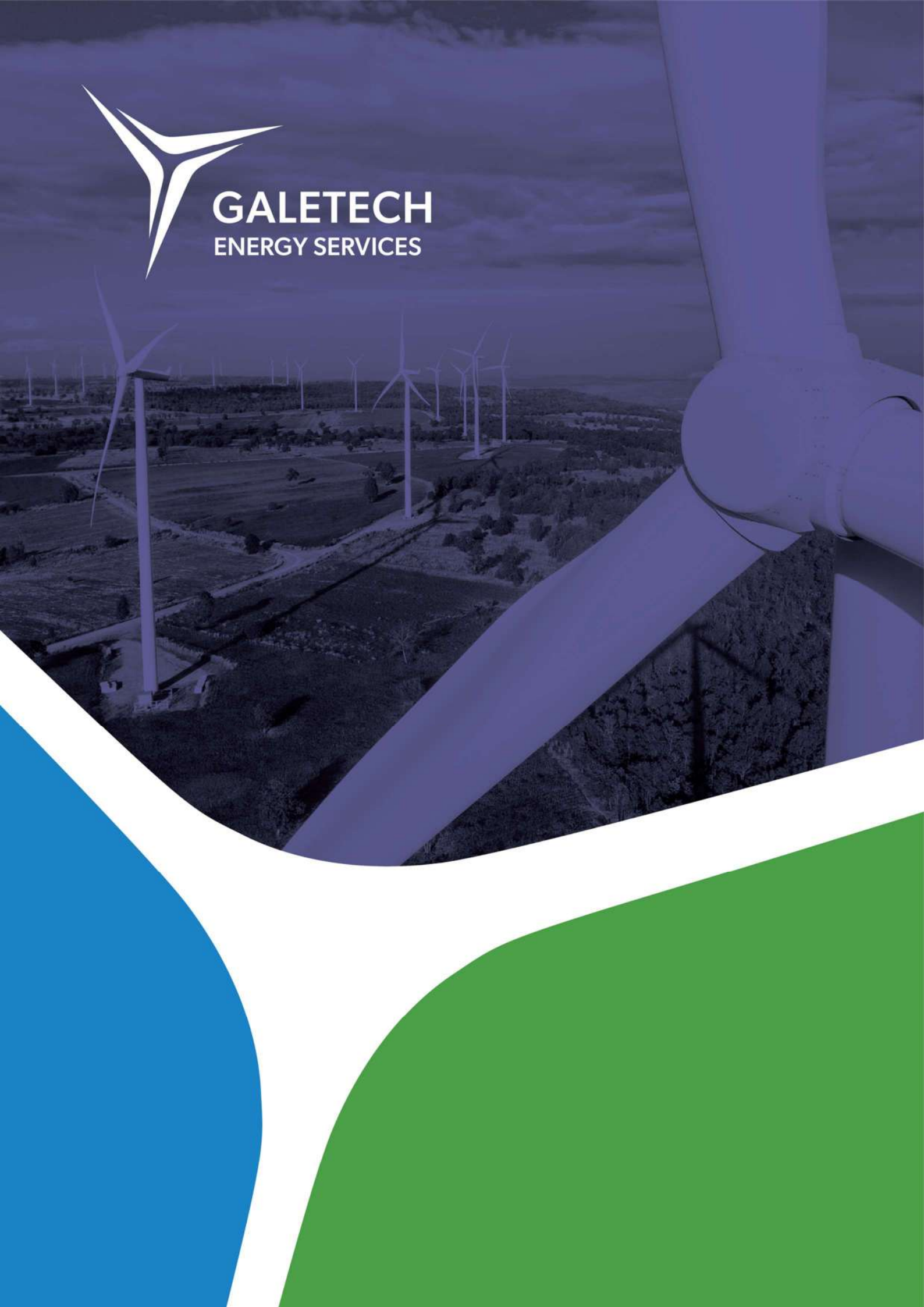
Item	Questions	Yes	No	Corrective Action	
				Action:	By:
5.09	Is on-site reuse or recovery of waste supported by the applicable Irish authorisation or documented legal status, where required?				
5.10	Is burning of waste prohibited, and is the site free from evidence of waste burning?				
5.11	Is the site free from unauthorised burial or disposal of waste?				
6. Water					
6.01	Are discharges managed in accordance with the approved drainage design and all required authorisations from the relevant competent authority?				
6.02	Have required consents for watercourse engineering works been obtained, including OPW consent where applicable, and are works consistent with agreed methods and IFI consultation requirements?				
6.03	Have proposed water abstractions been checked against EPA registration and licensing requirements, with any required registration or licence in place before abstraction?				
6.04	Are access-road drainage and SuDS installed in accordance with the approved design and any required agreements?				
6.05	Are clean-water diversion drains and dirty-water controls installed in accordance with the drainage design?				
6.06	Has vegetation clearance been minimised and confined to the agreed works footprint?				
6.07	Are settlement and treatment measures functioning to prevent untreated sediment-laden runoff entering receiving waters?				
6.08	Are hydrological buffers marked and maintained, with works inside them limited to the assessed activities and specified controls?				
6.09	Are plant movements and works at watercourse and drain crossings consistent with the assessed methods and any required authorisations?				

Item	Questions	Yes	No	Corrective Action	
				Action:	By:
6.10	Are stockpiles within designated areas and provided with the runoff and sediment controls specified in the Peat and Spoil Management Plan and drainage design?				
6.11	Are silt fences installed and maintained at the specified locations downslope of stockpiles and working areas?				
6.12	Are controls on site roads and within drains effective in limiting sediment runoff, including the specified flow attenuation measures?				
6.13	Are sediment-control materials inspected and maintained, with degraded materials removed before they can cause pollution?				
6.14	Are silt traps inspected and maintained regularly?				
6.15	Can permanent drainage features be accessed and maintained as required by the drainage design?				
6.16	Are receiving waters free from visible construction-related pollution, and are suspected incidents reported under the EERP?				
6.17	Is water-quality monitoring undertaken and recorded in accordance with the specified programme?				
6.18	Are dewatering operations controlled to prevent untreated sediment-laden water entering receiving waters?				
6.19	Is on-site batching of wet-cement products prohibited, and are concrete delivery, placement and washout managed in accordance with the specified mitigation?				
6.20	Are the specified pollution-prevention measures in place during concrete pours?				
7. Landscape					
7.01	Are earthworks and reinstatement undertaken in accordance with the agreed design to support vegetation re-establishment?				
7.02	Are reinstatement and restoration works implemented within the agreed programme?				

Item	Questions	Yes	No	Corrective Action	
				Action:	By:
8. Ecology					
8.01	Are storage areas confined to the agreed works footprint and designated locations, avoiding sensitive habitats in accordance with the ecological mitigation?				
8.02	Have ecological exclusion zones and protective buffers identified in Chapter 5, the NIS and pre-construction surveys been marked and maintained under the direction of the ECoW?				
8.03	Have ecology and environmental responsibility toolbox talks been delivered, with attendance records maintained?				
9. Documentation Check					
9.01	Start-up meeting record				
9.02	Current CEMP and full emergency contact list				
9.03	Induction records				
9.04	Pollution Prevention Measures Register				
9.05	Geotechnical Risk Register				
9.06	Weekly meeting minutes				
9.07	Environmental checks and routine mitigation-monitoring records				
9.08	Water-quality monitoring results				
9.09	Safety and Environmental Awareness Reports (SEARs), filed in the site records				
9.10	Safety and Environmental Audit Reports (record the date of the latest audit in the corrective action column)				
9.11	Contractor environmental plans and Construction Method Statements				



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ANNEX 2 – WASTE MANAGEMENT PLAN





Cush Wind Farm
Phase II

Planning-Stage Construction Environmental Management Plan

Annex 2: Waste Management Plan

Cush Wind Limited

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DOCUMENT CONTROL

Stage	Date	Name
Content	19/10/2026	Declan Owens
Approval	19/10/2026	Gavin Daly

RECORD OF CHANGES

Revision	Issue Date	Summary of Changes	Approved
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1.0 INTRODUCTION

Galetech Energy Services (GES), on behalf of Cush Wind Limited, has prepared this Waste Management Plan (WMP) to detail the measures to be implemented for the control, management and monitoring of waste associated with the Cush Wind Farm – Phase II.

Cush Wind Limited intends to construct Cush Wind Farm Phase II, comprising a 3 no. wind turbine extension to the permitted Cush Wind Farm Phase I. The proposed project, as defined and assessed in the EIAR, will consist of:-

- 3 no. wind turbines with overall tip heights within the range of 199.1 m to 200 m, rotor diameters within the range of 158 m to 175 m and hub heights within the range of 111.6 m to 120.9 m;
- all associated turbine foundations and crane hardstanding areas;
- construction of approximately 1.7km of new internal site access tracks and upgrading of existing and permitted access tracks and access arrangements;
- use of the construction compounds permitted as part of Cush Wind Farm Phase I;
- 1 no. electrical switch room building and associated compound, including a new site entrance from the L300321 local road;
- underground electrical and communications cabling within the wind farm site;
- storage of excavated peat and spoil within designated peat and spoil deposition areas;
- site drainage, surface water management and environmental protection measures;
- reinstatement, environmental stabilisation and drainage management works, having regard to the wider rehabilitation objectives for Galros Bog;
- a c.5 km underground electricity line extending from the proposed electrical switch room to facilitate connection of the proposed wind farm to the national electricity network;
- temporary and permanent accommodation works along the turbine component haul route to facilitate the delivery of turbine components; and
- all associated and ancillary site development, excavation, construction, landscaping, reinstatement and environmental mitigation works.

1.1 PURPOSE OF THIS REPORT

The principal purpose of this WMP is to ensure efficient use of material resources, reduce waste at source and reduce the quantity of waste that requires final off-site disposal to landfill in accordance with the waste hierarchy. A secondary aim is to facilitate the transition to a more circular economy thereby minimising the need for new inputs of virgin materials and energy, while reducing environmental pressures linked to resource extraction, emissions, and waste management.

This WMP should be viewed as a live document and will be regularly reviewed and revised as necessary throughout the pre-construction and construction phases so that opportunities to maximise waste reduction are exploited.

The WMP shall be implemented throughout the construction phase of the project to

ensure that: -

- All site activities are effectively managed to minimise the generation of waste and to maximise the opportunities for on-site reuse and recycling of waste materials;
- All waste materials are segregated into different waste fractions and stored on-site in a managed and dedicated waste storage area; and,
- Waste requiring off-site management will be collected by appropriately permitted waste collectors and transferred to facilities authorised to accept the relevant waste types and undertake the proposed recovery or disposal operations.

1.2 SCOPE & REQUIREMENTS

This WMP forms part of the pre-commencement requirement for the works and outlines conditions of work for staff, and for every Contractor or sub-contractor at the site. The Contractor will continually oversee changes to this document and will work alongside the Environmental Manager (EM) prior to any work commencing.

This document is a live document which will be updated regularly and forms part of the Planning-Stage Construction Environmental Management Plan (CEMP) for the Cush Wind Farm. Consequently, the majority of specific details can only be provided prior to the commencement of construction activities.

1.3 WASTE POLICIES & LEGISLATION

The following legislation and guidance is relevant to the preparation and continued development of this WMP: -

- *Waste Framework Directive 2008/98/EC (as amended);*
- *Landfill Directive 1999/31/EC (as amended);*
- *Waste Management Act 1996 (as amended);*
- *Waste Management (Facility Permit And Registration) (Amendment) Regulations 2019;*
- *Waste Management (Collection Permit) (Amendment) Regulations 2023 (S.I. No 63 of 2023);*
- *Litter Pollution Act 1997 (No. 12 of 1997) (as amended);*
- *European Communities (Waste Directive) (Amendment) Regulations 2020;*
- *EU Construction and Demolition Waste Management Protocol (European Commission) (2024 updated edition);*
- *Local Government Ireland National Waste Management Plan for a Circular Economy 2024-2030;*
- *By-Product Guidance Note, A Guide to by-products and submitting a by-product notification under Article 27 of the European Communities (Waste Directive) Regulations 2011 (S.I. No. 126 of 2011) (EPA, 2020);*
- *Circular Economy Action Plan, For a Cleaner and More Competitive Europe (European Commission 2020);*

- *Best Practice Guidelines for the Preparation of Resource & Waste Management Plans for Construction and Demolition Projects* (EPA 2021);
- *The Circular Economy Programme 2021-2027*;
- *Whole of Government Circular Economy Strategy 2026–2028: Accelerating Action*;
- *National Hazardous Waste Management Plan 2021–2027* (EPA 2021);
- *Guidance Document for the Local Authority Sector: Management of Materials Arising from Roadworks* (CCMA 2020);
- *Guidance on the Interpretation of Key Provisions of Directive 2008/98/EC on Waste* (European Commission, 2018);
- *The Management of Waste from National Road Construction Projects* (TII, December 2017); and,
- *Guidelines for the Waste Audits Before Demolition & Renovation Works of Buildings* (European Commission, May 2018).

The Waste Management Priority Hierarchy, which the developer is obligated to apply in the management of waste, is as follows: -

Waste management hierarchy

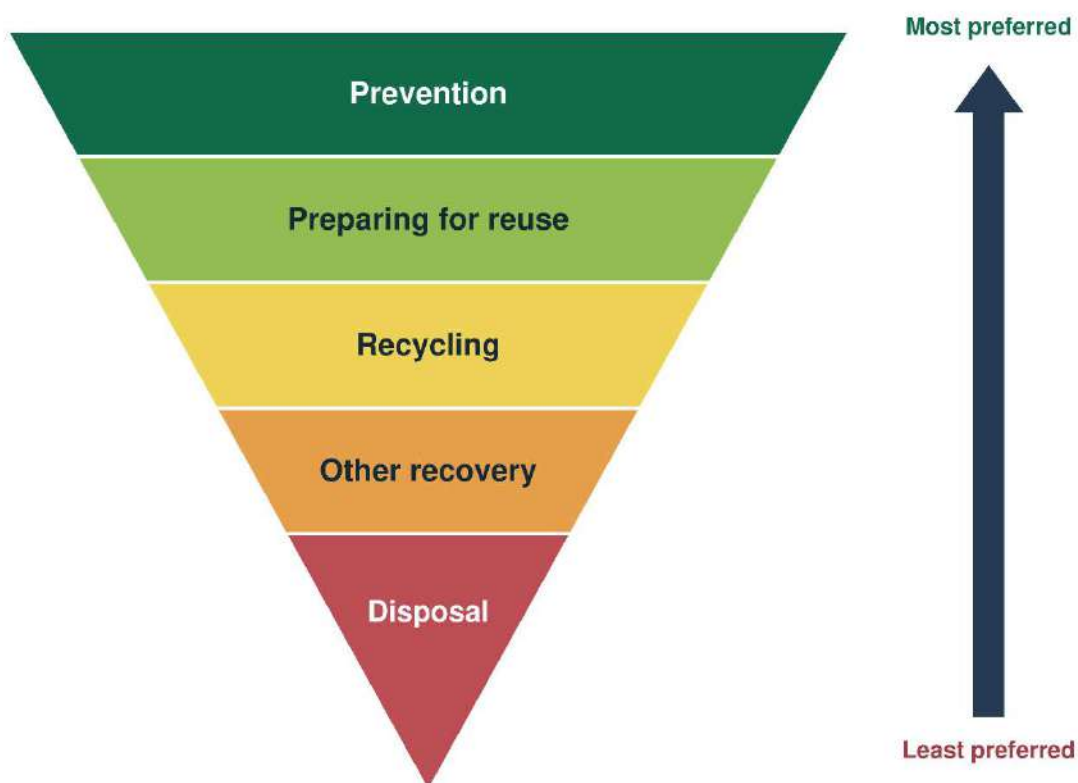


Figure 1: Waste Management Hierarchy

The waste management hierarchy shown above applies to all waste, including hazardous waste. The diagram conveys that above all; the prevention of waste production is the top priority.

The PCB/PCT Directive (Directive 96/59/EC on the disposal of polychlorinated biphenyls and polychlorinated terphenyls) deals with the disposal of certain hazardous chemicals that represent a particular threat to the environment and to human health.

The transport of dangerous goods to and from the site, including hazardous waste classified as dangerous goods for transport, will comply with the European Communities (Carriage of Dangerous Goods by Road and Use of Transportable Pressure Equipment) Regulations 2011 (S.I. No. 349 of 2011), as amended, and the applicable requirements of the Agreement concerning the International Carriage of Dangerous Goods by Road (ADR).

The Contractor, in accordance with the abovementioned Directives, is legally required to: -

- Prevent waste disposal constituting a public nuisance through excessive noise levels or unpleasant odours, or to degrade places of special natural interest;
- Prohibit the dumping or uncontrolled disposal of waste;
- Ensure that the disposal and recovery of waste does not present a risk to water, air, soil, plants and animals;
- Ensure that waste treatment operations are licensed;
- Prepare a Waste Management Plan;
- Require waste collectors to have special authorisation and to keep records; and,
- Ensure that the waste which cannot be prevented or recovered is disposed of without causing environmental pollution.

Waste will be transported by appropriately authorised collectors to facilities authorised for the relevant waste types and management operations. Any on-site waste treatment or recovery will proceed only under the applicable authorisation or documented lawful status.

1.4 REFERENCE DOCUMENTS

The production of this WMP has been supported by best practice manuals, including the *Best Practice Guidelines for the Preparation of Resource and Waste Management Plans for Construction and Demolition Projects* (Environmental Protection Agency, 2021).

Other guidance documents have been used to develop this WMP; including a Planning-Stage Construction & Environmental Management Plan, Peat & Spoil Management Plan, Surface Water Management Plan, and Environmental & Emergency Response Plan.

2.0 REQUIREMENTS OF A WMP

There are four stages to be followed in the management of waste:-

- Planning;
- Implementation;

- Monitor; and,
- Review.

2.1 PLANNING

During the planning/design/development stages of the Cush Wind Farm, the nature of the site has been accounted for as well as the environmental considerations and the design of the project. Insightful planning at the early stages will help minimise the quantity of waste produced.

In accordance with the waste hierarchy, the following targets have been established for the management of excavated materials and construction waste:

- 100% of excavated topsoil to be retained on site for restoration and landscaping;
- More than 95% of excavated peat, soil and subsoil to be retained on site through reinstatement, landscaping or placement within the designated deposition areas identified in the Peat & Spoil Management Plan;
- 100% of packaging materials, metals, timber, plastics, paper and cardboard waste to be sent for recycling or recovery;
- More than 95% of overall waste generated during construction to be sent for recycling or recovery; and
- Less than 5% of overall waste generated during construction to be sent for disposal.

Waste recycling, recovery and disposal targets will be assessed by mass. Excavated materials established as non-waste or by-products will be accounted for separately and excluded from the waste totals.

2.2 IMPLEMENTATION

The detailed WMP, to be prepared prior to construction, will implement the management of the following: -

- A brief of waste types expected to be produced;
- Estimates of quantum of each type of waste expected to be produced;
- An explanation of how the Contractor aims to minimise the different waste types produced prior to any activity that generates this waste; and
- Procedures for identification of the waste management actions proposed for each different waste type, including re-using, recycling, recovery and disposal (as per the waste hierarchy priorities).

All workers will be fully briefed of waste management procedures and aware of their requirements under the WMP. All site visitors will be briefed on appropriate waste storage and disposal units. Littering will not be tolerated, and all personnel will have a duty to challenge those who do not comply with WMP procedures.

2.3 ROLES & RESPONSIBILITIES

Person Responsible	Responsibilities	Contact Details
Developer	<ul style="list-style-type: none"> • To commission a competent Contractor to carry out works and to update WMP; 	

Person Responsible	Responsibilities	Contact Details
	<ul style="list-style-type: none"> To ensure that WMP is submitted and agreed on by the local authority prior to construction; and To commission Contractor to produce end-of-project WMP. 	
Contractor	<ul style="list-style-type: none"> To update, implement and review the WMP throughout the construction phase; To assign relevant duties and responsibilities to the appropriate person; To hire a responsible Project Manager who will implement the WMP; To identify all hauliers engaged to transport each of the resources/wastes off-site; To identify suitable licensed waste facility site for each type of waste; To maintain the records of all waste resources for the duration of the development; and, To prepare an end-of-construction WMP Review Report. 	
Project Manager	<ul style="list-style-type: none"> To maintain and update WMP through the planning and procurement phases of the project; To update record of details and estimated quantities of all projected waste streams; To deliver all training and induction in relation to resource management; To conduct waste checks: - <ul style="list-style-type: none"> To conduct internal audits routinely including as per the requirement of the site; To ensure site infrastructure is supplied and maintained as fit for purpose; To maintain and update the waste register; and, To be available as required for any Local Authority or other audits undertaken 	

2.4 MONITORING

2.4.1 Checks and Records

All stores on site of oil, fuel and chemicals should be visually inspected on a regular basis, especially during extreme weather conditions. Visual inspections will reveal evidence of leaks, spills or contamination.

Records of all visual checks must be maintained and be made available upon request for inspection. The topic of waste management will be regularly discussed during team meetings and, as required, waste management practices should be continually revised.

2.4.2 Waste Inventory

The Contractor will maintain an up-to-date waste inventory, based on the anticipated streams identified in **Section 4.1**, recording the types and quantities of waste generated and their management routes. Records will cover all off-site movements for recycling, recovery or disposal and identify the collection date, LoW code, quantity, permitted waste collector, authorised receiving facility and proposed management operation. Collector and facility details will correspond with the register in **Section 4.2**, and supporting collection receipts, weighbridge records and acceptance documentation will be retained. Excavated materials established as

non-waste or by-products will be recorded separately from the waste inventory.

2.4.3 Monitoring of WMP

The Contractor will appoint the EM to implement and monitor the WMP. The WMP should include an inventory of the types of estimates of the waste to be produced on site. The aim will be to keep the volumes of waste produced below the estimates of waste to be produced. The EM will ensure that a waste audit is carried out every 6-months.

2.5 REVIEW

Upon completion of the construction phase, a waste management review will be undertaken. The aim will be to measure compliance with the WMP objectives and to consider lessons learnt. The review will be carried out by the EM in conjunction with the Contractor.

3.0 GENERAL WASTE MANAGEMENT PRINCIPLES

- All personnel will be informed of the objectives of this WMP and their responsibilities through site induction and appropriate toolbox talks.
- Waste generation will be minimised through material selection, accurate ordering, appropriate storage and handling, and return of surplus materials and reusable packaging to suppliers where practicable. Reuse, recycling and recovery will be prioritised over disposal in accordance with the waste hierarchy.
- Excavated peat, topsoil, subsoil and stone will be managed in accordance with CEMP **Annex 3: Peat & Spoil Management Plan**. Materials used for reinstatement and landscaping will be recorded separately from material placed permanently within deposition areas. Non-waste or by-product status will not be assumed solely because material is uncontaminated or retained on site.
- Designated waste-storage areas will be provided within the construction compounds. Suitable collection arrangements will also be maintained at underground electricity line and haul-route work locations. Storage areas will be clearly identified, accessible for collection and protected against unauthorised access.
- General waste receptacles will not be located within 10m of a surface water feature. Hydrocarbons and hazardous waste chemicals will not be stored within 50m of a watercourse or drainage ditch. Any stricter location-specific restrictions specified in **Chapter 7** or the Surface Water Management Plan will also apply.
- Along the underground electricity line, no refuelling or handling of fuels, oils, lubricants or chemicals will take place within 100m of the mapped Rath Group Water Scheme source-protection area boundary.
- Waste receptacles will be suitable for their contents, maintained in good condition and securely closed or covered as appropriate to prevent litter, rainfall ingress, leakage and access by animals. Containers will be clearly labelled and collected before their capacity is exceeded.
- Paper, cardboard, metals, glass, timber, plastics, food waste and other recoverable materials will be segregated into appropriate streams.

Hazardous waste will be kept separate from non-hazardous waste, and incompatible materials will not be mixed.

- Waste will be classified according to its source, composition and hazardous properties using the appropriate List of Waste code. The inventory in **Section 4.1** will be updated to reflect the actual materials generated.
- Hazardous waste will be handled by appropriately trained personnel and stored in sealed, labelled containers compatible with their contents. Liquid hazardous waste will be provided with suitable secondary containment.
- Liquid waste oil will be stored in sealed, compatible tanks or drums within suitable secondary containment. Liquid waste oil will not be stored in bags.
- Oil-contaminated rags, absorbents and used spill-kit materials will be stored in suitable sealed containers with secondary containment where necessary to prevent the escape of residual oil.
- Food waste will be collected separately in closed containers and removed regularly for authorised biological treatment or recovery, as appropriate.
- Foul waste from welfare facilities will be retained in sealed collection tanks and removed by an appropriately authorised operator to an authorised receiving facility. It will not be discharged to ground, drains or watercourses.
- Waste electrical and electronic equipment and waste batteries will be segregated from general waste, protected against damage and stored securely pending timely collection through an appropriate authorised collection or take-back arrangement.
- Waste will be removed only by appropriately permitted waste collectors and transferred to facilities authorised to accept the relevant waste types and undertake the proposed recovery or disposal operations. The Contractor will verify the relevant authorisations before the first transfer and maintain current records.
- Waste will not be transferred to a contractor's yard or another intermediate location unless the transport, receipt and storage arrangements are lawfully authorised for the relevant waste.
- Hazardous-waste movements within the State will be accompanied by the applicable completed and signed Waste Transfer Form. Waste classified as dangerous goods for transport will also comply with applicable ADR requirements. Waste will not leave the site without the required documentation.
- A waste register will record the waste description, LoW code, quantity, source, collection date, collector and collection-permit details, receiving facility and authorisation details, and intended recovery or disposal operation. Collection receipts, weighbridge records and receiving-facility acceptance records will be retained.
- Waste-storage areas and containers will be inspected at least weekly, with additional inspections following severe weather or any event that could compromise containment. The Waste Checklist provided below will be completed for each inspection. Any defects or required corrective actions will be recorded and addressed promptly, with completed checklists retained in the site environmental records.

- Spills, leaks, uncontrolled waste releases and other waste-related environmental incidents will be reported immediately and managed in accordance with CEMP Annex 1: Environmental & Emergency Response Plan.
- Waste will not be burned, buried, fly-tipped or otherwise deposited or treated without the applicable authorisation or established lawful status.

Waste Checklist		
Waste area checked	Date Checked	Checked By
General office waste		
Bowser		
Portaloo		
Excavated soil		
Washings		
Concrete		
Oil		
Hazardous Waste		

4.0 TYPICAL WASTE STREAMS

4.1 WASTE INVENTORY

The typical waste arising during the construction of the project is provided below. This inventory will be further expanded upon by the Contractor prior to the commencement of construction.

Waste / Material Item	EWK / LoW*	Proposed Management Route
Excavated materials and reinstatement resources		
Excavated peat	17 05 04 (if waste)	Manage in accordance with CEMP Annex 3: Peat & Spoil Management Plan, including use for reinstatement/landscaping and placement of surplus material in designated deposition areas. Record permanent deposition separately from beneficial reuse.
Excavated topsoil and subsoil	17 05 04 (if waste)	Store separately and prioritise suitable material for reinstatement and landscaping in accordance with CEMP Annex 3: Peat & Spoil Management Plan. Manage surplus material through the deposition arrangements identified in that plan.
Excavated natural stone	17 05 04 (if waste)	Use suitable material in access-track and hardstanding construction, subject to engineering suitability and the applicable non-waste status or waste-management authorisation.
Vegetation and green waste	20 02 01 (as applicable)	Keep separate from mineral material and concrete. Retain suitable vegetated sods for reinstatement where specified in the Peat & Spoil Management Plan. Transfer surplus green waste to an authorised biological-treatment or recovery facility.
Clean, hardened concrete	17 01 01	Segregate for authorised collection and transfer to a concrete-recovery facility. Any on-site processing or recovery will require the applicable authorisation or established lawful status.

Waste / Material Item	EWC / LoW*	Proposed Management Route
Reuse and recycling		
Wood pallets	15 01 03, if discarded as waste	Return serviceable pallets to the supplier for reuse. Segregate damaged waste pallets for authorised wood recovery.
Aluminium cans	15 01 04	Segregate for authorised metal-packaging recycling.
Cardboard packaging	15 01 01	Keep clean and dry; segregate for authorised recycling.
Plastic cups	20 01 39	Segregate for authorised plastics recycling where accepted by the receiving facility.
Construction metals	17 04 05 (iron/steel); 17 04 07 (mixed metals)	Segregate by metal type where practicable and transfer for authorised recycling. Use the appropriate 17 04 entry for other separately collected metals.
Glass bottles and containers	15 01 07	Segregate glass packaging for authorised recycling.
Mixed packaging	15 01 06	Separate into recyclable fractions where practicable; transfer remaining mixed packaging for authorised sorting and recovery.
Paper, other than packaging	20 01 01	Keep clean and dry; segregate for authorised recycling.
Plastic packaging	15 01 02	Segregate clean plastic packaging for authorised recycling.
Plastic bottles and containers	15 01 02	Segregate non-contaminated plastic packaging for authorised recycling. Manage containers with hazardous residues separately.
Polystyrene packaging	15 01 02	Segregate clean material for authorised recycling or recovery where accepted by the receiving facility.
Wood/timber packaging, including crates	15 01 03	Prioritise return or reuse where suitable; segregate waste packaging for authorised wood recovery.
Clean metal drums and containers	15 01 04	Segregate empty, non-contaminated metal packaging for authorised recycling.
Food waste, residual waste and foul waste		
Food waste	20 01 08	Collect separately in suitable closed containers and transfer to an authorised biological-treatment or recovery facility.
Residual general waste	20 03 01	Collect separately from recyclable and hazardous streams. Transfer for authorised treatment, with recovery prioritised and disposal used for unsuitable residual fractions.
Foul waste from welfare facilities	20 03 04 (as applicable)	Collect in sealed welfare-system tanks. Arrange specialist collection and transfer to an authorised receiving facility. Confirm the code against the actual portable-toilet or sewage/sludge stream before removal.
Hazardous and specialist waste streams		
Aerosol cans	16 05 04*; 16 05 05 for non-hazardous contents	Segregate in suitable secure containers; do not puncture or compact. Arrange specialist authorised collection and treatment according to contents and pressure hazards.
Waste diesel / fuel oil	13 07 01*	Store in sealed compatible containers with suitable secondary containment. Arrange specialist authorised collection for recovery or other appropriate treatment.

Waste / Material Item	EWG / LoW*	Proposed Management Route
Waste hydrocarbon grease	13 08 99* (as applicable)	Segregate in sealed, labelled compatible containers and arrange specialist authorised collection and treatment. Confirm the applicable code for the actual grease stream.
Oily water from oil/water separators	13 05 07*	Collect separately in compatible contained storage; arrange specialist authorised collection and treatment. Classify other bund/sump liquids according to their actual source and composition.
PCB-contaminated insulating oil, only if encountered	13 03 01*	Isolate in sealed, labelled containers with suitable secondary containment and arrange specialist authorised hazardous-waste treatment. This is a contingency stream, not an anticipated product for the new development.
Synthetic engine, gear and lubricating oils	13 02 06*	Store separately in sealed compatible tanks or drums within suitable secondary containment; arrange specialist authorised oil recovery or treatment.
Synthetic hydraulic oils	13 01 11*	Store in sealed compatible tanks or drums within suitable secondary containment; arrange specialist authorised oil recovery or treatment.
Synthetic insulating / heat-transmission oils	13 03 08*	Store separately in sealed compatible tanks or drums within suitable secondary containment; arrange specialist authorised recovery or treatment.
Other engine, gear and lubricating oils	13 02 08*	Store in sealed compatible tanks or drums within suitable secondary containment; arrange specialist authorised oil recovery or treatment. Classify other oil functions under their corresponding LoW entries.
Packaging contaminated with hazardous residues, including oil drums	15 01 10*	Store separately from clean packaging in a secure designated area and arrange specialist authorised recovery or treatment.
Oil-contaminated absorbents, spill-kit materials and rags	15 02 02*	Store in sealed, labelled compatible containers with suitable secondary containment and arrange specialist authorised recovery or treatment.

* **Classification and status.** LoW codes apply only to materials classified as waste. Codes shown are conditional on the actual source, composition and hazardous properties; an asterisk (*) identifies a hazardous entry. The inventory will be updated before construction to reflect the confirmed waste streams and receiving-facility acceptance requirements.

Excavated natural material. Uncontaminated excavated natural material will be treated as non-waste under the same-site exclusion only where its use for construction in its natural state on the site of excavation is certain and the applicable statutory conditions are met. Permanent deposition does not automatically establish non-waste status or waste recovery. Any proposed by-product classification will be assessed separately; peat will not be assumed to qualify under the EPA soil-and-stone by-product criteria.

Collection and destinations. Off-site waste movements will use appropriately permitted collectors and facilities authorised for the relevant waste codes and management operations. Applicable hazardous-waste transfer and dangerous-goods documentation will accompany each movement.

4.2 MANAGEMENT OF WASTE

All waste will be segregated and securely stored at the temporary construction compound, in skips and receptacles, which will be covered to protect the contents from the weather. A licensed operator will collect and transfer the skips/receptacles of both recyclable and non-recyclable wastes as they are filled. No waste will be transferred to a contractor's yard or other intermediate location unless its receipt and storage, and the associated transport arrangements, are lawfully authorised for the relevant waste.

The appointed waste collectors and receiving facilities will be identified in the register below before waste is removed from site. The Contractor will verify that each

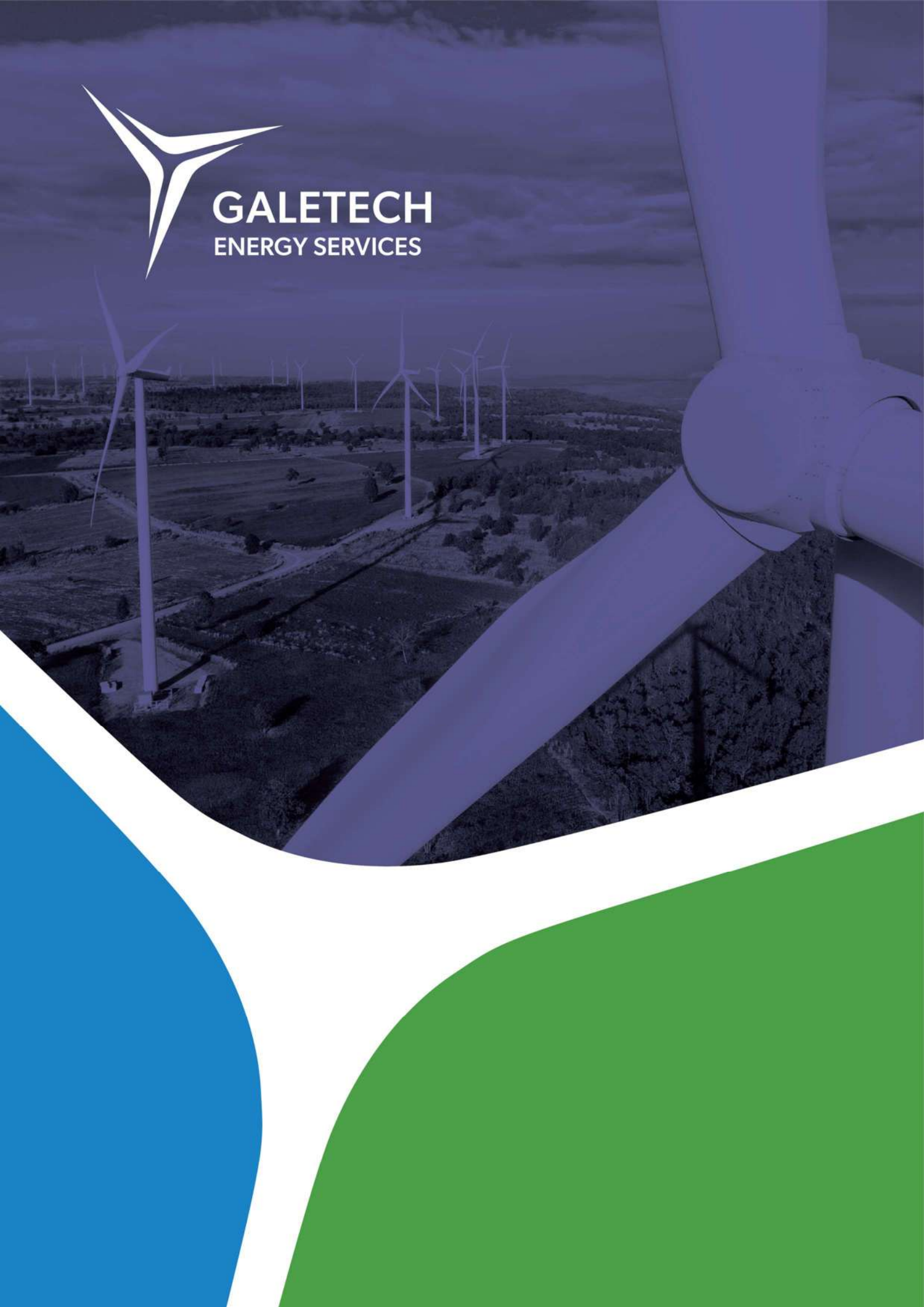
collector's collection permit covers the relevant waste types and that each receiving facility is authorised to accept those wastes and undertake the proposed management operation. Copies of the relevant authorisations will be retained in the site environmental records.

A separate record will be completed for each collector and receiving-facility combination.

Register Field	Details
Waste collector's name	
Waste collection permit number	
Relevant LoW codes covered by the collection permit	
Receiving facility's name	
Receiving facility's address	
Facility authorisation type and number — EPA licence, waste facility permit or certificate of registration, as applicable	
Relevant LoW codes accepted under the facility authorisation	
Proposed management operation — recycling, other recovery or disposal; include the applicable R/D code	



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ANNEX 3 – PEAT & SPOIL MANAGEMENT PLAN





Cush Wind Farm
Phase II

Planning-Stage Construction Environmental Management Plan

Annex 3: Peat & Spoil Management Plan

Cush Wind Limited

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DOCUMENT CONTROL

Stage	Date	Name
Content	19/10/2026	Declan Owens
Approval	19/10/2026	Gavin Daly

RECORD OF CHANGES

Revision	Issue Date	Summary of Changes	Approved
00	19/10/2026	Content	Declan Owens
01			
02			

DISTRIBUTION LIST

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1	Review	Cush Wind Limited	James Carville
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1.0 INTRODUCTION

Galetech Energy Services (GES), on behalf of Cush Wind Limited, has prepared this Peat & Spoil Management Plan (PSMP) to detail the appropriate management of excavated material arising from the construction of the proposed Cush Wind Farm Phase II.

1.1 PURPOSE OF THIS REPORT

This PSMP provides the framework for the management of peat and spoil at the site of the Cush Wind Farm Phase II for contractors and incorporates the measures set out in the various environmental assessment documents associated with the proposed development/project. The purpose of this report is to ensure that peat and spoil is managed safely and re-used without resulting in any adverse environmental effects, and to ensure that all spoil handling/management activities are carried out in accordance with best practice methods.

This is a live document and will be updated by the appointed contractor prior to the commencement of development. Prior to the commencement of construction, the updated PSMP will be reviewed by the Environmental Manager (EM) to confirm the appropriateness of the measures set out therein.

1.2 AIMS OF THIS PSMP

The overall objective of this PSMP is to provide for the appropriate management of excavated material arising from the construction of Cush Wind Farm Phase II. In doing so, the re-use of excavated material, locally to its excavation, will be maximised through reinstatement and landscaping proposals.

The reinstatement of excavated materials will occur as close to the site of excavation as possible. Excavated material horizons (topsoil, peat, subsoil, etc.) will be stored separately to ensure appropriate re-use; and will be replaced in sequence and to depths similar to those recorded prior to excavation.

Excavated material may also be used in the landscaping of the site; for example, the creation of berms around crane hardstandings or along access tracks to reduce the visual effects of the infrastructure. Again, material will be placed close to its source and will be placed in a fashion which allows for vegetative re-growth thus allowing for spoil to be assimilated into the local environment.

Notwithstanding the fact that the project site area is generally flat, with little in the way of discernible variation in elevation throughout, this PSMP also includes a series of control measures specifically related to peat, including monitoring measures, which will be implemented during the construction phase of the wind farm and a contingency plan should peat instability/failure occur at the site. As work is carried out on site the contents of the PSMP and its peat stability monitoring programme will be updated, as appropriate.

A detailed engineering construction design must be carried out by the appointed construction stage designer prior to any construction work commencing on site. This must take account of the consented project details and any conditions imposed by that consent. This must include a detailed peat stability assessment to account for any changes in the environment which may have occurred in the time leading up to the commencement of construction and a peat and spoil management plan to allow for the most appropriate geotechnical and environmental led solutions to be developed for the management of peat and spoil.

1.3 REFERENCE DOCUMENTS

The production of this PSMP has been supported by best practice manuals and will be accounted for in the further development of the appointed contractor's detailed CEMP.

Other documents have been used to develop this PSMP; including a Planning-Stage CEMP, Surface Water Management Plan, Environmental & Emergency Response Plan, and a Geotechnical Peat Stability Report.

1.4 PEAT INSTABILITY DEFINITION

Peat instability in this PSMP is defined as a mass movement of a body of peat that would have a significant adverse impact on the surrounding environment. Peat instability excludes localised movement of peat that would occur below a floating access track, creep movement or localised erosion type events. Adherence to the control measures included in this PSMP should reasonably minimise the potential for all such peat movements.

2.0 DESCRIPTION OF THE PROJECT

Cush Wind Limited intends to construct Cush Wind Farm Phase II, comprising a 3 no. wind turbine extension to the permitted Cush Wind Farm Phase I. The proposed project, as defined and assessed in the EIAR, will consist of:-

- 3 no. wind turbines with overall tip heights within the range of 199.1 m to 200 m, rotor diameters within the range of 158 m to 175 m and hub heights within the range of 111.6 m to 120.9 m;
- all associated turbine foundations and crane hardstanding areas;
- construction of approximately 1.7km of new internal site access tracks and upgrading of existing and permitted access tracks and access arrangements;
- use of the construction compounds permitted as part of Cush Wind Farm Phase I;
- 1 no. electrical switch room building and associated compound, including a new site entrance from the L300321 local road;
- underground electrical and communications cabling within the wind farm site;
- storage of excavated peat and spoil within designated peat and spoil deposition areas;
- site drainage, surface water management and environmental protection measures;
- reinstatement, environmental stabilisation and drainage management works, having regard to the wider rehabilitation objectives for Galros Bog;
- a c.5 km underground electricity line extending from the proposed electrical switch room to facilitate connection of the proposed wind farm to the national electricity network;
- temporary and permanent accommodation works along the turbine component haul route to facilitate the delivery of turbine components; and
- all associated and ancillary site development, excavation, construction, landscaping, reinstatement and environmental mitigation works.

The wind farm site is located in rural County Offaly, approximately 4 km north of Birr and c.28 km south-west of Tullamore. It extends across the townlands of Galros East, Whigsborough, Ballycollin, and Eglis, County Offaly.

The c.5 km underground electricity line will extend from the proposed electrical switch room, located on the southern side of the wind farm site, to the connection point at the proposed Mullanafawnia 110 kV substation. The Mullanafawnia 110 kV substation is third-party infrastructure that is subject to a separate consenting process and does not form part of the project.

The turbine component haul route and associated accommodation works extend through Counties Galway, Roscommon, Westmeath and Offaly. Turbine components will be transported from the Port of Galway through Counties Galway, Roscommon and Westmeath to the wind farm site in County Offaly.

Various environmental reports have been prepared in respect of the project and have been utilised in the preparation of this PSMP, including:-

- Environmental Impact Assessment Report (Galetech Energy Services);
- Biodiversity Chapter (SLR Consulting);
- Land & Soil Chapter (Hydro Environmental Services);
- Water Chapter (Hydro Environmental Services); and
- Natura Impact Statement (SLR Consulting).

3.0 DESCRIPTION OF BASELINE ENVIRONMENT

3.1 SITE LOCATION

The project site is located in rural County Offaly, approximately 4km north of Birr and c.28km south-west of Tullamore. The surrounding landscape is generally flat to gently undulating and is typical of the Midlands region.

Corine (2018) mapping identifies peat bogs and agricultural pastures as the principal land-cover categories across the project site. The three proposed turbines are located within Galros Bog, which comprises predominantly cutaway bog. The proposed electrical switch room is located within agricultural grassland, while the majority of the c.5km underground electricity line ('UGL') route passes through private lands comprising mainly grassland.

The Rapemills River flows in a westerly direction approximately 0.6km south of the wind farm site. The UGL route runs adjacent to the river for approximately 2.5km. The river channel is typically approximately 2m deep, with steep banks, and up to 5m wide.

The West Galros Stream, a tributary of the Rapemills River, flows along the southwestern boundary of Galros Bog and emerges from forestry southwest of the wind farm site. It crosses the N62 before joining the Rapemills River approximately 1km downstream of the wind farm site.

The UGL will cross beneath the N52 national road, the L7006 local road at Clonbeale Beg Glebe, and the Rapemills River at two locations using horizontal directional drilling ('HDD'). Four HDD crossings are therefore proposed. The remainder of the UGL route will be situated within private lands, outside the public road corridor.

3.2 TOPOGRAPHY

The proposed development site and surrounding topography are typical of the Midlands Region and comprise a generally flat landscape with occasional gentle undulations.

Ground elevations range from between approximately 45m and 65m OD (Ordnance Datum) across the project site. The most elevated section of the project site is found at its most eastern point where agricultural grassland rises up to 65m OD (at the point where the proposed underground electricity line connects to the national electricity network).

3.3 GEOLOGICAL ENVIRONMENT

Based on the GSI/Teagasc soils mapping (www.gsi.ie) the proposed wind farm is mapped largely as cutaway peat, with basic shallow well-drained mineral soil (BminSW) mapped on the south of the wind farm where there are some agricultural lands.

Soils along the western half of the underground electricity line route are mapped mainly as BminSW along with Alluvium where the proposed route intercepts the Rapemills River.

Soils mapped along the eastern half of the underground electricity line are more variable and comprise cut peat, shallow peaty poorly drained mineral soils (BminSPPT) and peaty poorly drained mineral soil (BminPDPT). The lands along the underground electricity line have been improved and drained for agriculture.

GSI subsoils mapping (www.gsi.ie) show that the proposed wind farm is underlain predominantly by cutover raised peat (Cut) along with Gravels derived from Limestones (GLs) mapped on the southeast of the proposed wind farm where agricultural lands are present.

Subsoils along the western half of the underground electricity line route are mapped mainly as Gravels derived from Limestones along with two gravel Esker ridges mapped along the proposed route.

Subsoils mapped along the eastern half of the underground electricity line are more variable and comprise cutover raised peat, Gravels and Limestone Tills (glacial tills). Alluvium is also mapped along sections of the Rapemills River. However, due to land improvements, any peat present is limited to shallow peat topsoil.

3.4 HYDROLOGICAL ENVIRONMENT

Galros Bog is drained by an extensive network of artificial drains. The West Galros Stream, a tributary of the Rapemills River, flows along the southwestern boundary of the bog. The underground electricity line runs adjacent to the Rapemills River for approximately 2.5km and crosses beneath it at two locations using horizontal directional drilling. Peat and spoil handling, storage and placement will implement the water-protection measures specified in **Chapter 7** of the EIAR and the Surface Water Management Plan (**Annex 4**), having regard to the Draft Galros Bog Rehabilitation Plan at **Annex 6.2** of the EIAR.

4.0 GENERAL PEAT & SPOIL MANAGEMENT PROPOSALS

The following are a suite of general measures which will be adhered to in the management of excavated material: -

- All excavated peat and spoil will be either temporarily stockpiled locally at turbine hardstands, or transported immediately on excavation to the spoil deposition area(s);
- Excavated material will be re-used on-site for reinstatement and landscaping insofar as possible (Some of the peat, in particular the acrotelm, i.e. the upper layer of the peat, excavated during construction will be used for landscaping purposes);
- Excavated rock, should any arise, shall be utilised in the construction of access tracks and crane hardstandings;
- Excavated sub-soil shall be prioritised for the reinstatement of infrastructure (e.g. turbine foundations);
- Excavated topsoil shall be prioritised for final landscaping measures (e.g. ground profiling/grading, etc.);
- Material requiring off-site management will be classified and transferred by appropriately permitted waste collectors to facilities authorised for the relevant material and proposed management operation. Suitable recovery routes will be prioritised over disposal in accordance with the Waste Management Plan at CEMP **Annex 2**;
- Where excavated material is to be re-used (for reinstatement or landscaping), it shall be side-cast and stored temporarily in an appropriate manner. Where excess material arises which will not be re-used at the excavation location, it shall be transported to the spoil deposition areas for permanent storage;
- Temporary storage locations shall be appropriately sited to avoid any smothering of important habitats or risk of sediment discharge to watercourses;
- Temporary storage locations will be carefully selected to avoid any ground instability risks;
- The temporary storage locations will be regularly inspected by the EM;
- Water pumped or drained from excavations will be conveyed through the sediment-control and treatment measures specified in the Surface Water Management Plan before discharge at an approved location. Untreated sediment-laden water will not be discharged directly to drains or watercourses;
- No excavations (e.g. drainage, peat cuttings) shall be carried out within 5m distance of a completed floating access track edge, or at a distance determined following inspection. The presence of excavations can destabilise the access track. Temporary excavations shall be excavated in short lengths and backfilled as soon as practicable;
- No stockpiling of materials shall take place on or adjacent to floating access tracks so as to avoid bearing failure of the underlying peat;
- End-tipping of stone onto proposed access tracks during the construction/upgrading of the track shall be carefully monitored to ensure that excessive impact loading, which may adversely affect the underlying peat, is limited;
- Due to the nature of floating access track construction it will be necessary to monitor the settlement/movement of the access track. Survey points will be

located along the track at 10m intervals in areas of deep peat (greater than 2m). See further measures included at Section 8.0 below;

- Excavated peat not required for backfill, reinstatement or landscaping will be transported immediately on excavation to the designated spoil deposition areas. Material will be placed in controlled shallow layers to maintain stability, with placement depths and finished profiles determined by the Project Geotechnical Engineer in accordance with the approved design, ground conditions and peat-stability requirements; and
- Reinstatement/landscaping works will commence as soon as practicable following the completion of individual work streams thus allowing for the timely management of material and early commencement of re-vegetation thus reducing the likelihood of soil erosion or release of silt/sediment.

5.0 ESTIMATED EXCAVATION QUANTITIES

On the basis of site investigations undertaken at the project site and the completion of the preliminary project (civil/electrical) design process; estimated volumes of material likely to be excavated during construction have been identified. The project will, should planning permission be granted, be subject to a further detailed design process where the volume of material to be excavated will be further refined. Accordingly, it is important to highlight that the volumes set out below are estimates based on the design process completed to date, the findings of the site investigations, and past experience of similar wind energy developments.

5.1 WIND FARM SITE

Infrastructure ID	Total Excavated Material (m ³)	Peat for Spoil Deposition Areas (m ³)	Peat for use in Reinstatement/Landscaping (m ³)	Topsoil & Subsoil for Spoil Deposition Areas (m ³)	Topsoil & Subsoil for Reinstatement/Landscaping (m ³)	Tar (m ³)
T9 Access Track, Hardstand, & Foundation	18,525	15,050	3,475	0	0	0
T10 Access Track, Hardstand, & Foundation	14,675	11,200	3,475	0	0	0
T11 Access Track, Hardstand, & Foundation	19,225	15,750	3,475	0	0	0
Wind Farm Access Track	4,360	0	0	3,052	1,308	0
Drainage Infill Areas	2,215	2,093	0	0	123	0
Ducting-back to switch room	3,509	0	2,924	0	585	0
Haul Route	10	0	0	0	0	10

Table 1: Estimated Spoil Volumes at Wind Farm Site

5.2 SWITCH ROOM & UNDERGROUND ELECTRICITY LINE

Infrastructure ID	Total Excavated Material (m³)	Peat for Spoil Deposition Areas (m³)	Peat for use in Reinstatement/Landscaping (m³)	Topsoil & Subsoil for Spoil Deposition Areas (m³)	Topsoil & Subsoil for Reinstatement/Landscaping (m³)	Tar (m³)
Switch Room	60	0	0	0	60	0
Underground Electricity Line	5,946	0	0	0	5,946	0

Table 2: Estimated Spoil Volumes at Switch Room & Underground Electricity Line

6.0 USE OF EXCAVATED MATERIAL

As outlined above, there are a number of possible uses for excavated material which has no further purpose in the construction process. In accordance with the aims of this PSMP, all usable excavated material will be utilised, in the first instance, for site reinstatement and landscaping purposes.

6.1 REINSTATEMENT OF INFRASTRUCTURE

Excavated subsoil and topsoil will, in the first instance, be utilised for the reinstatement of infrastructure including access track edges, crane hardstanding edges, and to provide turbine foundation ballast. Excavated peat from turbine foundation excavations will also be utilised for backfill at turbine foundation locations, where possible. Once again, this will ensure that material is, insofar as is practicable, reinstated at or close to its source location. For site reinstatement works and following the placement of subsoil, a layer of topsoil will be spread across the affected area, graded to match the surrounding ground profile, and re-seeded.

6.2 LANDSCAPING & PERMANENT STORAGE

Where material is not to be used for reinstatement at its source location, a number of permanent storage options are available, as follows: -

- The creation of track-side and hardstanding-side berms. Berms, constructed predominately of subsoil and topped with topsoil, with an approximate height of 1m could be constructed to permanently store material at appropriate access track and hardstand locations (noting, in line with the general measures included at **Section 4.0**, above, no stockpiling of materials shall take place on or adjacent to floating access tracks). The creation of berms, at appropriate locations, aids in the visual assimilation of infrastructure into the landscape and can assist in screening access tracks and hardstandings from view; and
- Permanent storage of material in the spoil deposition areas. While it is estimated that the above reinstatement and landscaping processes will account for substantial volumes of surplus excavated materials; 1 no. dedicated spoil deposition area, along with other smaller areas around turbines bases and hardstands, will be developed where excess material which cannot be utilised for reinstatement or is unsuitable for landscaping purposes. The estimated volume of peat and spoil requiring permanent deposition is 47,145m³¹, as identified in **Tables 1** and **2**. The designated

¹ The reference to approximately 48,000 m³ in **Chapter 6** of the EIAR represents the same estimated volume of 47,145 m³, rounded up.

deposition areas have been identified and sized by the project engineers alongside the assessment of excavation volumes, imported construction materials and the reuse of suitable excavated material for backfilling, reinstatement and landscaping. These estimates reflect the planning-stage civil design. Material allocated to permanent deposition will be placed within the designated areas in controlled shallow layers. Placement depths and finished profiles will be determined by the Project Geotechnical Engineer having regard to the approved design, encountered ground conditions and peat-stability requirements.

The location of the deposition area has been chosen as it comprises localised flat/level ground, and exhibits a general absence of any particular environmental constraints. Deposition areas include one main deposition area and smaller deposition areas located at the base of proposed turbines T9, T10 and T11. Spoil and Peat will be transported to these locations where it will be placed in a thin layer in accordance with best-practice methods. Appropriate drainage management measures will be implemented to prevent uncontrolled ponding, erosion, instability or sediment release from the deposited material. Following completion, the deposition areas will be graded to match the surrounding ground profile. Works at the deposition areas will be monitored, on a weekly basis during the construction phase and monthly for a six-month period thereafter, by an appropriately qualified geotechnical engineer.

6.3 PERMANENT STORAGE OF PEAT

As set out above, the project site includes designated spoil deposition areas. The following recommendations/best practice guidelines for the placement of peat within the deposition areas will be considered and taken into account during construction.

- The placement of excavated peat and spoil is to be avoided without first establishing the adequacy of the ground to support the load;
- Peat placement within the main deposition area southeast of T11 will not exceed 1.0 m in height, in accordance with Section 9.3 of the Peat Stability Assessment (Fehily Timoney, 2026). Placement depths and finished profiles will be determined by the Project Geotechnical Engineer within this assessed maximum.
- The height of any surrounding buttress(es) constructed will be greater than the height of the stored peat and spoil to prevent any surface run-off or saturated peat to flow out;
- An interceptor drain will also be installed upslope of the deposition areas. The drain will divert any surface water away from the deposition area and hence prevent water from ponding in the area;
- Where practical, it should be ensured that the surface of the placed peat and spoil is shaped to allow efficient run-off of surface water. Where possible, shaping of the surface of the peat and spoil should be carried out as placement of peat and spoil within the placement area progresses. This will reduce the likelihood of debris run-off and ensure stability of the placed peat and spoil;
- Where possible, the acrotelm shall be placed with the vegetation part of the

sod facing the right way up to encourage growth of vegetation at the surface of the placed peat and spoil within the deposition areas;

- Movement monitoring instrumentation may be required adjacent to the access track where peat has been placed. The locations where monitoring is required will be identified by the designer on site;
- Supervision by a geotechnical engineer or appropriately competent person is recommended for the works; and,
- All the above mentioned general guidelines and requirements should be confirmed by the designer prior to construction.

6.4 DISPOSAL OFF-SITE

Material requiring off-site management will be classified and transferred by appropriately permitted waste collectors to facilities authorised for the relevant material and proposed management operation. Suitable recovery routes will be prioritised over disposal in accordance with the Waste Management Plan at CEMP **Annex 2**.

7.0 GENERAL RECOMMENDATIONS FOR GOOD CONSTRUCTION PRACTICE

To minimise the risk of construction activity causing potential peat instability it is recommended that the Construction Method Statements (CMS) for the project will also take into account, but not be limited, to the general recommendations below together with the specific recommendations above:-

- Avoidance of uncontrolled concentrated water discharge onto peat slopes identified as being unsuitable for such discharge. All water discharged from excavations during work shall be piped over areas specifically assessed as being unsuitable and hence directly into suitable drainage lines;
- Avoidance of unstable excavations. All excavations shall be suitably supported to prevent collapse and development of tension cracks;
- Installation and regular monitoring of geotechnical instrumentation, as appropriate, during construction in areas of possible poor ground, such as deeper peat deposits;
- Site reporting procedures to ensure that working practices are suitable for the encountered ground conditions. Ground conditions to be assessed by suitably experienced geotechnical engineer;
- Regular briefing of all site staff (e.g. toolbox talks) to provide feedback on construction and ground performance and to promote reporting of any observed change in ground conditions; and,
- Routine inspection of wind farm site by Contractor to include an assessment of ground stability conditions (e.g. cracking, excessive floating access track settlement, disrupted surface, closed-up drains) and drainage conditions (e.g. blocked drains, absence of water in previously flowing drains, springs, etc).

8.0 CONTINGENCY MEASURES

8.1 EXCESSIVE MOVEMENT/MONITORING RESPONSE

Where there is excessive movement or continuing peat movement recorded at a monitoring location or identified at any location within the site but no apparent signs

of distress to the peat (e.g. cracking, surface rippling) then the following shall be carried out:-

- All activities (if any) shall cease within the affected area;
- Increased monitoring at the location shall be carried out. The area will be monitored, as appropriate, until such time as movements have ceased; and,
- Works will recommence only following assessment by the Project Geotechnical Engineer, implementation of any required stabilisation measures, and written authorisation from the Project Manager in consultation with the Environmental Manager. The assessment and authorisation will be recorded.

8.2 ONSET OF PEAT SLIDE

In the unlikely event where there is the onset or actual detachment of peat (e.g. cracking, surface rippling) then the following shall be carried out:-

- On alert of a peat slide incident, all activities (if any) in the area should cease and all available resources will be diverted to assist in the required mitigation procedures;
- Action will be taken to prevent a peat slide reaching any watercourse. This will take the form of the construction of check barrages on land. Due to the terrain and the inability to predict locations it may not be possible to implement any on-land prevention measures, in this case a watercourse check barrage will be implemented;
- The Environmental & Emergency Response Plan at CEMP **Annex 1** will be activated immediately. Internal escalation and external notifications will follow the responsibilities, notification sequence and contact arrangements specified in that plan; and,
- For localised peat slides that do not represent a risk to a watercourse and have essentially come to rest the area will be stabilised initially by rock infill, if required. The failed area and surrounding area will then be assessed by the engineering staff and stabilisation procedures implemented. The area will be monitored, as appropriate, until such time as movements have ceased.

8.3 CHECK BARRAGES

Whilst it is not anticipated from the analysis undertaken that a peat slide will occur on site, as a contingency a check barrage procedure is included below.

The check barrage procedure deals with preventing a peat slide from moving downstream within a watercourse. The most effective method of preventing excessive peat slide debris from travelling downstream in a watercourse is the use of a check barrage. A check barrage comprises the placement of rock fill across a watercourse. The check barrage is a highly permeable construction that will allow the passage of water but will prevent peat debris from passing through. Rock fill should comprise well-graded coarse rock pieces from about 300mm up to typically 1000mm.

The size of the barrage will vary depending on the scale of the peat debris to be contained and the geometry of the watercourse at the barrage location. In general, due to the low speed of a peat slide there is generally little impact force and most of the lateral load is due to fluid pressure on the upslope face of the barrage. Typically, the check barrage should fill the entire channel width of the watercourse up to a height of 3 to 4m with a crest width of typically 2m and side slopes of about 45 degrees

depending on the geometry of the barrage location.

The check barrage procedure is as follows:-

- Access to the check barrage location shall be along the existing access tracks on the wind farm site and/or along public roads, where possible. When it is necessary to form the barrage then rock fill will be placed across the watercourse to effectively block the passage of peat debris;
- Operatives employed to carry out the construction of the check barrage would need to be inducted by means of a briefing by on-site supervisors as to the proposed location of the check barrage;
- The check barrage provides containment for peat debris in the highly unlikely event of a major peat slide. Further remedial measures, should they be required, will be assessed by the Contractor and the Project Geotechnical Engineer and carried out as soon as physically possible when the location and extent of the failure is established; and,
- Where a barrage was constructed as a precaution and no peat debris reached the watercourse then the barrage should be removed as soon as any measures to prevent further peat sliding is agreed with all parties.

Any in-channel check barrage would be implemented only where necessary as an emergency response to prevent peat debris entering or travelling downstream within a watercourse. Relevant statutory authorities shall be notified as soon as practicable, and any subsequent removal, retention or remedial works shall be agreed with the relevant authorities where required.

The location, dimensions, materials and construction method for any emergency containment measure will be determined by the Project Geotechnical Engineer, with hydrological and ecological input as required, having regard to the actual ground conditions, debris volume, watercourse geometry, flow conditions and safe access.

9.0 CONCLUSION

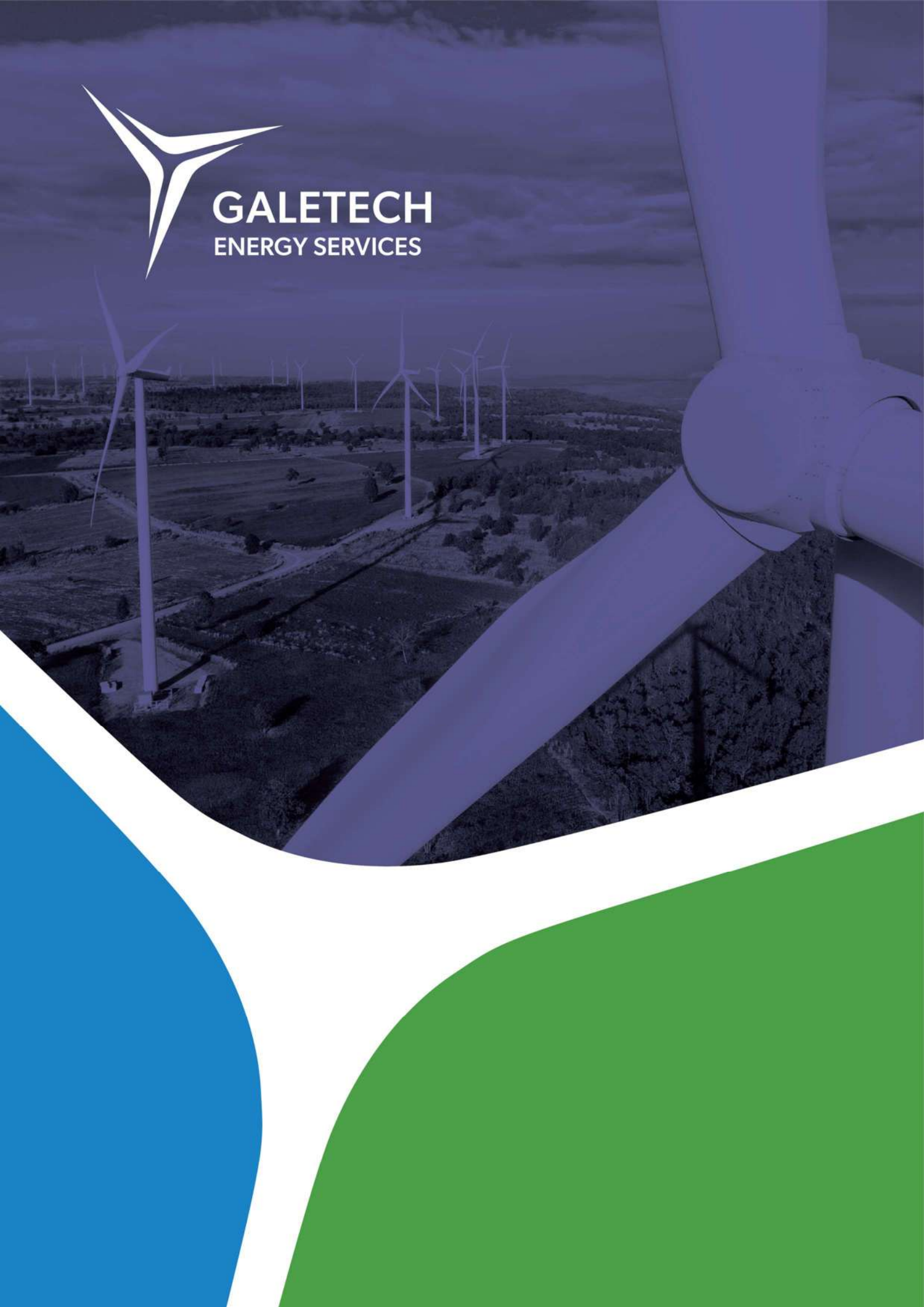
This PSMP sets out the proposed management of material excavated during construction of Cush Wind Farm Phase II. Suitable excavated material will be used for reinstatement and landscaping, with surplus material placed within the designated peat and spoil deposition areas. The excavation and destination quantities in Tables 1 and 2 will be reconciled with a capacity schedule identifying the usable area, placement depth and available capacity of each deposition area. Materials unsuitable for the identified on-site arrangements, including asphalt arising from haul-route works, will be managed off-site in accordance with the Waste Management Plan at CEMP **Annex 2**.

The range of good practice construction measures, including measures relative to working with peat, will be implemented in full. The peat management measures contained within this PSMP include some drainage guidelines for construction works and for management of peat on site. It should be noted that the control of water quality and drainage measures for site is outlined in detail in the relevant chapter of Environmental Impact Assessment Report (EIAR).

This is a live document and will be updated by the appointed contractor prior to the commencement of development. Prior to the commencement of construction, the updated PSMP will be reviewed by the EM to confirm the appropriateness of the measures set out therein.



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ANNEX 4 – SURFACE WATER MANAGEMENT PLAN





Cush Wind Farm
Phase II

Planning-Stage Construction Environmental Management Plan

Annex 4: Surface Water Management Plan

Cush Wind Limited

DOCUMENT CONTROL

Stage	Date	Name
Content	19/10/2026	Declan Owens
Approval	19/10/2026	Gavin Daly

RECORD OF CHANGES

Revision	Issue Date	Summary of Changes	Approved
00	19/10/2026	Content	Declan Owens
01			
02			

DISTRIBUTION LIST

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1.0 INTRODUCTION

Galetech Energy Services (GES), on behalf of Cush Wind Limited, has prepared this Surface Water Management Plan (SWMP) for the construction and operational phases of the Cush Wind Farm – Phase II.

1.1 PURPOSE OF THIS REPORT

This SWMP provides the framework for water management at the project site for contractors and incorporates the measures set out in the various environmental assessment documents associated with the development. The purpose of this report is to detail the practical implementation of these measures such that the construction and operational phases do not have an adverse effect on water quality.

This is a live document and will be updated by the appointed contractor prior to the commencement of development. Prior to the commencement of construction, the updated SWMP will be reviewed by the Environmental Manager (EM) and Ecological Clerk of Works (ECoW), as necessary, to confirm the appropriateness of the measures set out therein.

This SWMP aims to:-

- Describe environmental sensitivities of the site and any applicable buffer zones;
- Describe how the system will operate to minimise modification and disruption to the existing site hydrology;
- Outline the proposed maintenance regime; and,
- Outline the proposed drainage management post-construction.

1.2 REFERENCE DOCUMENTS

The production of this SWMP has been supported by best practice manuals and will be accounted for in the further development of the appointed contractor's detailed CEMP.

Other documents have been used to develop this SWMP; including a Planning-Stage Construction Environmental Management Plan, Peat & Spoil Management Plan, and Environmental & Emergency Response Plan.

1.2.1 Legislative Background

This plan has been prepared in accordance with the following legislation:-

- *Dangerous Substances Act 1972 (No. 10 of 1972), as amended;*
- *S.I. No. 293 of 1988 Quality of Salmon Water Regulations;*
- *S.I. No. 249 of 1989 Quality of Surface Water Intended for Abstraction (Drinking Water);*
- *European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. No. 477 of 2011), as amended;*
- *Water Framework Directive (2000/60/EC);*
- *S.I. No. 600 of 2001 Planning and Development Regulations 2001, as amended;*

- S.I. No. 722 of 2003 European Communities (Water Policy) Regulations;
- S.I. 547 of 2008 European Communities (Environmental Liability) Regulations;
- S.I. No. 272 of 2009 European Communities Environmental Objectives (Surface Waters) Regulations;
- S.I. No. 9 of 2010 European Communities Environmental Objectives (Groundwater) Regulations 2010, as amended; and,
- S.I. No. 350 of 2014 European Union (Water Policy) Regulations 2014.

1.2.2 Construction Industry Research & Information Association (CIRIA) Manuals

- CIRIA (Construction Industry Research & Information Association) Report C502 Environmental Good Practice on Site;
- CIRIA 521 - Sustainable Urban Drainage Systems; Design Manual for Scotland and Northern Ireland;
- CIRIA Report C532 Control of Water Pollution from Construction Sites;
- CIRIA Report C648 Control of Pollution from Linear Construction Project Technical Guidance;
- CIRIA Handbook C650 Environmental good practice on site;
- CIRIA Handbook C651 Environmental good practice on site checklist;
- CIRIA Report C609 - SuDS - hydraulic, structural & water quality advice;
- CIRIA C753 — The SuDS Manual (2015); and,
- Guidelines on Protection of Fisheries during Construction Work in and Adjacent to Water (Inland Fisheries Ireland, January 2016).

2.0 DESCRIPTION OF THE PROJECT

Cush Wind Limited proposes to construct Cush Wind Farm Phase II, comprising a three-turbine extension to the permitted Cush Wind Farm Phase I. The project comprises:

- 3 no. wind turbines with overall tip heights within the range of 199.1 m to 200 m, rotor diameters within the range of 158 m to 175 m and hub heights within the range of 111.6 m to 120.9 m;
- all associated turbine foundations and crane hardstanding areas;
- construction of approximately 1.7km of new internal site access tracks and upgrading of existing and permitted access tracks and access arrangements;
- use of the construction compounds permitted as part of Cush Wind Farm Phase I;
- 1 no. electrical switch room building and associated compound, including a new site entrance from the L300321 local road;
- underground electrical and communications cabling within the wind farm site;
- storage of excavated peat and spoil within designated peat and spoil deposition areas;
- site drainage, surface water management and environmental protection measures;

- reinstatement, environmental stabilisation and drainage management works, having regard to the wider rehabilitation objectives for Galros Bog;
- a c.5 km underground electricity line extending from the proposed electrical switch room to facilitate connection of the proposed wind farm to the national electricity network;
- temporary and permanent accommodation works along the turbine component haul route to facilitate the delivery of turbine components; and
- all associated and ancillary site development, excavation, construction, landscaping, reinstatement and environmental mitigation works.

The wind farm site is located in rural County Offaly, approximately 4 km north of Birr and c.28 km south-west of Tullamore. It extends across the townlands of Galros East, Whigsborough, Ballycollin, and Eglis, County Offaly.

The c.5 km underground electricity line will extend from the proposed electrical switch room, located on the southern side of the wind farm site, to the connection point at the proposed Mullanafawnia 110 kV substation. The Mullanafawnia 110 kV substation is third-party infrastructure that is subject to a separate consenting process and does not form part of the project.

The turbine component haul route and associated accommodation works extend through Counties Galway, Roscommon, Westmeath and Offaly. Turbine components will be transported from the Port of Galway through Counties Galway, Roscommon and Westmeath to the wind farm site in County Offaly.

As well as the reference documents listed in **Section 1.2**, various environmental reports have been prepared for the project including:-

- Environmental Impact Assessment Report (Galetech Energy Services);
- Biodiversity chapter (SLR Consulting Ireland);
- Land & Soil chapter (Hydro Environmental Services); and,
- Water chapter (Hydro Environmental Services), and,
- Natura Impact Statement (SLR Consulting Ireland).

3.0 DESCRIPTION OF BASELINE ENVIRONMENT

3.1 SITE LOCATION

The project site is located in rural County Offaly, approximately 4km north of Birr and c.28km south-west of Tullamore. The surrounding landscape is generally flat to gently undulating and is typical of the Midlands region.

Corine (2018) mapping identifies peat bogs and agricultural pastures as the principal land-cover categories across the project site. The three proposed turbines are located within Galros Bog, which comprises predominantly cutaway bog. The proposed electrical switch room is located within agricultural grassland, while the majority of the c.5km underground electricity line ('UGL') route passes through private lands comprising mainly grassland.

The Rapemills River flows in a westerly direction approximately 0.6km south of the wind farm site. The UGL route runs adjacent to the river for approximately 2.5km. The river channel is typically approximately 2m deep, with steep banks, and up to 5m wide.

The West Galros Stream, a tributary of the Rapemills River, flows along the southwestern boundary of Galros Bog and emerges from forestry southwest of the wind farm site. It crosses the N62 before joining the Rapemills River approximately 1km downstream of the wind farm site.

The UGL will cross beneath the N52 national road, the L7006 local road at Clonbeale Beg Glebe, and the Rapemills River at two locations using horizontal directional drilling ('HDD'). Four HDD crossings are therefore proposed. The remainder of the UGL route will be situated within private lands, outside the public road corridor.

3.2 TOPOGRAPHY

The project site and surrounding topography are typical of the Midlands Region and comprise a generally flat landscape with occasional gentle undulations.

Ground elevations range from between approximately 45m and 65m OD (Ordnance Datum) across the project site. The most elevated section of the project site is found at its most eastern point where agricultural grassland rises up to 65m OD (at the point where the proposed underground electricity line connects to the national electricity network).

3.3 HYDROLOGICAL ENVIRONMENT

On a regional scale, the proposed wind farm site, electrical switch room and underground electricity line are located within the Lower Shannon Catchment (Hydrometric Area 25) and within the Shannon[lower]_SC_040 sub-catchment.

On a more local hydrological scale, the wind farm site and underground electricity line are situated within the Rapemills River catchment. The Rapemills River, identified by the EPA as the Rapemills_010 river waterbody, rises approximately 8km east of the wind farm site and flows in a westerly direction approximately 0.6km south of the proposed turbines. The river discharges to the River Shannon approximately 12km downstream of the project site.

The majority of the wind farm site, including Galros Bog and the three proposed turbine locations T9, T10 and T11, drains initially to the West Galros Stream, a tributary of the Rapemills River. The West Galros Stream emerges from forestry southwest of the wind farm site and flows along the southwestern boundary of Galros Bog. It crosses the N62 before joining the Rapemills River approximately 1km downstream of the wind farm site. The stream has a modified, heavily vegetated channel, up to approximately 3m wide and 1m deep, with water levels close to the surrounding ground surface.

The southeastern portion of the wind farm site is drained by the Eglish 25 Stream, as named by the EPA. This stream flows southwards along the edge of a separate bog south of Galros Bog before discharging to the Rapemills River approximately 0.6km south of the wind farm site. The agricultural grassland accommodating the proposed electrical switch room also drains to the Eglish 25 Stream.

Galros Bog is extensively drained by a network of generally north–south orientated, parallel open drains associated with former peat production. Water from these drains is collected by an underground pipe network and conveyed to two existing settlement ponds located southwest of the bog, before discharge to the adjacent West Galros Stream. The drainage network serving the three proposed turbine locations and the designated peat and spoil deposition areas discharges through these settlement ponds.

The c.5km underground electricity line is located predominantly within private agricultural lands. Its route runs adjacent to the Rapemills River for approximately 2.5km and crosses beneath the river at two locations using horizontal directional drilling (HDD). The Rapemills River channel is typically approximately 2m deep, with steep banks, and up to 5m wide. Minor field drains are also crossed along the underground electricity line route, generally at field boundaries, and discharge towards the Rapemills River.

The underground electricity line will also cross beneath the N52 national road and the L7006 local road at Clonbeale Beg Glebe using HDD. Four HDD crossings are therefore proposed in total, comprising the two river crossings and two public-road crossings.

At the N62/N52 junction, the turbine haul-route accommodation works intersect a small watercourse which drains westwards into a wetland area immediately northwest of the junction.

The proposed surface water drainage arrangements will integrate with existing drainage pathways where appropriate and will have regard to the wider rehabilitation and environmental stabilisation objectives of the Draft Galros Bog Rehabilitation Plan (2026), included at EIAR **Annex 6.2**. The existing settlement ponds will supplement the project-specific drainage and treatment measures; the project will not rely on these ponds alone for the treatment of runoff.

3.4 GEOLOGICAL ENVIRONMENT

The wind farm site comprises predominantly cutaway raised bog, with agricultural grassland in its southeastern portion. The three proposed turbines, T9, T10 and T11, are located within Galros Bog, where historical peat extraction has removed much of the original raised bog surface. The proposed electrical switch room is located within agricultural grassland, while the underground electricity line passes predominantly through private agricultural lands.

GSI subsoil mapping identifies cutover raised peat as the predominant superficial deposit beneath the wind farm site, with gravels derived from limestone mapped in the southeastern portion where agricultural lands are present. Site investigations indicate that the ground profile typically comprises peat overlying shell marl and lacustrine clay deposits. Residual peat thickness varies across the wind farm site.

Along the western half of the underground electricity line route, mapped subsoils comprise mainly gravels derived from limestone, including two gravel esker ridges. Alluvial deposits are mapped where the route encounters the Rapemills River corridor.

Mapped subsoils along the eastern half of the underground electricity line route are more variable and include cutover raised peat, limestone-derived gravels and glacial tills, together with alluvium along sections of the Rapemills River. The lands along the route have been improved and drained for agriculture, with peat generally limited to shallow peat or peaty topsoil.

3.5 FLOOD RISK ASSESSMENT

A Stage 2 Site-Specific Flood Risk Assessment (FRA) has been prepared for Cush Wind Farm Phase II. The assessment considers published flood mapping, historical records, site characteristics and the previous Stage 3 hydraulic modelling undertaken for Cush Wind Farm Phase I.

No past flood incidents within the project site were identified in the OPW Past Flood Event Mapping reviewed for the assessment. The closest mapped recurring flood event is located at Fivealley (Flood ID 2904), approximately 2.5km east of the wind farm site. The project site does not drain towards this location. The closest mapped downstream flood event is on the Lower Shannon, approximately 12km downstream of the project site.

The historical 6-inch and 25-inch mapping reviewed for the assessment does not identify lands within the project site or along the underground electricity line as liable to flooding.

OPW CFRAM flood extent mapping was not available for the Rapemills River at the project location when the FRA was prepared. National Indicative Fluvial Mapping (NIFM) was therefore reviewed to identify the estimated 100-year and 1,000-year fluvial flood extents.

The NIFM indicates that the proposed wind farm site and its above-ground infrastructure are outside the mapped 100-year and 1,000-year fluvial flood extents and are located in Flood Zone C, where the probability of fluvial flooding is low.

The Stage 3 hydraulic modelling completed for Cush Wind Farm Phase I in December 2023 provides additional information for the overlapping wind farm site and the same receiving watercourses and flood mechanisms. This modelling considered the Rapemills River, West Galros Stream and associated floodplains, with a 20% increase in flows allowed for climate change. The modelled flood extents are consistent with the wind farm site being outside the 100-year and 1,000-year fluvial flood zones.

Sections of the underground electricity line route intersect mapped Flood Zone A along the Rapemills River corridor. The completed underground line is identified in the FRA as water-compatible infrastructure, with no loss of floodplain storage or permanent alteration of surface levels anticipated following reinstatement. Construction-stage flood risks along the route, including those associated with open trenches and temporary works, will be managed through the measures specified in **Chapter 7** of the project EIAR and this SWMP.

GSI Winter 2015/2016 Surface Water Flood Mapping records localised ponding in the northeastern and southwestern portions of Galros Bog. The FRA identifies that these mapped areas do not significantly interact with the proposed wind farm infrastructure. Localised groundwater flooding is also mapped south of Galros Bog; however, the assessment considers that ponding in this area is more likely to reflect surface water runoff over the low-permeability underlying deposits than groundwater upwelling.

The FRA identifies the turbine haul-route alterations as relatively minor works along established public transport routes which will not alter the hydrological regime or increase flood risk. These works were therefore scoped out of detailed flood-risk assessment.

Surface water management will maintain existing drainage pathways where appropriate, keep clean runoff separate from construction runoff, and collect, treat and attenuate potentially sediment-laden water before controlled discharge. Runoff rates will be controlled to pre-development greenfield rates to avoid increasing downstream flood risk.

3.6 NATURE CONSERVATION SITES

Nature conservation sites in Ireland include Special Areas of Conservation (SACs),

Special Protection Areas (SPAs), Natural Heritage Areas (NHAs) and proposed Natural Heritage Areas (pNHAs). The proposed wind farm site and underground electricity line are not located within any designated nature conservation site.

The wind farm site and underground electricity line drain to the Rapemills River, either directly or through tributaries including the West Galros Stream and Eglish 25 Stream. The Rapemills River subsequently discharges to the River Shannon, providing a downstream surface water connection to River Shannon Callows SAC (Site Code: 000216) and Middle Shannon Callows SPA (Site Code: 004096).

Further downstream, the River Shannon flows into Lough Derg, providing a surface water connection to Lough Derg, North-east Shore SAC (Site Code: 002241) and Lough Derg (Shannon) SPA (Site Code: 004058). The AA Screening Report and NIS identify these hydrological pathways as relevant to the assessment of potential effects from sediment-laden runoff or accidental releases of pollutants.

The Rapemills River also passes the vicinity of All Saints Bog and Esker SAC and pNHA (Site Code: 000566) and All Saints Bog SPA (Site Code: 004103), west of the wind farm site. All Saints Bog drains towards the Rapemills River rather than receiving surface water from it. The river's downstream passage beside the designated bog therefore does not establish a direct surface water pathway from the project into the bog. The Water chapter of the project EIAR identifies low-permeability marl and lacustrine clay deposits separating the peat from deeper groundwater-bearing deposits, while the AA Screening Report considers the potential hydrological and hydrogeological pathways to these European sites.

Lough Coura pNHA (Site Code: 000909) is located north of the wind farm site. The wind farm site does not drain towards this pNHA.

River Shannon Callows pNHA (Site Code: 000216) and Lough Derg pNHA (Site Code: 000011) are also associated with the downstream receiving environment. Their interests overlap with the SAC and SPA designations considered in the ecological assessments.

The surface water protection measures specified in this SWMP will be implemented alongside the mitigation measures in the project EIAR and the NIS to protect receiving watercourses and hydrologically connected nature conservation sites. Wider ecological connections, including those associated with bird movements, are addressed in the Biodiversity chapter of the project EIAR and AA Screening Report/NIS.

4.0 DRAINAGE SYSTEM

This section describes the permanent drainage arrangements for the Cush Wind Farm Phase II wind farm site, based on the drainage design prepared by Jennings O'Donovan & Partners, together with the temporary surface water controls required during construction of the underground electricity line and turbine haul route accommodation works. It will be read in conjunction with **Chapter 7** of the project EIAR, the Natura Impact Statement (NIS), the CEMP and the drainage drawings included at **Annex 1** to this SWMP.

The drainage arrangements will retain existing drainage pathways where appropriate, separate clean runoff from construction runoff, and provide treatment and attenuation before controlled release. Within Galros Bog, the design will have regard to the existing bog drainage network and the draft Galros Bog Rehabilitation Plan included at EIAR **Annex 6.2**.

4.1 SUSTAINABLE DRAINAGE SYSTEM

Surface water is a valuable resource and this should be reflected in the way it is managed. The appropriate management of surface water should be considered at the early stages of the project design process. It is important, particularly on large developments such as wind farms, that surface water is managed in a fashion which prevents significant alterations to the existing hydrological regime whilst ensuring the appropriate drainage of the site.

The project has been designed to implement a Sustainable Drainage System (SuDS) which seeks to:-

- Minimise changes to surface water and groundwater conditions and maintain existing drainage pathways where practicable;
- Protect sensitive watercourses and apply the hydrological buffers and specific crossing measures identified in the project EIAR;
- Keep clean runoff separate from runoff arising within disturbed ground and construction areas;
- Control sediment at source and provide a sequence of collection, settlement and filtration measures;
- Control runoff to pre-development greenfield rates and provide attenuation in accordance with the design criteria in the project EIAR (**Chapter 7**); and
- Reduce flow velocities, prevent scour and erosion, and support the progressive stabilisation and revegetation of disturbed surfaces.

These measures will minimise the volume of water requiring treatment and prevent sediment-laden runoff or other polluting material from entering watercourses. The existing Galros Bog settlement ponds will provide additional downstream treatment; the project will not rely on those ponds as a substitute for its own drainage controls.

4.1.1 SuDS Design

The drainage system will comprise clean-water interception drains, collector drains and swales, check dams, silt traps, stilling/settlement ponds and buffered outfalls. The following criteria will apply:

- Drainage controls serving each works area will be installed and made operational before the associated ground disturbance begins. Their installation will be phased to avoid exposing untreated areas of ground;
- Clean-water interception drains will be positioned upslope of works areas, where required, to prevent clean runoff entering excavations, disturbed ground and material storage or deposition areas. Clean flows will be conveyed around or beneath the works and returned to their existing drainage pathway without mixing with construction runoff;
- Runoff from turbine foundations, hardstandings, access tracks and other disturbed areas will be collected in downslope swales or collector drains and directed through the appropriate sediment treatment and attenuation measures;
- Track crossfalls, cross-drains and culverts will maintain drainage continuity and avoid creating concentrated flows or impounding water against infrastructure. Existing artificial drains crossed by access tracks will be

maintained through appropriately sized crossings;

- Swales and check dams will reduce runoff velocity and encourage settlement close to the source. Check dams will use clean, durable, non-friable stone or an equivalent specified material, consistent with the project EIAR and the detailed drainage design;
- Stilling/settlement ponds will provide sediment treatment and runoff attenuation. The design will implement the greenfield runoff and 1-in-100-year rainfall criteria set out in **Chapter 7** of the project EIAR. The detailed calculations will document the climate-change allowance, required storage, effective storage provided, treatment performance and inlet and outlet controls;
- Treated runoff will be released through buffered outfalls or level spreaders over suitable vegetated ground, avoiding scour and direct discharge of construction runoff to watercourses. Dilution will not be used as a substitute for treatment;
- Excavation dewatering will be collected in controlled sumps and pumped through suitable settlement and filtration measures, including silt bags used with vegetation filters or sedimats where appropriate. Pumping rates will remain within the capacity of the receiving treatment system;
- Runoff from temporary stockpiles and permanent deposition areas will be intercepted and treated. Silt fencing, including double silt fencing where specified, and temporary erosion protection will be maintained until the surfaces have stabilised. These arrangements will be coordinated with CEMP: Peat & Spoil Management Plan;
- New aggregate access tracks and hardstandings will use durable material resistant to erosion and the generation of fines. Their drainage will follow the existing local drainage pattern as far as practicable;
- Fuels, oils, chemicals, concrete washout and foul wastewater will be contained separately from the surface water system. Potentially contaminated water will not be routed through sediment ponds as if it were ordinary sediment-laden runoff. Hydrocarbon interception will be provided at the switch room as shown on the drainage drawings;
- Drain and pond geometry, side slopes, access and protection measures will address ground conditions, maintenance requirements and the safety of personnel and plant;
- Drainage features will be inspected regularly during construction and following heavy rainfall. Sediment, blockages, erosion and damaged controls will be addressed promptly. If treatment is inadequate, affected works will be suspended and the treatment measures supplemented before discharge or works resume. Permanent drainage features will be retained and maintained throughout the operation phase; and
- A proprietary treatment system, such as a Siltbuster or equivalent, will be used where the standard treatment measures do not achieve the required discharge quality.

4.1.2 SuDS Design Philosophy

The SuDS design principles are as follows:-

Minimise	→	Intercept	→	Treat	→	Disperse
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Minimise

The area of disturbed ground and the duration for which it remains exposed will be minimised through phased construction and progressive reinstatement. Clean-water interception will reduce the volume requiring treatment, while local source controls will limit sediment mobilisation from excavations, stockpiles and deposition areas.

Intercept

The key silt/sediment control measure is the separation of construction runoff from the clean water runoff that arises in the undisturbed areas of the project site and surrounding lands. This significantly reduces the volume, and velocity, of dirty water that the control measures are required to manage. To achieve separation, clean water infiltration interception drains are positioned on the upslope and dirty water swales/drains positioned along the verge, with site surfaces sloped towards dirty water swales/drains. The remainder of this clean water will be regularly piped under both the access tracks and dirty water swales/drains to prevent contamination. This process allow for the mimicking the paths which clean water would have taken in the absence of the project.

Treat & Disperse

Construction runoff will pass through a sequence of sediment controls appropriate to the contributing area and water quality, including check dams, silt traps, filtration measures and stilling/settlement ponds. Following adequate treatment and attenuation, runoff will be dispersed through buffered outfalls over vegetated ground. The system will provide sufficient treatment capacity and retention time; complete settlement of all suspended particles will not be assumed solely from the presence of a pond.

4.2 DESIGN MEASURES

4.2.1 Planning-Stage Design of Surface Water Management System

Jennings O'Donovan & Partners ('JOD') has prepared a coordinated planning-stage drainage design encompassing the permitted Cush Wind Farm Phase I and proposed Phase II extension. The inclusion of both phases allows the drainage arrangements to be understood across the overall wind farm site, including the contributing catchments, flow paths, access corridors, connections and outfalls. This is particularly relevant where Phase II infrastructure interfaces with the permitted Phase I layout and the existing Galros Bog drainage network.

The drainage arrangements relevant to Phase II are shown on drawings 6921-JOD-XX-DR-C-0308, 6921-JOD-XX-DR-C-0309, 6921-JOD-XX-DR-C-0310 and 6921-JOD-XX-DR-C-0311, revision P01.5 dated 10 August 2026, read in conjunction with the overall drainage keyplan, drawing 6921-JOD-XX-DR-C-0300. These drawings are included at **Annex 1** of this SWMP.

Table 1 identifies SP64 and SP69–SP85 at the Phase II turbine areas and connecting

corridors. The original pond references are retained to facilitate comparison with the drawings. The detailed construction-stage SWMP will identify the drainage features to be constructed for Phase II and any permitted Phase I features to be used or shared, together with the connections, modifications and construction sequencing required. Where a feature serves both phases, its contributing catchment and capacity will account for the combined drainage load. The drainage controls serving each Phase II works area will be operational before the associated ground disturbance begins.

Pond ref.	Contributing development area (m ²)	Length (m)	Width (m)	Depth (m)	Overall Volume of Silt Pond (m ³)
SP64	400	4	2.8	0.75	8.4
SP69	1,000	10	2.8	0.75	21.0
SP70	500	6	2.8	0.75	12.6
SP71	900	8	2.8	0.75	16.8
SP72	1,350	10	3.6	0.75	27.0
SP73	400	4	2.8	0.75	8.4
SP74	750	8	2.8	0.75	16.8
SP75	750	8	2.8	0.75	16.8
SP76	800	8	2.8	0.75	16.8
SP77	2,400	12	5.2	0.75	46.8
SP78	2,400	12	5.2	0.75	46.8
SP79	1,200	10	2.8	0.75	21.0
SP80	3,100	14	5.6	0.75	58.8
SP81	2,400	12	5.2	0.75	46.8
SP82	750	8	2.8	0.75	16.8
SP83	1,350	10	3.6	0.75	27.0
SP84	2,300	12	4.5	0.75	40.5
SP85	2,300	12	4.5	0.75	40.5

Note: Pond volumes are calculated from the scheduled length, width and depth and are rounded to one decimal place.

Table 1: Silt/Settlement Pond Specifications

Temporary surface water controls will be implemented during construction of the underground electricity line and turbine haul route accommodation works in accordance with the project EIAR and the NIS. These will include clean-water diversion, sediment interception, double silt fencing where specified, controlled dewatering and prompt reinstatement. HDD drilling fluids and arisings will be contained separately, and the drilling contractor will implement the required frac-out prevention and contingency arrangements.

Following installation of the underground electricity line, disturbed surfaces will be reinstated and existing land drains and surface water flow paths will be maintained or restored. The reinstatement will prevent the cable trench from obstructing existing drainage or creating a preferential flow path. On this basis, no permanent alteration to the surface water drainage regime along the underground electricity line route is

anticipated during the operation phase.

Prior to the commencement of development, the appointed Contractor; in conjunction with the project design team, EM, and ECoW; shall prepare a detailed SWMP which shall detail the precise specifications and locations of all surface water management infrastructure to be installed.

5.0 CONSTRUCTION PHASE MEASURES

In the first instance, the project seeks to avoid adverse effects on surface water through avoidance. In particular, the project has sought to avoid direct interactions with watercourses; through minimising the number of watercourse crossings and the implementation of a 50m buffer zone around natural watercourses. The design of the project has, where possible, sought to avoid this buffer area.

Best practice measures are also proposed to minimise impacts to water quality, as follows:-

- All site personnel will be made aware of their environmental responsibilities at the site;
- Contractors will be required to include contingency plans to deal with spillages, should they occur;
- Land disturbance will be kept to minimum and disturbed areas will be stabilised as soon as possible;
- In principle, soil excavation should be undertaken during dry periods, whenever possible;
- Site visits by a Design Engineer will be undertaken at various stages of the construction process to ensure that the SuDS scheme is being constructed and implemented appropriately; and,
- In order to verify the efficacy of pollution prevention works during construction, water quality monitoring will be undertaken by a suitably qualified EM, prior to, during and post completion of construction works. This will include all watercourses within the catchment of the construction area. The monitoring will comprise visual and hydrochemistry monitoring, as described in detail in the Water Quality Monitoring Plan.

Finally, all mitigation measures proposed in the Water chapter of the EIAR will be implemented in full, as set out in the following sections.

5.1 EARTHWORKS (REMOVAL OF VEGETATION COVER, EXCAVATIONS AND STOCK PILING) RESULTING IN SUSPENDED SOLIDS ENTRAINMENT IN SURFACE WATER

The key mitigation measure during the construction phase is the avoidance of sensitive aquatic areas by using a 50m buffer. From the constraints map (**Annex 7.4** of the EIAR) it is evident that only the underground electricity line is within a 50m buffer zone.

The following section details the measures which will be put in place during the construction phase to ensure that surface water features are protected from the release of silt or sediment and to ensure that all surface water runoff is fully treated and attenuated to avoid the discharge of dirty water.

- Source controls to limit the likelihood for 'dirty water' to occur:

- Interceptor drains, vee-drains, diversion drains, flume pipes, erosion and velocity control measures such as use of sand bags, oyster bags filled with clean washed gravel, filter fabrics, and other similar/equivalent or appropriate systems;
- Small working areas, covering stockpiles, weathering off stockpiles, cessation of works in certain areas or other similar/equivalent or appropriate measures.
- In-Line controls to ensure appropriate management of silt laden water:
 - Interceptor drains, vee-drains, oversized swales, erosion and velocity control measures such as check dams, sand bags, oyster bags, straw bales, flow limiters, weirs, baffles, silt bags, silt fences, sedimats, filter fabrics, and collection sumps, temporary sumps/attenuation lagoons, sediment traps, pumping systems, settlement ponds, temporary pumping chambers, or other similar/equivalent or appropriate systems.
- Treatment systems to fully attenuate silt laden waters prior to discharge:
 - Temporary sumps and attenuation ponds, temporary storage lagoons, sediment traps, and settlement ponds, and proprietary settlement systems such as Siltbuster, and/or other similar/equivalent or appropriate systems; and
 - The existing settlement ponds lagoons on the BnM lands.

It should be noted for this site that an extensive network of bog drains already exists, and these will be integrated and enhanced as required and used within the wind farm drainage system. The wind farm drainage will coexist with the BnM bog rehabilitation plan. The integration of the existing land drainage network and the proposed wind farm network is common practice in wind energy developments and will also result in benefits to surrounding lands.

The main elements of interaction with existing drains will be as follows:

- Apart from interceptor drains, which will convey clean runoff water to the downstream drainage system, there will be no direct discharge (without treatment for sediment reduction and attenuation for flow management) of runoff from the wind farm drainage into the existing site drainage network. This will reduce the likelihood of any increased risk of downstream flooding or sediment transport/erosion;
- Silt traps will be placed in the existing drains upstream of any streams where construction works is taking place, and these will be diverted into proposed interceptor drains, or culverted under/across the works area; and
- Buffered outfalls, which will be numerous over the site, will promote percolation of drainage waters across vegetation and close to the point at which the additional runoff is generated, rather than direct discharge to the existing drains of the site.

Water Treatment Train

While the silt/sediment ponds and lagoons are assessed as providing a sufficient level of protection to avoid any deterioration in downstream water quality; a final line of defence can be provided by a water treatment train such as a 'Siltbuster', if required. If the discharge water from construction areas fails to be of a high quality, then a

filtration treatment system (such as a 'Siltbuster' or similar equivalent treatment train [sequence of water treatment processes]) will be used to filter and treat all surface discharge water collected in the dirty water drainage system. This water treatment train will apply for the entirety of the construction phase.

Silt Fences

Silt fences will be emplaced within drains down-gradient of all construction areas. Silt fences are effective at removing heavy settleable solids. This will act to prevent entry to watercourses of sand and gravel sized sediment, released from excavation of mineral sub-soils of glacial and glacio-fluvial origin, and entrained in surface water runoff. Inspection and maintenance of these structures during construction phase is critical to their functioning to stated purpose. They will remain in place throughout the entire construction phase. Double silt fences will be emplaced within drains down-gradient of all construction areas inside the hydrological buffer zones to provide an additional layer of protection in these areas.

Silt Bags

Silt bags will be used where small to medium volumes of water need to be pumped from excavations. As water is pumped through the bag, most of the sediment is retained by the geotextile fabric allowing filtered water to pass through. Silt bags will be used with natural vegetation filters or sedimats (sediment entrapment mats, consisting of coir or jute matting) placed at the silt bag location to provide further treatment of the water outfall from the silt bag. Sedimats will be secured to the ground surface using stakes/pegs. The sedimat will extend to the full width of the outfall to ensure all water passes through this additional treatment measure.

Existing BnM/Galros Bog Settlement Ponds/lagoons

The project infrastructure on the BnM lands (i.e. turbines T9 – T11 and spoil deposition areas) have the added benefit of the existing settlement ponds/lagoon providing additional attenuation and any future measures introduced as part of the rehabilitation plan.

Management of Runoff from Peat/Spoil Deposition Areas

It is proposed that excavated overburden/spoil will be utilised for reinstatement of excavated areas etc. and for landscaping purposes. Excess material, or material which is unsuitable for this purpose, will be stored, permanently, at 1 no. dedicated spoil deposition area located southeast of proposed turbine T11 as well as smaller deposition areas at each of the 3 no. turbine locations.

All proposed spoil deposition areas are located outside the 50m stream buffer zone (refer to **Annex 7.4** of the EIAR).

During the initial placement of spoil in the deposition areas, silt fences, straw bales and biodegradable matting will be used to control surface water runoff. Double silt fencing will be placed along the edge of each bog drain that intercepts the deposition areas.

Drainage from overburden deposition areas will ultimately be into to the existing bog drain network where it is proposed that check dams will be installed every 20m or so to create a series of settlement ponds, before being discharged.

The spoil deposition area drainage on the BnM lands have the added benefit of the existing settlement ponds/lagoons.

Spoil deposition areas will be sealed with a digger bucket and vegetated as soon possible to reduce sediment entrainment in runoff. Once re-vegetated and stabilised, spoil deposition areas will no longer be a likely source of silt laden runoff. Surface water protection infrastructure will be left in place until the areas have stabilised.

Underground Electricity Line Installation Works

Mitigation measures which are outlined below will be implemented to ensure that silt laden or contaminated surface water runoff from the trenching work does not discharge directly to the Rapemills River:

- All existing dry drains that intercept the works area will be temporarily blocked down-gradient of the works using temporary check dams/silt traps (e.g. straw bales);
- Clean water diversion drains will be installed upgradient of the works areas, as required;
- Check dams/silt fence arrangements (silt traps or straw bales) will be placed in all existing drains that have surface water flows and also along existing roadside drains;
- A double silt fence perimeter will be placed down-slope of works areas that are located inside the watercourse 50m buffer zones;
- At drain crossing locations, where open trenching is required, damming and over pumping method will be used to manage flows in the drain.

Specific mitigation measures relating to the directional drilling at the crossing location are detailed below.

Horizontal Directional Drilling (HDD)

The following mitigation will be carried out during directional drilling works:

- Firstly, the crossing works area will be clearly marked out with fencing or flagging tape to avoid unnecessary disturbance of vegetation;
- A minimum 10m vegetated buffer will be maintained between the HDD working areas, including launch and receiving pits, and the riverbank. Plant entry into this buffer will be avoided. Where limited access within the buffer is demonstrably unavoidable, ground-protection mats will be used and the duration and extent of access will be minimised;
- Double silt fencing will be placed upslope of the buffer zone on each side of the watercourse.
- Mats will be used underneath the excavator, inside the 10 metre vegetative buffer zone, to prevent soil erosion/rutting and potential surface water quality impacts from localised surface water runoff;
- Temporary storage of excavated material will be undertaken outside of the 10m buffer on flat ground or within a local hollow area. A containment berm will be placed downslope of the excavated material which in turn will be surrounded by secondary silt fence protection to prevent saturated soil from flowing back into the watercourse;
- Operation of machinery and use of equipment within the 10m buffer will be kept to a minimum to avoid any unnecessary disturbance;
- There will be no refuelling allowed within 50m of the watercourse crossing;

- All plant will be checked for purpose of use prior to mobilisation at the watercourse crossing; and,
- Works shall not take place during periods of heavy rainfall and will be scaled back or suspended if heavy rain is forecasted.

Mitigation Measures relating to the use of a mixture of a natural, inert and fully biodegradable drilling fluid such as Clear Bore™ and water for directional drilling include:

- The area around the Clear Bore™ batching, pumping and recycling plants will be bunded using terram and sandbags in order to contain any spillages;
- One or more lines of silt fences will be placed between the works area and adjacent rivers and streams on both banks;
- Accidental spillage of fluids will be cleaned up immediately and transported off site for disposal at a licensed facility; and,
- Adequately sized skips will be used for temporary storage of drilling arisings during directional drilling works. This will ensure containment of drilling arisings and drilling flush.

A Fracture Blow-out (Frac-out) Prevention and Contingency Plan will be prepared by the drilling contractor prior to construction and will include the following measures:

- The drilling fluid/bentonite will be non-toxic and naturally biodegradable (i.e., Clear Bore Drilling Fluid or similar will be used);
- The area around the drilling fluid batching, pumping and recycling plants will be bunded using terram and/or sandbags to contain any potential spillage;
- A double row of silt fencing will be placed between the works area and the adjacent river;
- Spills of drilling fluid will be cleaned up immediately and transported off-site for disposal at a licensed facility;
- Adequately sized skips will be used where temporary storage of arisings are required;
- The drilling process/pressure will be constantly monitored to detect any possible leaks or breakouts into the surrounding geology or local watercourse;
- This will be gauged by observation and by monitoring the pumping rates and pressures. If any signs of breakout occur then drilling will be immediately stopped;
- Any frac-out material will be contained and removed off-site;
- The drilling location will be reviewed, before re-commencing with a higher viscosity drilling fluid mix; and,
- If the risk of a further inadvertent return remains high, the drilling methodology and alignment will be reviewed within the assessed works corridor before drilling recommences.

Pre-emptive Site Drainage Management

The works programme for the initial construction stage of the development will also take account of weather forecasts, and predicted rainfall in particular. Large excavations and movements of soil/subsoil or vegetation stripping will be suspended

or scaled back if prolonged or intense rain is forecast. The extent to which works will be scaled back or suspended will relate directly to the amount of rainfall forecast.

The following forecasting systems are available and will be used on a daily basis at the site to direct proposed construction activities:

- General Forecasts: Available on a national, regional and county level from the Met Eireann website (www.met.ie/forecasts). These provide general information on weather patterns including rainfall, wind speed and direction but do not provide any quantitative rainfall estimates;
- Meteo Alarm: Alerts to the possible occurrence of severe weather for the next 2 days. Less useful than general forecasts as only available on a provincial scale;
- 3 hour Rainfall Maps: Forecast quantitative rainfall amounts for the next 3 hours but does not account for possible heavy localised events;
- Rainfall Radar Images: Images covering the entire country are freely available from the Met Eireann website (www.met.ie/latest/rainfall_radar.asp). The images are a composite of radar data from Shannon and Dublin airports and give a picture of current rainfall extent and intensity. Images show a quantitative measure of recent rainfall. A 3 hour record is given and is updated every 15 minutes. Radar images are not predictive; and,
- Consultancy Service: Met Eireann provide a 24 hour telephone consultancy service. The forecaster will provide interpretation of weather data and give the best available forecast for the area of interest.

Using the safe threshold rainfall values will allow work to be safely controlled (from a water quality perspective) in the event of an impending high rainfall intensity event.

Works will be suspended if forecasting suggests any of the following is likely to occur:

- >10 mm/hr (i.e. high intensity local rainfall events);
- >25 mm in a 24-hour period (heavy frontal rainfall lasting most of the day); or,
- >half monthly average rainfall in any 7 days.

Prior to works being suspended the following control measures will be completed:

- Secure all open excavations;
- Provide temporary or emergency drainage to prevent back-up of surface runoff; and,
- Avoid working during heavy rainfall and for up to 24-hours after heavy events to ensure drainage systems are not overloaded.

Timing of Site Construction Works

The construction of the site drainage system will be carried out, at the respective locations, prior to other activities being commenced. The construction of the drainage system will only be carried out during periods of, where possible, no rainfall, therefore avoiding runoff. This will avoid the risk of entrainment of suspended sediment in surface water runoff, and transport via this pathway to surface watercourses. Construction of the drainage system during this period will also ensure that attenuation features associated with the drainage system will be in place and functional for all subsequent construction works.

Monitoring

A detailed Water Quality Monitoring Plan will form part of the construction-stage CEMP. Monitoring will include baseline, construction and post-construction monitoring, with field testing and laboratory analysis of the agreed parameters. The surface water sampling locations SW1–SW4 will be used during construction, supplemented by additional locations where required to monitor individual working areas.

The civil works contractor and EM will regularly inspect the drainage system, particularly following heavy rainfall, to identify blockages, unintended standing water, erosion and sediment accumulation. Accumulated sediment that reduces the effectiveness of a drainage feature will be removed and managed appropriately. The monitoring plan will identify sampling frequencies, assessment criteria, reporting responsibilities and the corrective actions required where deterioration or ineffective treatment is identified.

5.2 EXCAVATION DEWATERING AND EFFECTS ON SURFACE WATER QUALITY

The management of excavation dewatering (pumping), particularly in relation to any accumulation of water in foundations or underground electricity line trenches, and subsequent treatment prior to discharge into the drainage network will be undertaken as follows:

- Appropriate interceptor drainage, to prevent upslope surface runoff from entering excavations, will be put in place;
- The interceptor drainage will be discharged to the site constructed drainage system or onto natural vegetated surfaces and not directly to surface waters to ensure that Greenfield runoff rates are mimicked;
- If required, pumping of excavation inflows will prevent build-up of water in the excavation;
- The pumped water volumes will be discharged via volume and silt/sediment ponds and settlement lagoons adjacent to excavation areas, or via specialist treatment systems such as a Siltbuster unit;
- There will be no direct discharge to surface watercourses, and therefore no risk of hydraulic loading or contamination will occur;
- Daily monitoring of wind farm excavations by the Environmental Manager will occur during the construction phase. If high levels of seepage inflow occur, excavation work at this location will cease immediately and a geotechnical assessment undertaken; and,
- A mobile ‘Siltbuster’ or similar equivalent specialist treatment system will be available on-site for emergencies. Siltbusters are mobile silt traps that can remove fine particles from water using a proven technology and hydraulic design in a rugged unit. The mobile units are specifically designed for use on construction-sites. They will be used as final line of defence if needed.

5.3 RELEASE OF HYDROCARBONS DURING CONSTRUCTION AND STORAGE

Measures proposed to avoid release of hydrocarbons at the site are as follows:

- The volume of fuels or oils stored on site will be minimised. All fuel and oil will be stored in an appropriately bunded area within the temporary construction

compound. Only an appropriate volume of fuel will be stored at any given time. The bunded area will be roofed to avoid the ingress of rainfall and will be fitted with a storm drainage system and an appropriate oil interceptor;

- All bunded areas will have 110% capacity of the volume to be stored;
- On site refuelling of machinery will be carried out using a mobile double skinned fuel bowser. The fuel bowser, a double-axel custom-built refuelling trailer will be re-filled at the temporary compound and will be towed around the site by a 4x4 jeep to where plant and machinery is located. No refuelling will be permitted at works locations within the 50m hydrological buffer. The 4x4 jeep will also be fully stocked with fuel absorbent material and pads in the event of any accidental spillages. The fuel bowser will be parked on a level area in the construction compound when not in use and only designated trained and competent operatives will be authorised to refuel plant on site. Mobile measures such as drip trays and fuel absorbent mats will be used during all refuelling operations to avoid any accidental leakages;
- All plant and machinery used during construction will be regularly inspected for leaks and fitness for purpose;
- Spill kits will be readily available to deal with and accidental spillages;
- All waste tar material arising from road cuttings (from trenching or other works in public roads) will be removed off-site and taken to a licensed waste facility. Due to the potential for contamination of soils and subsoils, it is not proposed to utilise this material for any reinstatement works; and
- An outline emergency plan for the construction phase to deal with accidental spillages is contained within the Planning-Stage CEMP. This emergency plan will be further developed prior to the commencement of development, and will be agreed with the Planning Authority as part of the detailed CEMP.

5.4 RELEASE OF CEMENT-BASED PRODUCTS

The following mitigation measures are proposed to ensure that the release of cement-based products is avoided:

- No batching of wet-cement products will occur on site. Ready-mixed concrete will be brought to site as required and, where possible, emplacement of pre-cast products, will take utilised;
- All drain crossings will utilise pre-cast products and the use of wet-cement products within the hydrological buffer will be avoided;
- Where concrete is delivered on site, only the chute will be cleaned, using the smallest volume of water practicable. Chute cleaning will be undertaken at lined cement washout ponds with waters being stored in the temporary construction compound, removed off site and disposed of at an approved licensed facility. No discharge of cement contaminated waters to the construction phase drainage system or directly to any artificial drain or watercourse will be allowed;
- Weather forecasting will be used to ensure that prolonged or intense rainfall is not predicted during concrete pouring activities; and,

The concrete pour site will be kept free of standing water and plastic covers will be ready in case of sudden rainfall event.

5.5 RATH GROUP WATER SCHEME

The Rath groundwater source serves Eglish, Rath & Drumcullen GWS Ltd, the scheme referred to within the project EIAR. The designation 'Rath Group Water Scheme' is retained in this SWMP for consistency with the project EIAR and the GSI/Offaly County Council report, Rath Group Water Scheme Groundwater Source Protection Zones (July 2009), which informs the assessment.

The underground electricity line passes through the mapped Rath Group Water Scheme source protection area. The following measures will be implemented:

- No refuelling or handling of fuels, oils, lubricants or chemicals will be permitted within 100m of the mapped source protection area boundary.
- Where concrete is to be poured, a geotextile liner will be placed around the founding layer of lean-mix concrete.
- Clear signage will be installed within the source protection area to identify the drinking water protection area and the restrictions on the use of fuels, oils, lubricants and chemicals.

5.6 CONSTRUCTION-STAGE FLOOD RISK – UNDERGROUND ELECTRICITY LINE

The EM or ECoW will monitor weather forecasts and rainfall warnings and implement a forecast-based trigger-response procedure for works within the fluvial floodplain. Preparations will begin when forecasts indicate a potential high-intensity rainfall event. Sustained rainfall forecast to last more than four hours, any Met Éireann Status Yellow or higher rainfall warning affecting the works area, and the rainfall thresholds (specified in **Section 5.1** of the project EIAR) will trigger the relevant precautionary response.

A managed retreat from the floodplain will be implemented before anticipated inundation. Exposed soil and subsoil surfaces will be secured, open trenches will be backfilled and compacted, and plant, machinery and equipment will be removed from the flood zones. Temporary sediment controls liable to be washed away will be removed as part of the managed retreat, following the securing of exposed working areas. Exposed stockpiles will be covered during heavy rainfall and periods when works have ceased.

Works will be postponed during flooding or high river flows and will remain suspended until the storm and associated runoff have passed. Before works recommence, the working areas and drainage controls will be inspected, necessary corrective measures completed, and temporary sediment controls reinstated.

6.0 OPERATION PHASE MEASURES

Following completion of construction and stabilisation of disturbed surfaces, the potential for sediment-laden runoff will reduce. Runoff from access tracks, hardstandings and the switch room compound will continue to be managed through the retained drainage system, including swales, check dams, settlement ponds and buffered outfalls. The drainage arrangements will control runoff rates and provide treatment before release, having regard to the low-permeability ground conditions at the wind farm site.

Infiltration interceptor drains will be retained for the duration of the project to ensure that up-slope ('clean') runoff is directed away from site infrastructure and managed

in an appropriate manner.

Swales, check dams and settlement/silt ponds (i.e. for the management of 'dirty' water) shall be retained for the duration of the project. The swales, having become vegetated, and check dams will act as a filtration feature for the low volume of surface water runoff arising and provide primary treatment and attenuation for runoff.

The following measures will also be implemented.

6.1 REPLACEMENT OF NATURAL SURFACES

The operational phase drainage system of the project is described below:-

- Interceptor drains will be installed up-gradient of all infrastructure to collect clean surface runoff, in order to minimise the amount of runoff reaching areas where suspended sediment could become entrained. It will then be directed to areas where it can be re-distributed over the ground by means of a level spreader;
- Swales/track side drains will be used to collect runoff from access tracks, crane hardstanding areas and electrical switch room compound areas which may contain entrained suspended sediment, and channel it to settlement ponds for sediment settling;
- Transverse drains ('grips') will be constructed, where appropriate, in the surface layer of access tracks to divert any runoff into swales/track side drains;
- Check dams will be used along sections of access tracks drains to intercept silts at source. Check dams will be constructed from a 40mm non-friable crushed rock or similar;
- Swales and check dams will buffer volumes of runoff discharging from the drainage system during periods of high rainfall, by retaining water until the storm hydrograph has receded, thus reducing the hydraulic loading to watercourses; and,
- Settlement ponds will be designed in accordance the greenfield runoff rate requirements; and,
- Imported rock for construction purposes and road surfacing will be strong, well-graded limestone which will be resistant to erosion and have a low likelihood to generate fines in hardstand runoff.

The operation of the underground electricity line will not result in any likely hydrological or water quality effects and therefore do not require mitigation measures.

6.2 HYDROCARBONS SPILLAGES/LEAKAGES

Measures relating to oils and fuels are as follows:-

- All storage containers will be labelled appropriately, including hazardous markings;
- Fuel storage during the operation phase will be minimised. Any fuel stored on site will be held in appropriately bunded storage;
- Any oil storage tanks will be located within an impermeable bund capable of holding 110% of the stored oil volume;
- Bunds will be to standard specified in CIRIA Report 163 'Construction of bunds for oil storage tanks' and CIRIA Report C535 'Above-ground proprietary

prefabricated oil storage tank systems;

- Barrels and bunded containers will be stored upright and internally where appropriate and always on drip trays or sump pallets;
- Appropriate spill kits will be available at all storage locations;
- Turbine transformers will be located within the turbines, and any leaks will be fully contained within the turbine thus eliminating any pathway for leakages to affect land and soil.
- Maintenance vehicles will be regularly inspected for leaks and fitness for purpose;
- All fuel/chemical storage facilities will be subject to weekly inspection; and,
- An emergency plan for the operational phase to deal with accidental spillages will be contained within Environmental Management Plan. Spill kits will be available to deal with accidental spillages.

7.0 DECOMMISSIONING PHASE MEASURES

Prior to decommissioning works, a detailed Decommissioning Plan will be developed to detail the methods and measures to be adopted during that phase of works. The Decommissioning Plan will avail of, and implement, prevailing best practice measures including surface water protection methods.

It is likely that the methods adopted will be similar to those presented above in respect of the construction phase but of a reduced scale. Regardless of the specific practices and methods to be adopted; the overall objective will be the prevention of any silt, sediment or deleterious matter being discharged from the site such that could cause a deterioration in downstream water quality.

The drainage system will remain operational throughout decommissioning. Temporary runoff controls will be installed before ground disturbance, and disturbed areas will be revegetated as soon as practicable and monitored until vegetation is established.

8.0 CONCLUSION

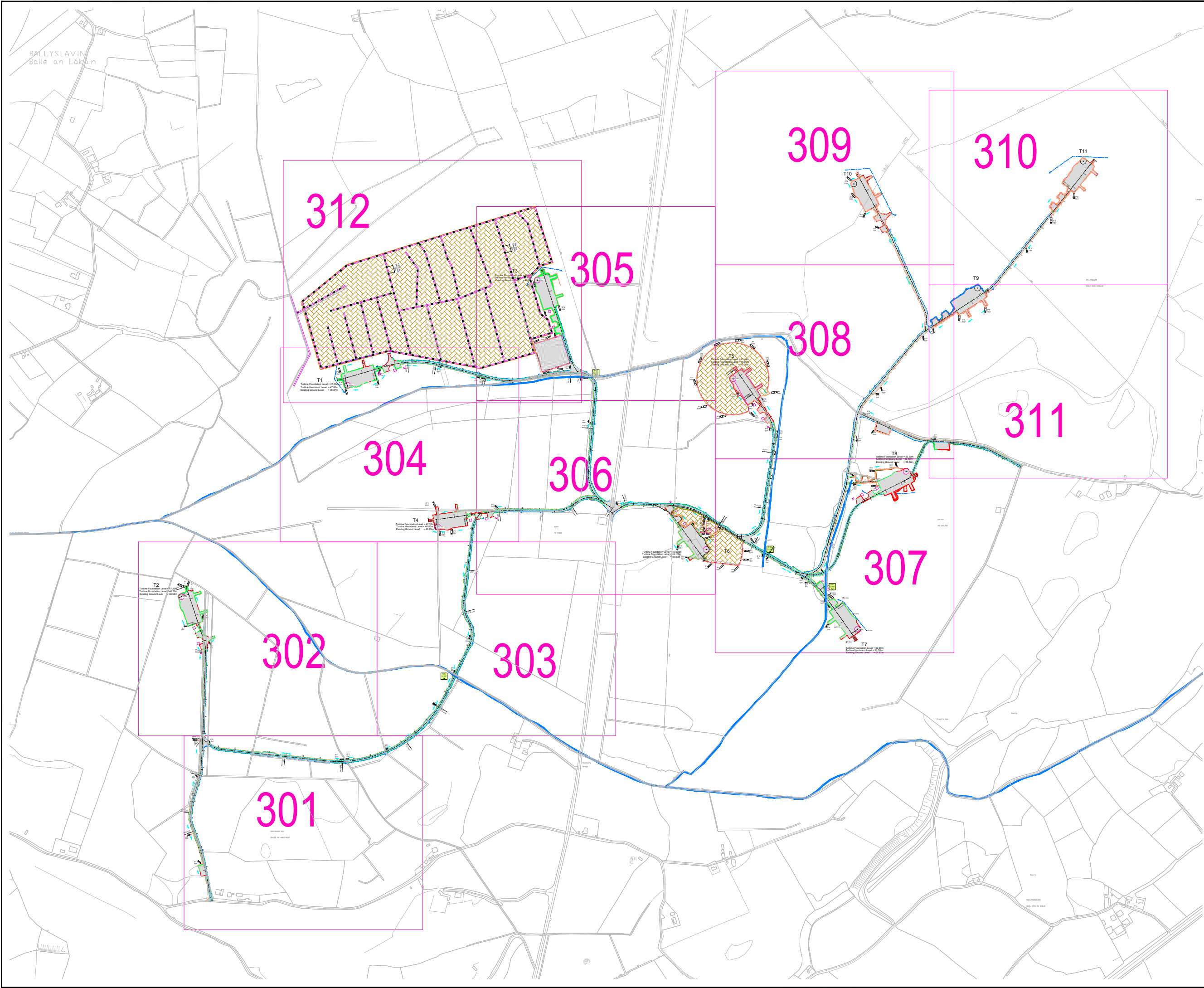
This SWMP has been prepared to detail the practical implementation of surface water management infrastructure to address the requirements of measures set out in the EIAR. This is a live document and will be updated by the appointed Contractor prior to the commencement of development. Prior to the commencement of construction, the updated SWMP will be reviewed by the Environmental Manager (EM) and Ecological Clerk of Works (ECOW), as necessary, to confirm the appropriateness of the measures set out therein.

The SWMP incorporates the principles of SuDS; with the overall objective of ensuring that no silt, sediment or other material is discharged from the site to surrounding drainage features; to ensure that the project does not adversely affect the drainage regime within the project site and in its vicinity.

The proposed SuDS comprises drainage infrastructure to intercept and direct 'clean' incidental runoff away from works locations; and a separate surface water management train to effectively control manage and treat 'dirty' water runoff from the works areas.

The efficacy of the measures set out in this SWMP will be regularly monitored and will be supported by water quality monitoring as set out in the Water Quality Monitoring Plan.

ANNEX 1 - PLANNING-STAGE DRAINAGE/SURFACE WATER MANAGEMENT SYSTEM



- NOTES:
- 1 FIGURED DIMENSIONS ONLY TO BE TAKEN FROM THIS DRAWING.
 - 2 ALL DRAWINGS TO BE CHECKED BY THE CONTRACTOR ON SITE.
 - 3 ENGINEER TO BE INFORMED OF ANY DISCREPANCIES BEFORE ANY WORK COMMENCES.
 - 4 THIS DRAWING TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT DRAWINGS AND SPECIFICATIONS.

Legend

- Proposed Access Road in Cut
- Proposed Access Road in Fill
- Proposed Hardstand
- Proposed Clean Water Drainage
- Proposed Dirty Water Drainage
- SP 12 550m²
- Stilling Pond Number, Catchment Area & Flow Direction
- Proposed Culvert to Existing Open Drain
- Spoil Deposition Area

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OS Sheets: 3643,3644,3701 & 3702

P01.3	Silt Ponds added to Spoil Deposition Areas, Drainage Table Updated	AMcC 23.11.23
P01.2	Spoil Deposition Areas Updated	AMcC 13.11.23
P01.1	Issued For Comment	AMcC 13.04.23
rev.	modifications	by date

Client

Cush Wind Farm

Project

Cush Wind Farm, Co Offlay.

Stage

Planning

Title

Drainage Layout
Keyplan

Scales

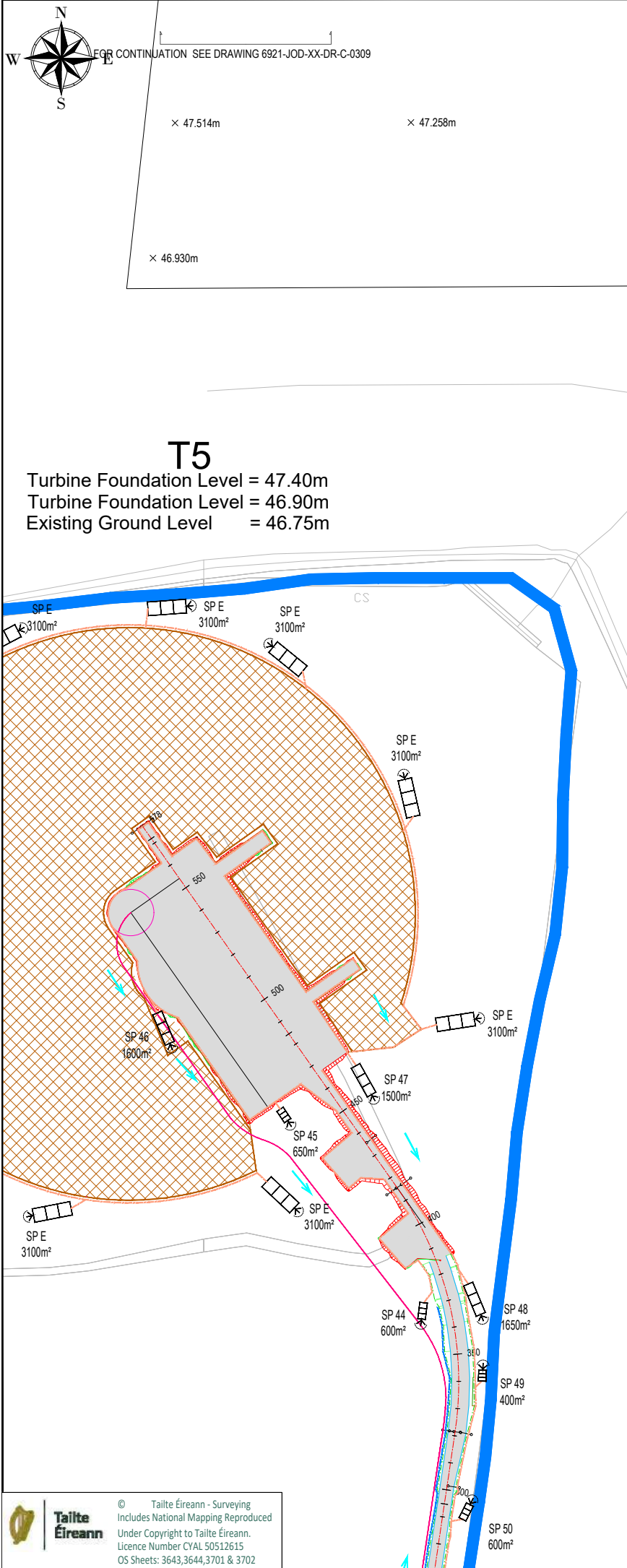
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Surveyed	Prepared By	Checked	Date
	AMcC	JMcE	16.04.2023

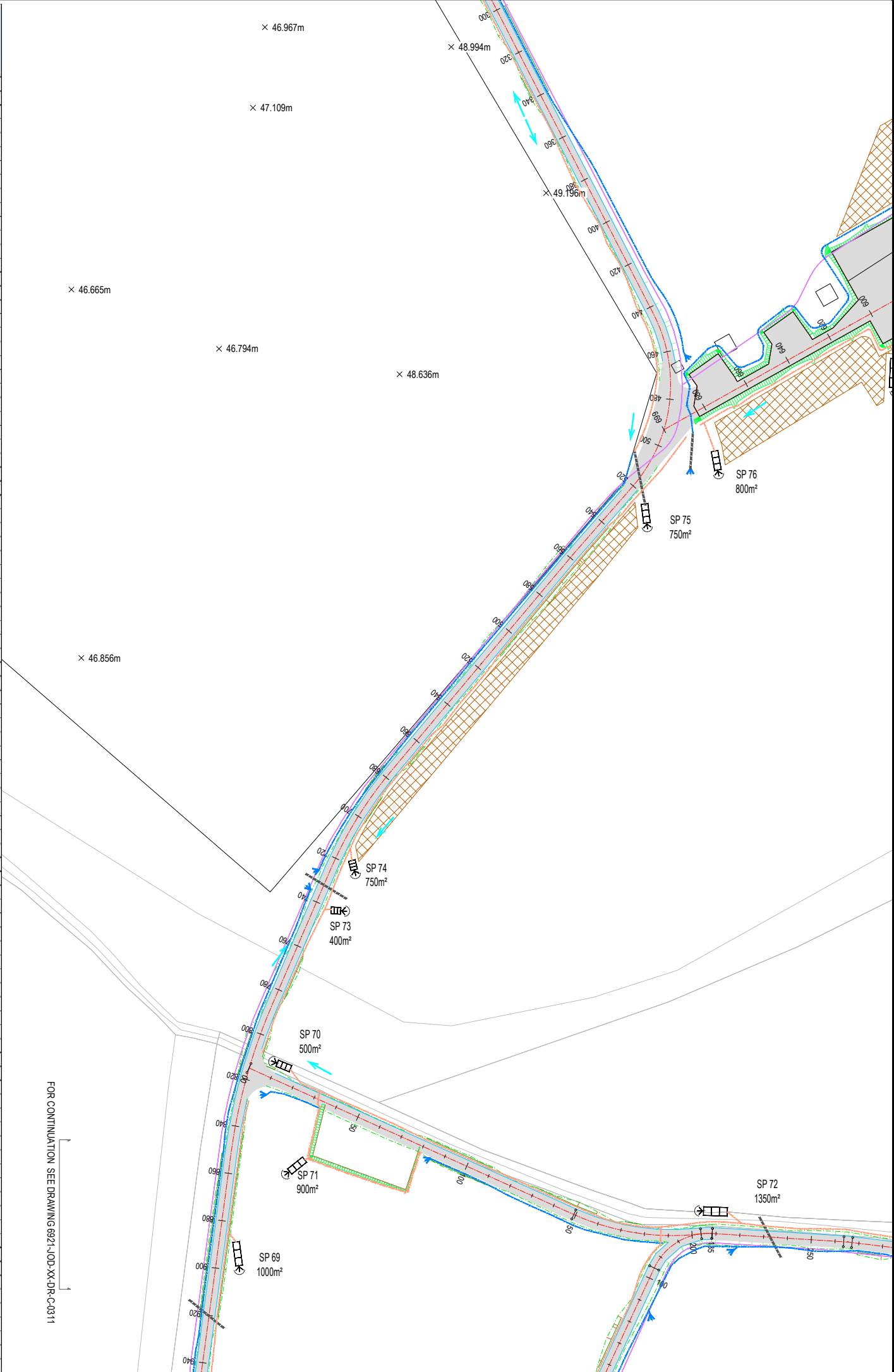
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IRELAND.

TEL: (0035371) 9161416.
FAX: (0035371) 9161080.
Email: info@jodireland.com
Web: www.jodireland.com

Job No.	Drawing no.	Revision
6921	6921-JOD-XX-DR-C-0300	P01.3



Pond Ref. SP	Development Area (m ²)	Dim. length (m)	Dim. Width (m)	Dim. Depth (m)
1	950	8	2.8	0.75
2	800	8	2.8	0.75
3	450	4	2.8	0.75
4	1750	9	4.5	0.75
5	650	6	2.8	0.75
6	3100	14	5.2	0.75
7	1700	9	4.5	0.75
8	1700	9	4.5	0.75
9	500	6	2.8	0.75
10	1150	8	3.6	0.75
11	825	8	2.8	0.75
12	550	6	2.8	0.75
13	330	4	2.8	0.75
14	1125	8	3.6	0.75
15	425	4	2.8	0.75
16	1050	8	3.6	0.75
17	2500	12	5.2	0.75
18	1500	10	3.6	0.75
19	2000	12	4.5	0.75
20	1500	10	3.6	0.75
21	1100	8	3.6	0.75
22	925	8	2.8	0.75
23	650	6	2.8	0.75
24	550	6	2.8	0.75
25	550	6	2.8	0.75
26	1500	10	3.6	0.75
27	1500	10	3.6	0.75
28	1750	12	3.6	0.75
29	1750	12	3.6	0.75
30	700	6	2.8	0.75
31	700	6	2.8	0.75
32	1500	10	3.6	0.75
33	1600	12	3.6	0.75
34	1600	12	3.6	0.75
35	500	6	2.8	0.75
36	1200	10	2.8	0.75
37	720	6	2.8	0.75
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49	400	4	2.8	0.75
50	600	6	2.8	0.75
51	1100	10	2.8	0.75
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58	500	6	2.8	0.75
59	1250	8	3.6	0.75
60	3300	14	5.6	0.75
61	550	6	2.8	0.75
62	500	6	2.8	0.75
63	500	6	2.8	0.75
64	400	4	2.8	0.75
65	1550	10	3.6	0.75
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68	750	8	2.8	0.75
69	1000	10	2.8	0.75
70	500	6	2.8	0.75
71	900	8	2.8	0.75
72	1350	10	3.6	0.75
73	400	4	2.8	0.75
74	750	8	2.8	0.75
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76	800	8	2.8	0.75
77	2400	12	5.2	0.75
78	2400	12	5.2	0.75
79	1200	10	2.8	0.75
80	3100	14	5.6	0.75
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E	3100	14	5	0.75
F	1750	12	3.6	0.75
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- Proposed Handstand
- Proposed Clean Water Drainage
- Proposed Dirty Water Drainage
- SP 12 550m² Stilling Pond Number, Catchment Area & Flow Direction
- Proposed Culvert to Existing Open Drain
- Spoil Deposition Area
- Existing Streams
- Double Silt Fence
- Cable Route Phase 2
- Cable Routes

KEYPLAN

309 310 311 312 305 306 307 308 303 302 301

P01.5	Updated Control Room, Cabling & Settlement Pond Numbering	A.G	10.08.26
P01.4	Updated T8,T9,T10,T11 & Drainage Layout	A.G	11.06.26
P01.3	Silt Ponds added to Spoil Deposition Areas, Drainage Table Updated	AMcC	23.11.23
P01.2	Spoil Deposition Areas Updated	AMcC	13.11.23
P01.1	Issued For Comment	AMcC	13.04.23
rev.	modifications	by	date

Client

Cush Wind Farm

Project

Cush Wind Farm, Co Offlay.

Stage

Planning

Title

Drainage Layout Plan
Sheet 8 of 12

Scales

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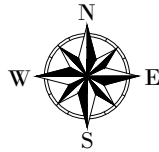
Surveyed	Prepared	Checked	Approved	Date
	A.G	JMcE	JMcE	June 2026

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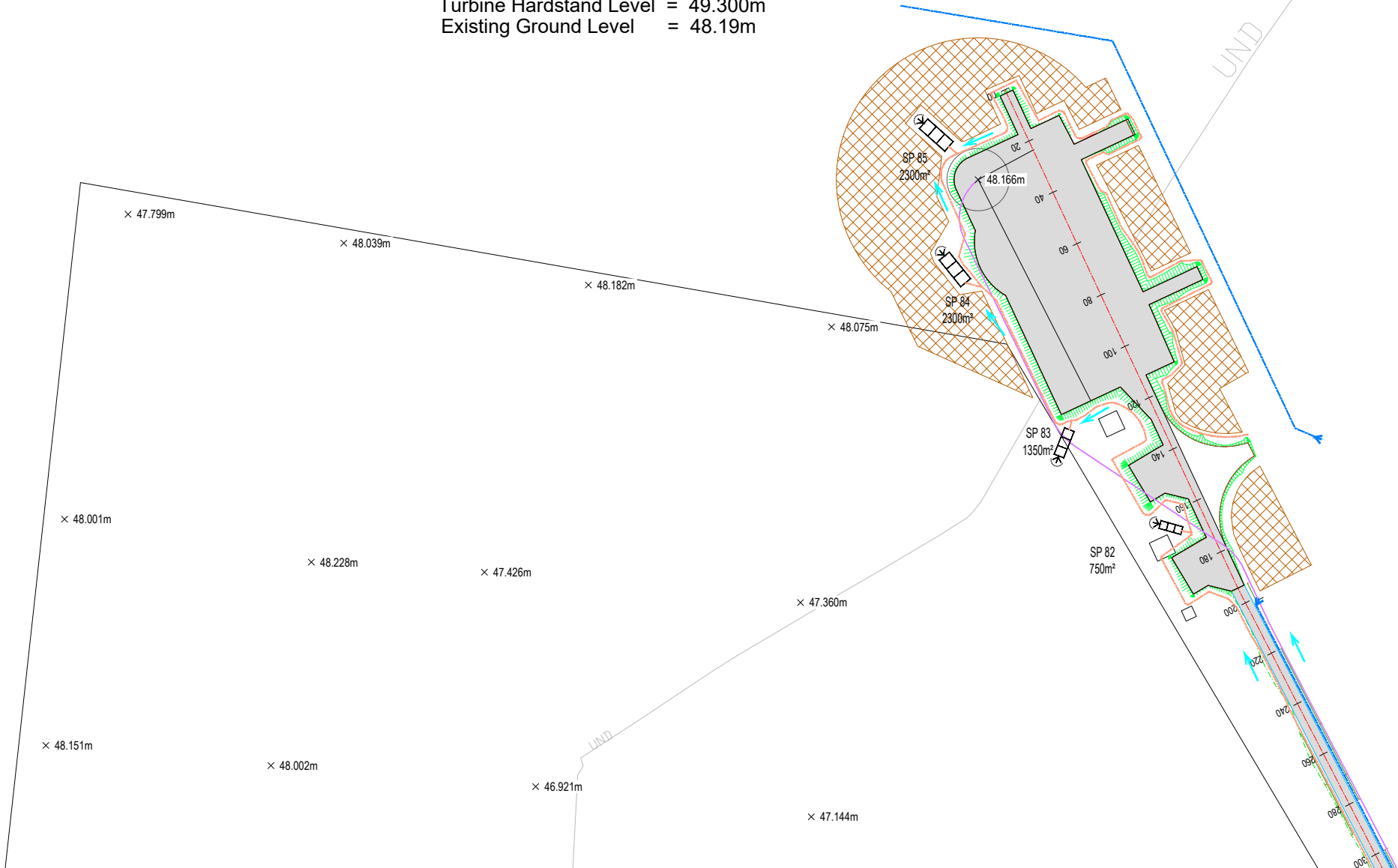
Job Ref.	Drawing No.	Revision
6921	6921-JOD-XX-DR-C-0308	P01.5



Pond Ref. SP	Development Area (m ²)	Dim. Length (m)	Dim. Width (m)	Dim. Depth (m)
1	950	8	2.8	0.75
2	800	8	2.8	0.75
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23	650	6	2.8	0.75
24	550	6	2.8	0.75
25	550	6	2.8	0.75
26	1500	10	3.6	0.75
27	1500	10	3.6	0.75
28	1750	12	3.6	0.75
29	1750	12	3.6	0.75
30	700	6	2.8	0.75
31	700	6	2.8	0.75
32	1500	10	3.6	0.75
33	1600	12	3.6	0.75
34	1600	12	3.6	0.75
35	500	6	2.8	0.75
36	1200	10	2.8	0.75
37	720	6	2.8	0.75
38	1600	12	3.6	0.75
39	1450	10	3.6	0.75
40	650	6	2.8	0.75
41	500	6	2.8	0.75
42	200	4	2.8	0.75
43	500	6	2.8	0.75
44	600	6	2.8	0.75
45	650	5	2.8	0.75
46	1600	12	3.6	0.75
47	1500	10	3.6	0.75
48	1650	12	3.6	0.75
49	400	4	2.8	0.75
50	600	6	2.8	0.75
51	1100	10	2.8	0.75
52	500	6	2.8	0.75
53	250	4	2.8	0.75
54	350	4	2.8	0.75
55	350	4	2.8	0.75
56	500	6	2.8	0.75
57	500	6	2.8	0.75
58	500	6	2.8	0.75
59	1250	8	3.6	0.75
60	3300	14	5.6	0.75
61	550	6	2.8	0.75
62	500	6	2.8	0.75
63	500	6	2.8	0.75
64	400	4	2.8	0.75
65	1550	10	3.6	0.75
66	1500	10	3.6	0.75
67	1500	10	3.6	0.75
68	750	8	2.8	0.75
69	1000	10	2.8	0.75
70	500	6	2.8	0.75
71	900	8	2.8	0.75
72	1350	10	3.6	0.75
73	400	4	2.8	0.75
74	750	8	2.8	0.75
75	750	8	2.8	0.75
76	800	8	2.8	0.75
77	2400	12	5.2	0.75
78	2400	12	5.2	0.75
79	1200	10	2.8	0.75
80	3100	14	5.6	0.75
81	2400	12	5.2	0.75
82	750	8	2.8	0.75
83	1350	10	3.6	0.75
84	2300	12	4.5	0.75
85	2300	12	4.5	0.75
86	1800	12	3.6	0.75
87	1800	12	3.6	0.75
88	1800	12	3.6	0.75
89	1800	12	3.6	0.75
E	3100	14	5	0.75
F	1750	12	3.6	0.75
G	1100	8	3.6	0.75
H	1750	12	3.6	0.75

FOR CONTINUATION SEE DRAWING 6921-JOD-XX-DR-C-03-10

T10
Turbine Foundation Level = 49.800m
Turbine Hardstand Level = 49.300m
Existing Ground Level = 48.19m



NOTES:

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Legend

- Proposed Access Road in Cut
- Proposed Access Road in Fill
- Proposed Hardstand
- Proposed Clean Water Drainage
- Proposed Dirty Water Drainage
- SP 12 550m² Stilling Pond Number, Catchment Area & Flow Direction
- Proposed Culvert to Existing Open Drain
- Spoil Deposition Area
- Existing Streams
- Double Silt Fence
- Cable Route Phase 2
- Cable Routes

KEYPLAN

P01.5	Updated Control Room, Cabling & Settlement Pond Numbering	A.G	10.08.26
P01.4	Updated T8,T9,T10,T11 & Drainage Layout	A.G	11.06.26
P01.3	Silt Ponds added to Spoil Deposition Areas, Drainage Table Updated	AMcC	23.11.23
P01.2	Spoil Deposition Areas Updated	AMcC	13.11.23
P01.1	Issued For Comment	AMcC	13.04.23
rev.	modifications	by	date

Client

Project

Cush Wind Farm, Co Offlay.

Stage

Planning

Title

Drainage Layout Plan
Sheet 9 of 12

Scales

1:2000 (A3)

Surveyed	Prepared	Checked	Approved	Date
	A.G	JMcE	JMcE	June 2026

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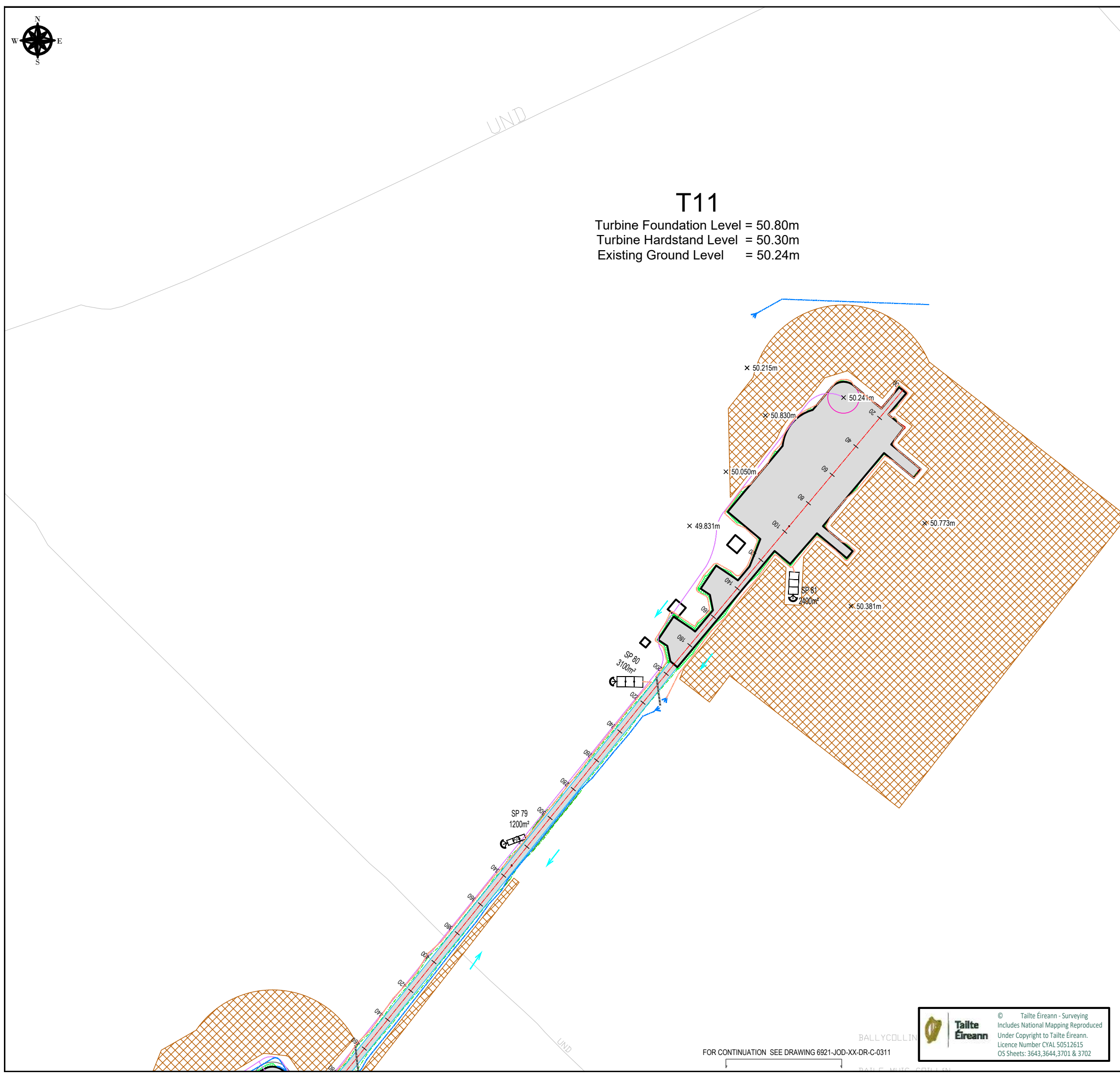
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IRELAND

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Job Ref.	Drawing No.	Revision
6921	6921-JOD-XX-DR-C-0309	P01.5



Turbine Foundation Level = 50.80m
Turbine Hardstand Level = 50.30m
Existing Ground Level = 50.24m

Pond Ref. SP	Development Area (m ²)	Dim. length (m)	Dim. Width (m)	Dim. Depth (m)	
	1	950	8	2.8	0.75
	2	800	8	2.8	0.75
	3	450	4	2.8	0.75
	4	1750	9	4.5	0.75
	5	650	6	2.8	0.75
	6	3100	14	5.2	0.75
	7	1700	9	4.5	0.75
	8	1700	9	4.5	0.75
	9	500	6	2.8	0.75
	10	1150	8	3.6	0.75
	11	825	8	2.8	0.75
	12	550	6	2.8	0.75
	13	330	4	2.8	0.75
	14	1125	8	3.6	0.75
	15	425	4	2.8	0.75
	16	1050	8	3.6	0.75
	17	2500	12	5.2	0.75
	18	1500	10	3.6	0.75
	19	2000	12	4.5	0.75
	20	1500	10	3.6	0.75
	21	1100	8	3.6	0.75
	22	925	8	2.8	0.75
	23	650	6	2.8	0.75
	24	550	6	2.8	0.75
	25	550	6	2.8	0.75
	26	1500	10	3.6	0.75
	27	1500	10	3.6	0.75
	28	1750	12	3.6	0.75
	29	1750	12	3.6	0.75
	30	700	6	2.8	0.75
	31	700	6	2.8	0.75
	32	1500	10	3.6	0.75
	33	1600	12	3.6	0.75
	34	1600	12	3.6	0.75
	35	500	6	2.8	0.75
	36	1200	10	2.8	0.75
	37	720	6	2.8	0.75
	38	1600	12	3.6	0.75
	39	1450	10	3.6	0.75
	40	650	6	2.8	0.75
	41	500	6	2.8	0.75
	42	200	4	2.8	0.75
	43	500	6	2.8	0.75
	44	600	6	2.8	0.75
	45	650	5	2.8	0.75
	46	1600	12	3.6	0.75
	47	1500	10	3.6	0.75
	48	1650	12	3.6	0.75
	49	400	4	2.8	0.75
	50	600	6	2.8	0.75
	51	1100	10	2.8	0.75
	52	500	6	2.8	0.75
	53	250	4	2.8	0.75
	54	350	4	2.8	0.75
	55	350	4	2.8	0.75
	56	500	6	2.8	0.75
	57	500	6	2.8	0.75
	58	500	6	2.8	0.75
	59	1250	8	3.6	0.75
	60	3300	14	5.6	0.75
	61	550	6	2.8	0.75
	62	500	6	2.8	0.75
	63	500	6	2.8	0.75
	64	400	4	2.8	0.75
	65	1550	10	3.6	0.75
	66	1500	10	3.6	0.75
	67	1500	10	3.6	0.75
	68	750	8	2.8	0.75
	69	1000	10	2.8	0.75
	70	500	6	2.8	0.75
	71	900	8	2.8	0.75
	72	1350	10	3.6	0.75
	73	400	4	2.8	0.75
	74	750	8	2.8	0.75
	75	750	8	2.8	0.75
	76	800	8	2.8	0.75
	77	2400	12	5.2	0.75
	78	2400	12	5.2	0.75
	79	1200	10	2.8	0.75
	80	3100	14	5.6	0.75
	81	2400	12	5.2	0.75
	82	750	8	2.8	0.75
	83	1350	10	3.6	0.75
	84	2300	12	4.5	0.75
	85	2300	12	4.5	0.75
	86	1800	12	3.6	0.75
	87	1800	12	3.6	0.75
	88	1800	12	3.6	0.75
	89	1800	12	3.6	0.75
E	3100	14	5	0.75	
F	1750	12	3.6	0.75	
G	1100	8	3.6	0.75	
H	1750	12	3.6	0.75	

P01.5	Updated Control Room, Cabling & Settlement Pond Numbering	A/G	10.08.26
P01.4	Updated T8,T9,T10,T11 & Drainage Layout	A/G	11.06.26
P01.3	Silt Ponds added to Spoil Deposition Areas, Drainage Table Updated	AMcC	23.11.23
P01.2	Spoil Deposition Areas Updated	AMcC	13.11.23
P01.1	Issued For Comment	AMcC	13.04.23
rev.	modifications	by	date



Cush Wind Farm, Co Offlay.

Planning

Drainage Layout Plan
Sheet 10 of 12

1:2000 (A3)

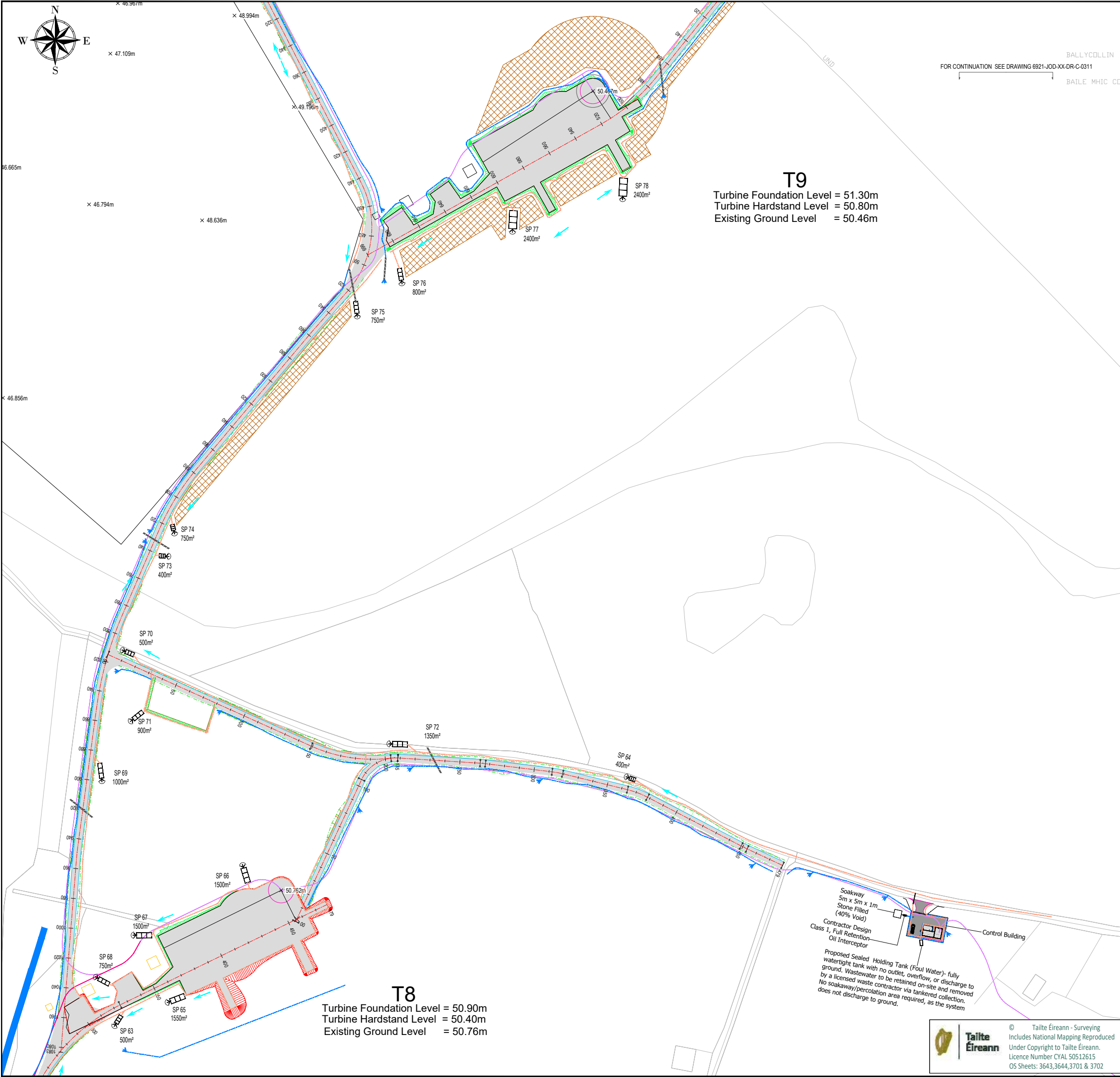
Surveyed	Prepared A.G	Checked JMcE	Approved JMcE	Date June 2026
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Job Ref.	Drawing No.	Revision
6921	6921-JOD-XX-DR-C-0310	P01.5



T9
Turbine Foundation Level = 51.30m
Turbine Hardstand Level = 50.80m
Existing Ground Level = 50.46m

T8
Turbine Foundation Level = 50.90m
Turbine Hardstand Level = 50.40m
Existing Ground Level = 50.76m

BALLYCOLLIN
FOR CONTINUATION SEE DRAWING 6921-JOD-XX-DR-C-0311
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Pond Ref. SP	Development Area (m ²)	Dim. length (m)	Dim. Width (m)	Dim. Depth (m)
1	950	8	2.8	0.75
2	800	8	2.8	0.75
3	450	4	2.8	0.75
4	1750	9	4.5	0.75
5	650	6	2.8	0.75
6	3100	14	5.2	0.75
7	1700	9	4.5	0.75
8	1700	9	4.5	0.75
9	500	6	2.8	0.75
10	1150	8	3.6	0.75
11	825	8	2.8	0.75
12	550	6	2.8	0.75
13	330	4	2.8	0.75
14	1125	8	3.6	0.75
15	425	4	2.8	0.75
16	1050	8	3.6	0.75
17	2500	12	5.2	0.75
18	1500	10	3.6	0.75
19	2000	12	4.5	0.75
20	1500	10	3.6	0.75
21	1100	8	3.6	0.75
22	925	8	2.8	0.75
23	650	6	2.8	0.75
24	550	6	2.8	0.75
25	550	6	2.8	0.75
26	1500	10	3.6	0.75
27	1500	10	3.6	0.75
28	1750	12	3.6	0.75
29	1750	12	3.6	0.75
30	700	6	2.8	0.75
31	700	6	2.8	0.75
32	1500	10	3.6	0.75
33	1600	12	3.6	0.75
34	1600	12	3.6	0.75
35	500	6	2.8	0.75
36	1200	10	2.8	0.75
37	720	6	2.8	0.75
38	1600	12	3.6	0.75
39	1450	10	3.6	0.75
40	650	6	2.8	0.75
41	500	6	2.8	0.75
42	300	4	2.8	0.75
43	500	6	2.8	0.75
44	600	6	2.8	0.75
45	650	5	2.8	0.75
46	1600	12	3.6	0.75
47	1500	10	3.6	0.75
48	1650	12	3.6	0.75
49	400	4	2.8	0.75
50	600	6	2.8	0.75
51	1100	10	2.8	0.75
52	500	6	2.8	0.75
53	250	4	2.8	0.75
54	350	4	2.8	0.75
55	350	4	2.8	0.75
56	500	6	2.8	0.75
57	500	6	2.8	0.75
58	500	6	2.8	0.75
59	1250	8	3.6	0.75
60	3300	14	5.6	0.75
61	550	6	2.8	0.75
62	500	6	2.8	0.75
63	500	6	2.8	0.75
64	400	4	2.8	0.75
65	1550	10	3.6	0.75
66	1500	10	3.6	0.75
67	1500	10	3.6	0.75
68	750	8	2.8	0.75
69	1000	10	2.8	0.75
70	500	6	2.8	0.75
71	900	8	2.8	0.75
72	1350	10	3.6	0.75
73	400	4	2.8	0.75
74	750	8	2.8	0.75
75	750	8	2.8	0.75
76	800	8	2.8	0.75
77	2400	12	5.2	0.75
78	2400	12	5.2	0.75
79	1200	10	2.8	0.75
80	3100	14	5.6	0.75
81	2400	12	5.2	0.75
82	750	8	2.8	0.75
83	1350	10	3.6	0.75
84	2300	12	4.5	0.75
85	2300	12	4.5	0.75
86	1800	12	3.6	0.75
87	1800	12	3.6	0.75
88	1800	12	3.6	0.75
89	1800	12	3.6	0.75
E	3100	14	5	0.75
F	1750	12	3.6	0.75
G	1100	8	3.6	0.75
H	1750	12	3.6	0.75

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Legend

- Proposed Access Road in Cut
- Proposed Access Road in Fill
- Proposed Hardstand
- Proposed Clean Water Drainage
- Proposed Dirty Water Drainage
- SP 12 550m² Stilling Pond Number, Catchment Area & Flow Direction
- Proposed Culvert to Existing Open Drain
- Spoil Deposition Area
- Existing Streams
- Double Silt Fence
- Cable Route Phase 2
- Cable Routes

KEYPLAN

P01.5	Updated Control Room, Cabling & Settlement Pond Numbering	A.G	10.08.26
P01.4	Updated T8,T9,T10,T11 & Drainage Layout	A.G	11.06.26
P01.3	Silt Ponds added to Spoil Deposition Areas, Drainage Table Updated	AMcC	23.11.23
P01.2	Spoil Deposition Areas Updated	AMcC	13.11.23
P01.1	Issued For Comment	AMcC	13.04.23
rev.	modifications	by	date

Client

Cush Wind Farm

Project

Cush Wind Farm, Co Offlay.

Stage

Planning

Title

Drainage Layout Plan
Sheet 11 of 12

Scales

1:2500 (A3)

Surveyed	Prepared	Checked	Approved	Date
	A.G	JMcE	JMcE	June 2026

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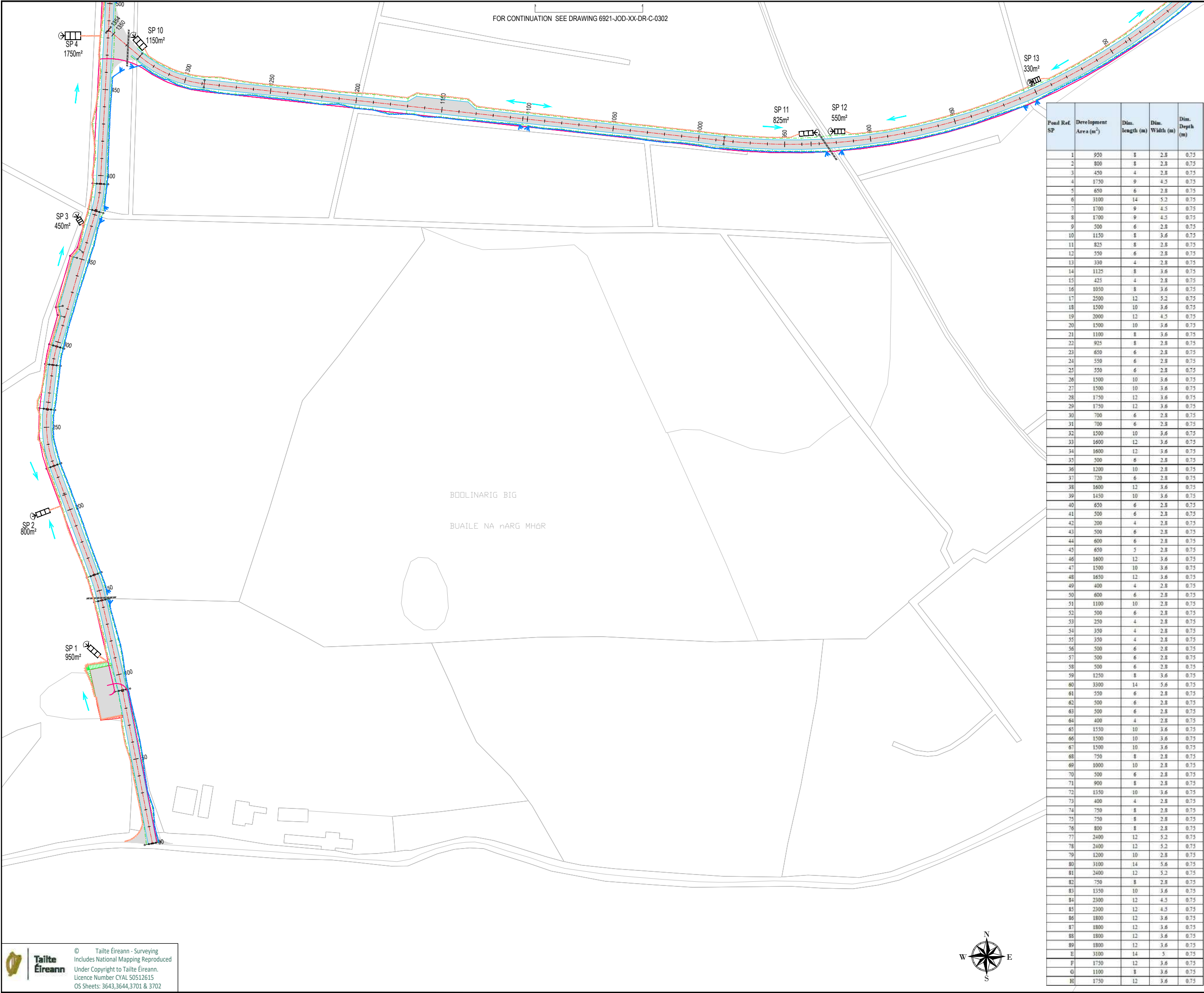
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Job Ref.	Drawing No.	Revision
6921	6921-JOD-XX-DR-C-0311	P01.5

Soakway
5m x 5m x 1m
Stone Filled
(40% Void)
Contractor Design
Class 1, Full Retention
Oil Interceptor
Proposed Sealed Holding Tank (Foul Water)- fully
watertight tank with no outlet, overflow, or discharge to
ground. Wastewater to be retained on-site and removed
by a licensed waste contractor via tanker collection.
No soakaway/percolation area required, as the system
does not discharge to ground.

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OS Sheets: 3643,3644,3701 & 3702



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- Proposed Handstand
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KEYPLAN

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P01.1	Issued For Comment	AMcC	13.04.23
rev.	modifications	by	date

Client

Project

Cush Wind Farm, Co Offlay.

Stage

Planning

Title

Drainage Layout Plan
Sheet 1 of 12

Scales

1:2000 (A3)

Surveyed	Prepared	Checked	Approved	Date
	AMcC	JMcE	JMcE	June 2026

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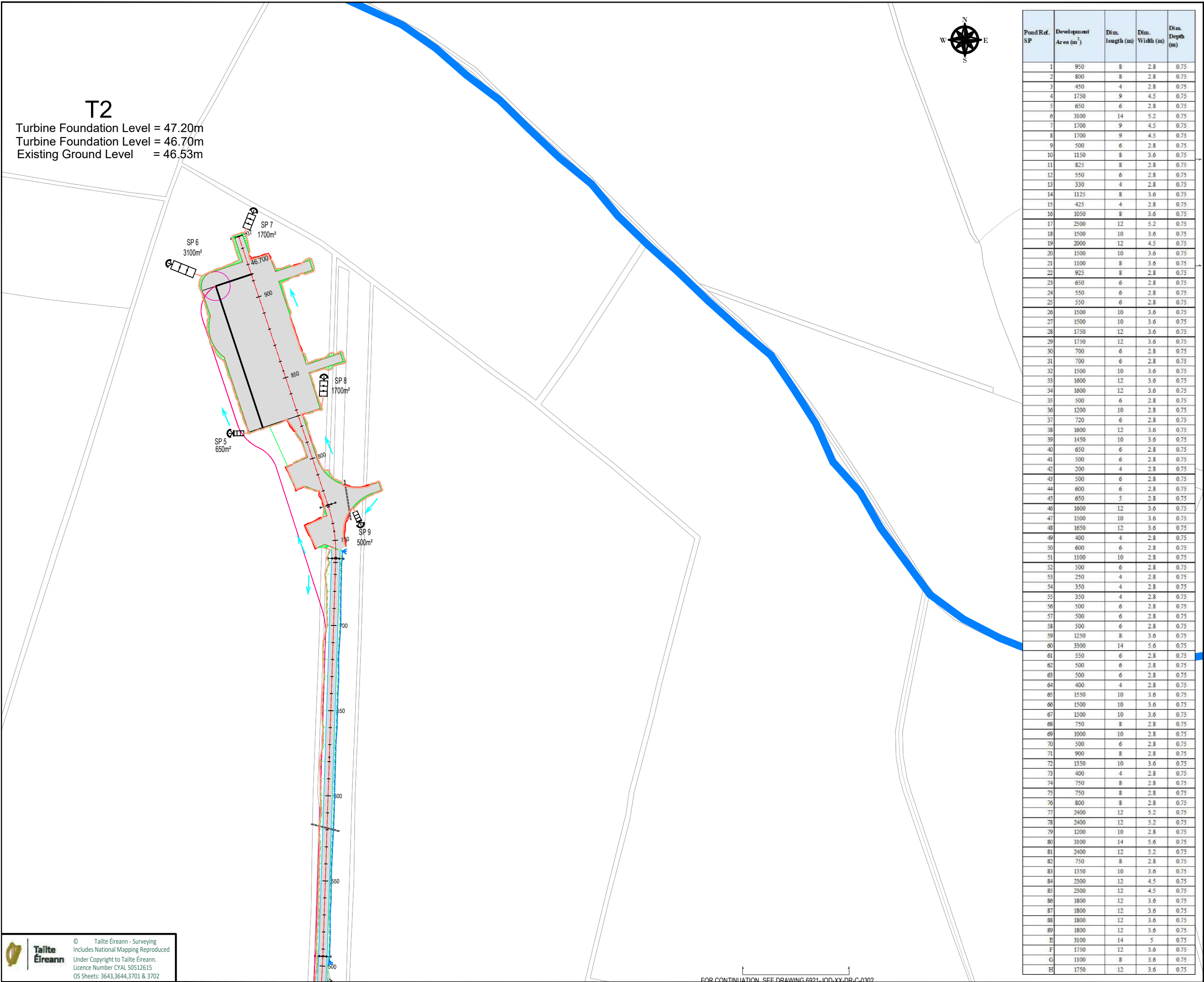
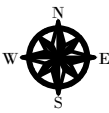
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Job Ref.	Drawing No.	Revision
6921	6921-JOD-XX-DR-C-0301	P01.5



Pond Ref. SP	Development Area (m ²)	Dim. length (m)	Dim. Width (m)	Dim. Depth (m)
1	950	8	2.8	0.75
2	800	8	2.8	0.75
3	450	4	2.8	0.75
4	1750	9	4.5	0.75
5	650	6	2.8	0.75
6	3100	14	5.2	0.75
7	1700	9	4.5	0.75
8	1700	9	4.5	0.75
9	500	6	2.8	0.75
10	1150	8	3.6	0.75
11	825	8	2.8	0.75
12	550	6	2.8	0.75
13	330	4	2.8	0.75
14	1125	8	3.6	0.75
15	425	4	2.8	0.75
16	1050	8	3.6	0.75
17	2500	12	5.2	0.75
18	1500	10	3.6	0.75
19	2000	12	4.5	0.75
20	1500	10	3.6	0.75
21	1100	8	3.6	0.75
22	925	8	2.8	0.75
23	650	6	2.8	0.75
24	550	6	2.8	0.75
25	550	6	2.8	0.75
26	1500	10	3.6	0.75
27	1500	10	3.6	0.75
28	1750	12	3.6	0.75
29	1750	12	3.6	0.75
30	700	6	2.8	0.75
31	700	6	2.8	0.75
32	1500	10	3.6	0.75
33	1600	12	3.6	0.75
34	1600	12	3.6	0.75
35	500	6	2.8	0.75
36	1200	10	2.8	0.75
37	720	6	2.8	0.75
38	1600	12	3.6	0.75
39	1450	10	3.6	0.75
40	650	6	2.8	0.75
41	500	6	2.8	0.75
42	200	4	2.8	0.75
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51	1100	10	2.8	0.75
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53	250	4	2.8	0.75
54	350	4	2.8	0.75
55	350	4	2.8	0.75
56	500	6	2.8	0.75
57	500	6	2.8	0.75
58	500	6	2.8	0.75
59	1250	8	3.6	0.75
60	3300	14	5.6	0.75
61	550	6	2.8	0.75
62	500	6	2.8	0.75
63	500	6	2.8	0.75
64	400	4	2.8	0.75
65	1550	10	3.6	0.75
66	1500	10	3.6	0.75
67	1500	10	3.6	0.75
68	750	8	2.8	0.75
69	1000	10	2.8	0.75
70	500	6	2.8	0.75
71	900	8	2.8	0.75
72	1350	10	3.6	0.75
73	400	4	2.8	0.75
74	750	8	2.8	0.75
75	750	8	2.8	0.75
76	800	8	2.8	0.75
77	2400	12	5.2	0.75
78	2400	12	5.2	0.75
79	1200	10	2.8	0.75
80	3100	14	5.6	0.75
81	2400	12	5.2	0.75
82	750	8	2.8	0.75
83	1350	10	3.6	0.75
84	2300	12	4.5	0.75
85	2300	12	4.5	0.75
86	1800	12	3.6	0.75
87	1800	12	3.6	0.75
88	1800	12	3.6	0.75
89	1800	12	3.6	0.75
E	3100	14	5	0.75
F	1750	12	3.6	0.75
G	1100	8	3.6	0.75
H	1750	12	3.6	0.75

NOTES:

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- 4 THIS DRAWING TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT DRAWINGS AND SPECIFICATIONS.

Legend

- Proposed Access Road in Cut
- Proposed Access Road in Fill
- Proposed Handstand
- Proposed Clean Water Drainage
- Proposed Dirty Water Drainage
- SP 12 550m² Stilling Pond Number, Catchment Area & Flow Direction
- Proposed Culvert to Existing Open Drain
- Spoil Deposition Area
- Existing Streams
- Double Silt Fence
- Cable Route Phase 2
- Cable Routes

KEYPLAN

P01.5	Updated Control Room, Cabling & Settlement Pond Numbering	A.G	10.08.26
P01.4	Updated T8,T9,T10,T11 & Drainage Layout	A.G	11.06.26
P01.3	Silt Ponds added to Spoil Deposition Areas, Drainage Table Updated	AMcC	23.11.23
P01.2	Spoil Deposition Areas Updated	AMcC	13.11.23
P01.1	Issued For Comment	AMcC	13.04.23
rev.	modifications	by	date

Client

Cush Wind Farm

Project

Cush Wind Farm, Co Offlay.

Stage

Planning

Title

Drainage Layout Plan
Sheet 2 of 12

Scales

1:2000 (A3)

Surveyed	Prepared	Checked	Approved	Date
	AMcC	JMcE	JMcE	June 2026

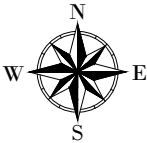
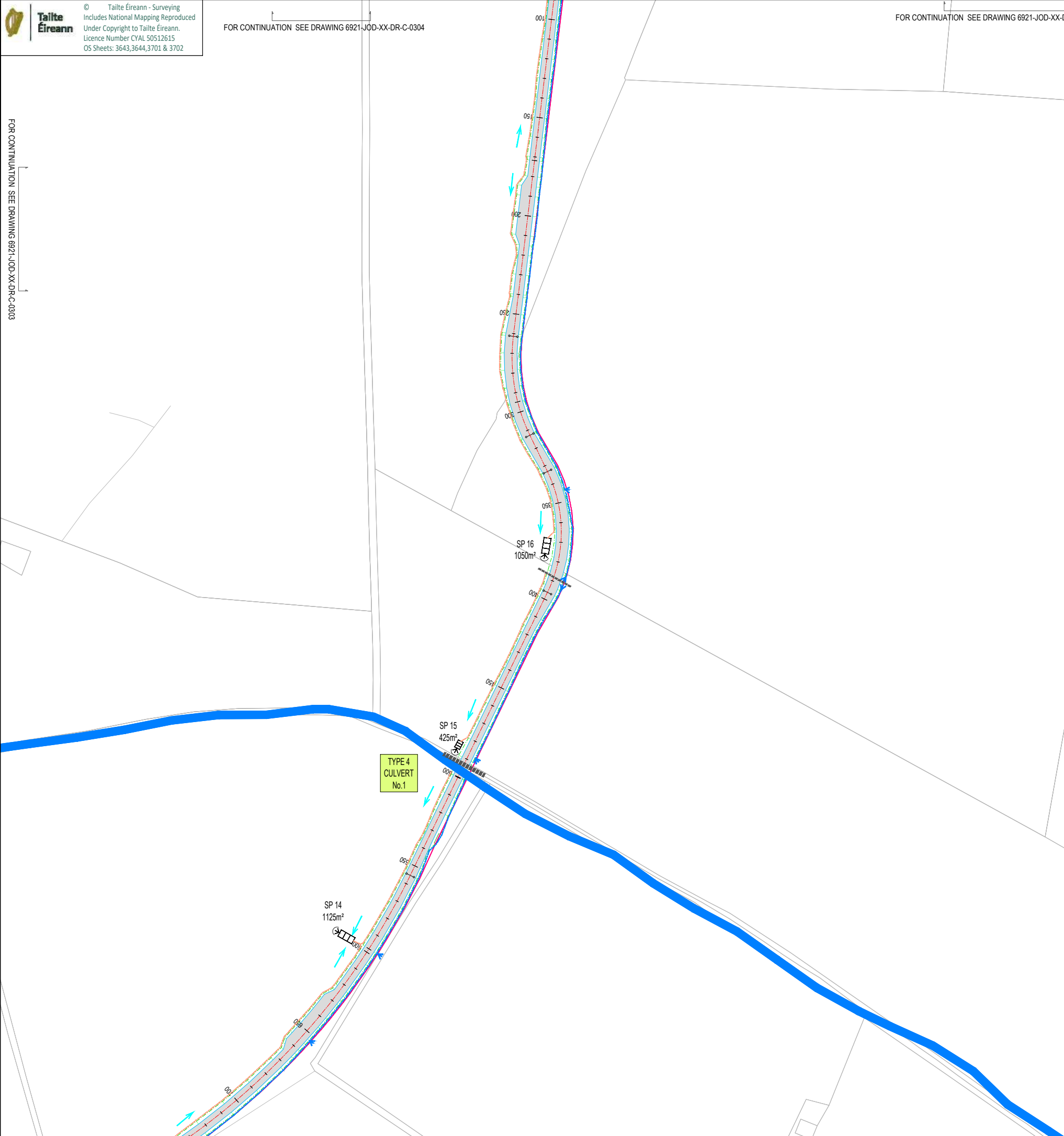
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Job Ref.	Drawing No.	Revision
6921	6921-JOD-XX-DR-C-0302	P01.5

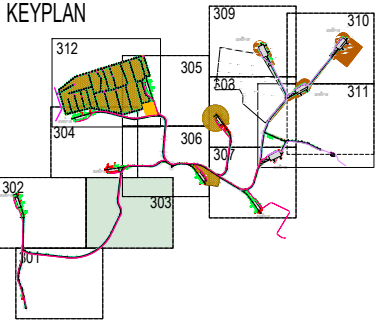


Pond Ref. SP	Development Area (m ²)	Dim. length (m)	Dim. Width (m)	Dim. Depth (m)
1	950	8	2.8	0.75
2	800	8	2.8	0.75
3	450	4	2.8	0.75
4	1750	9	4.5	0.75
5	650	6	2.8	0.75
6	3100	14	5.2	0.75
7	1700	9	4.5	0.75
8	1700	9	4.5	0.75
9	500	6	2.8	0.75
10	1150	8	3.6	0.75
11	825	8	2.8	0.75
12	550	6	2.8	0.75
13	330	4	2.8	0.75
14	1125	8	3.6	0.75
15	425	4	2.8	0.75
16	1050	8	3.6	0.75
17	2500	12	5.2	0.75
18	1500	10	3.6	0.75
19	2000	12	4.5	0.75
20	1500	10	3.6	0.75
21	1100	8	3.6	0.75
22	925	8	2.8	0.75
23	650	6	2.8	0.75
24	550	6	2.8	0.75
25	550	6	2.8	0.75
26	1500	10	3.6	0.75
27	1500	10	3.6	0.75
28	1750	12	3.6	0.75
29	1750	12	3.6	0.75
30	700	6	2.8	0.75
31	700	6	2.8	0.75
32	1500	10	3.6	0.75
33	1600	12	3.6	0.75
34	1600	12	3.6	0.75
35	500	6	2.8	0.75
36	1200	10	2.8	0.75
37	720	6	2.8	0.75
38	1600	12	3.6	0.75
39	1450	10	3.6	0.75
40	650	6	2.8	0.75
41	500	6	2.8	0.75
42	200	4	2.8	0.75
43	500	6	2.8	0.75
44	600	6	2.8	0.75
45	650	5	2.8	0.75
46	1600	12	3.6	0.75
47	1500	10	3.6	0.75
48	1650	12	3.6	0.75
49	400	4	2.8	0.75
50	600	6	2.8	0.75
51	1100	10	2.8	0.75
52	500	6	2.8	0.75
53	250	4	2.8	0.75
54	350	4	2.8	0.75
55	350	4	2.8	0.75
56	500	6	2.8	0.75
57	500	6	2.8	0.75
58	500	6	2.8	0.75
59	1250	8	3.6	0.75
60	3300	14	5.6	0.75
61	550	6	2.8	0.75
62	500	6	2.8	0.75
63	500	6	2.8	0.75
64	400	4	2.8	0.75
65	1550	10	3.6	0.75
66	1500	10	3.6	0.75
67	1500	10	3.6	0.75
68	750	8	2.8	0.75
69	1000	10	2.8	0.75
70	500	6	2.8	0.75
71	900	8	2.8	0.75
72	1350	10	3.6	0.75
73	400	4	2.8	0.75
74	750	8	2.8	0.75
75	750	8	2.8	0.75
76	800	8	2.8	0.75
77	2400	12	5.2	0.75
78	2400	12	5.2	0.75
79	1200	10	2.8	0.75
80	3100	14	5.6	0.75
81	2400	12	5.2	0.75
82	750	8	2.8	0.75
83	1350	10	3.6	0.75
84	2300	12	4.5	0.75
85	2300	12	4.5	0.75
86	1800	12	3.6	0.75
87	1800	12	3.6	0.75
88	1800	12	3.6	0.75
89	1800	12	3.6	0.75
E	3100	14	5	0.75
F	1750	12	3.6	0.75
G	1100	8	3.6	0.75
H	1750	12	3.6	0.75

- NOTES:
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Legend

- Proposed Access Road in Cut
- Proposed Access Road in Fill
- Proposed Hardstand
- Proposed Clean Water Drainage
- Proposed Dirty Water Drainage
- SP 12 550m² Stilling Pond Number, Catchment Area & Flow Direction
- Proposed Culvert to Existing Open Drain
- Spoil Deposition Area
- Existing Streams
- Double Silt Fence
- Cable Route Phase 2
- Cable Routes



P01.5	Updated Control Room, Cabling & Settlement Pond Numbering	A.G	10.08.26
P01.4	Updated T8,T9,T10,T11 & Drainage Layout	A.G	11.06.26
P01.3	Silt Ponds added to Spoil Deposition Areas, Drainage Table Updated	AMcC	23.11.23
P01.2	Spoil Deposition Areas Updated	AMcC	13.11.23
P01.1	Issued For Comment	AMcC	13.04.23
rev.	modifications	by	date

Client

Project

Cush Wind Farm, Co Offaly.

Stage

Planning

Title

Drainage Layout Plan
Sheet 3 of 12

Scales

1:2000 (A3)

Surveyed	Prepared	Checked	Approved	Date
	AMcC	JMcE	JMcE	June 2026

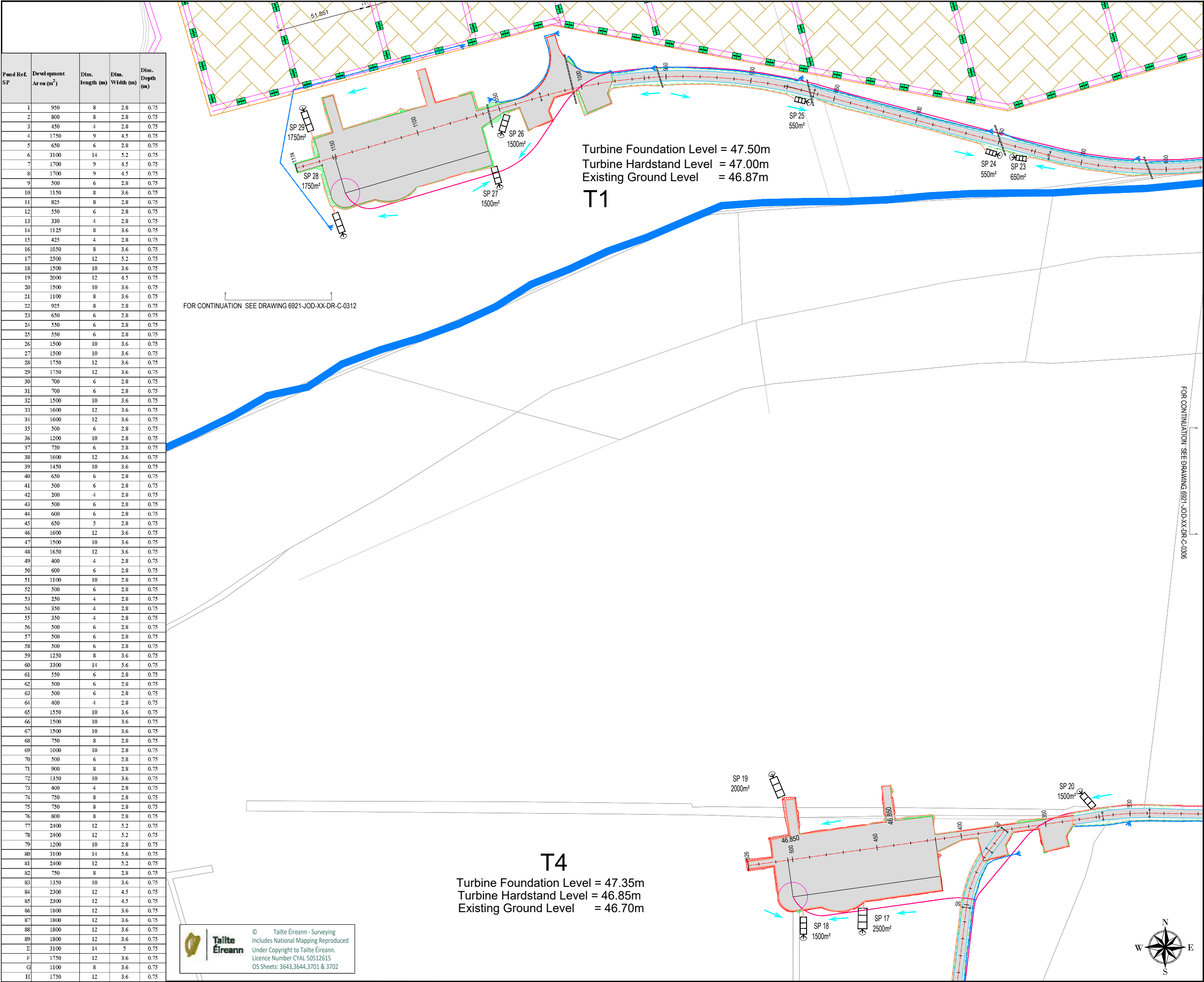
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Job Ref.	Drawing No.	Revision
6921	6921-JOD-XX-DR-C-0303	P01.5



NOTES:

- 1 FIGURED DIMENSIONS ONLY TO BE TAKEN FROM THIS DRAWING.
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Legend

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- Existing Streams
- Double Silt Fence
- Cable Route Phase 2
- Cable Routes

KEYPLAN

P01.5	Updated Control Room, Cabling & Settlement Pond Numbering	A.G	10.08.26
P01.4	Updated T8,T9,T10,T11 & Drainage Layout	A.G	11.06.26
P01.3	Silt Ponds added to Spoil Deposition Areas, Drainage Table Updated	AMcC	23.11.23
P01.2	Spoil Deposition Areas Updated	AMcC	13.11.23
P01.1	Issued For Comment	AMcC	13.04.23
rev.	modifications	by	date

Client

Cush Wind Farm

Project

Cush Wind Farm, Co Offlay.

Stage

Planning

Title

Drainage Layout Plan
Sheet 4 of 12

Scales

1:2000 (A3)

Surveyed	Prepared	Checked	Approved	Date
	AMcC	JMcE	JMcE	June 2026

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Job Ref. 6921
Drawing No. 6921-JOD-XX-DR-C-0304
Revision P01.5

Turbine Foundation Level = 48.95m
Turbine Hardstand Level = 48.45m
Existing Ground Level = 48.28m

FOR CONTINUATION SEE DRAWING 6921-JOD-XX-DR-C-0303

Pond Ref. SP	Development Area (m ²)	Dim. length (m)	Dim. Width (m)	Dim. Depth (m)
1	950	8	2.8	0.75
2	800	8	2.8	0.75
3	450	4	2.8	0.75
4	1750	9	4.5	0.75
5	650	6	2.8	0.75
6	3100	14	5.2	0.75
7	1700	9	4.5	0.75
8	1700	9	4.5	0.75
9	500	6	2.8	0.75
10	1150	8	3.6	0.75
11	825	8	2.8	0.75
12	550	6	2.8	0.75
13	330	4	2.8	0.75
14	1125	8	3.6	0.75
15	425	4	2.8	0.75
16	1050	8	3.6	0.75
17	2500	12	5.2	0.75
18	1500	10	3.6	0.75
19	2000	12	4.5	0.75
20	1500	10	3.6	0.75
21	1100	8	3.6	0.75
22	925	8	2.8	0.75
23	650	6	2.8	0.75
24	550	6	2.8	0.75
25	550	6	2.8	0.75
26	1500	10	3.6	0.75
27	1500	10	3.6	0.75
28	1750	12	3.6	0.75
29	1750	12	3.6	0.75
30	700	6	2.8	0.75
31	700	6	2.8	0.75
32	1500	10	3.6	0.75
33	1600	12	3.6	0.75
34	1600	12	3.6	0.75
35	500	6	2.8	0.75
36	1200	10	2.8	0.75
37	720	6	2.8	0.75
38	1600	12	3.6	0.75
39	1450	10	3.6	0.75
40	650	6	2.8	0.75
41	500	6	2.8	0.75
42	200	4	2.8	0.75
43	500	6	2.8	0.75
44	600	6	2.8	0.75
45	650	5	2.8	0.75
46	1600	12	3.6	0.75
47	1500	10	3.6	0.75
48	1650	12	3.6	0.75
49	400	4	2.8	0.75
50	600	6	2.8	0.75
51	1100	10	2.8	0.75
52	500	6	2.8	0.75
53	250	4	2.8	0.75
54	350	4	2.8	0.75
55	350	4	2.8	0.75
56	500	6	2.8	0.75
57	500	6	2.8	0.75
58	500	6	2.8	0.75
59	1250	8	3.6	0.75
60	3300	14	5.6	0.75
61	550	6	2.8	0.75
62	500	6	2.8	0.75
63	500	6	2.8	0.75
64	400	4	2.8	0.75
65	1550	10	3.6	0.75
66	1500	10	3.6	0.75
67	1500	10	3.6	0.75
68	750	8	2.8	0.75
69	1000	10	2.8	0.75
70	500	6	2.8	0.75
71	900	8	2.8	0.75
72	1350	10	3.6	0.75
73	400	4	2.8	0.75
74	750	8	2.8	0.75
75	750	8	2.8	0.75
76	800	8	2.8	0.75
77	2400	12	5.2	0.75
78	2400	12	5.2	0.75
79	1200	10	2.8	0.75
80	3100	14	5.6	0.75
81	2400	12	5.2	0.75
82	750	8	2.8	0.75
83	1350	10	3.6	0.75
84	2500	12	4.5	0.75
85	2300	12	4.5	0.75
86	1800	12	3.6	0.75
87	1800	12	3.6	0.75
88	1800	12	3.6	0.75
89	1800	12	3.6	0.75
E	3100	14	5	0.75
F	1750	12	3.6	0.75
G	1100	8	3.6	0.75
H	1750	12	3.6	0.75

FOR CONTINUATION SEE DRAWING 6921-JOD-XX-DR-C-0306



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Proposed Access Road in Cut

Proposed Access Road in Fill

Proposed Hardstand

Proposed Clean Water Drainage

Proposed Dirty Water Drainage

SP 12
550m²

Stilling Pond Number, Catchment Area & Flow Direction

Proposed Culvert to Existing Open Drain

Spoil Deposition Area

Existing Streams

Double Silt Fence

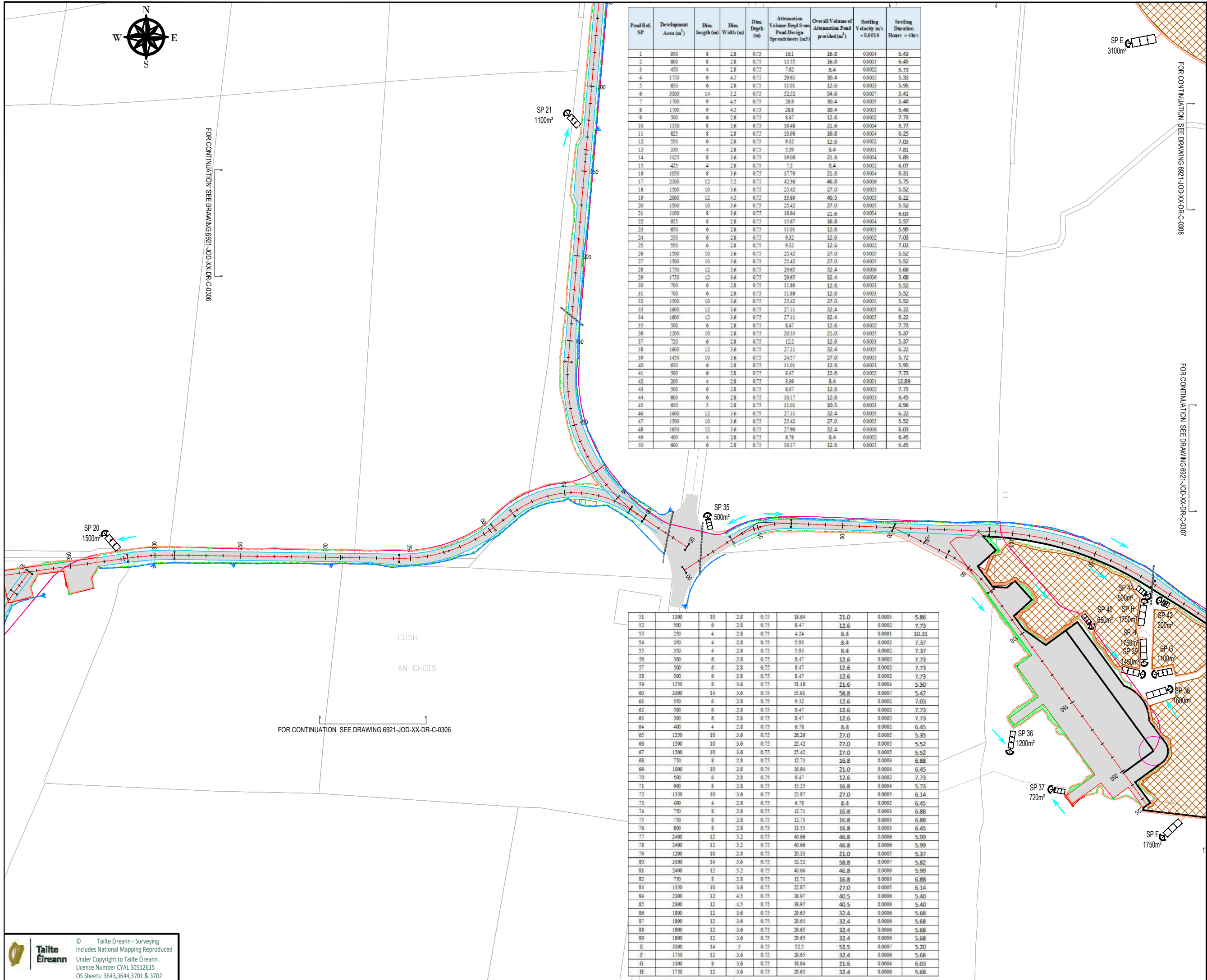
Cable Route Phase 2

Cable Routes

Client				
 Cush Wind Farm				
Project				
Cush Wind Farm, Co Offlay.				
Stage				
Planning				
Title				
Drainage Layout Plan Sheet 5 of 12				
Scales				
1:2000 (A3)				
Surveyed	Prepared AMcC	Checked JMcE	Approved JMcE	Date June 2026

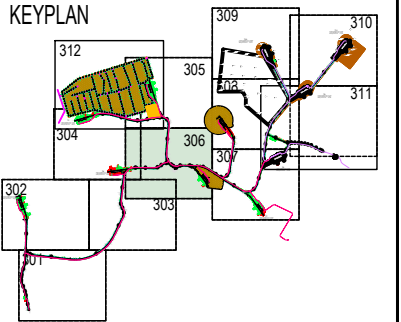


Job Ref.	Drawing No.	Revision
6921	6921-JOD-XX-DR-C-0305	P01.5



- NOTES:
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- Legend
- Proposed Access Road in Cut
 - Proposed Access Road in Fill
 - Proposed Handstand
 - Proposed Clean Water Drainage
 - Proposed Dirty Water Drainage
 - SP 12 550m² Stilling Pond Number, Catchment Area & Flow Direction
 - Proposed Culvert to Existing Open Drain
 - Spoil Deposition Area
 - Existing Streams
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 - Cable Route Phase 2
 - Cable Routes



P01.5	Updated Control Room, Cabling & Settlement Pond Numbering	A.G	10.08.26
P01.4	Updated T8,T9,T10,T11 & Drainage Layout	A.G	11.06.26
P01.3	Silt Ponds added to Spoil Deposition Areas, Drainage Table Updated	AMcC	23.11.23
P01.2	Spoil Deposition Areas Updated	AMcC	13.11.23
P01.1	Issued For Comment	AMcC	13.04.23
rev.	modifications	by	date

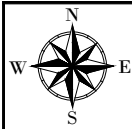
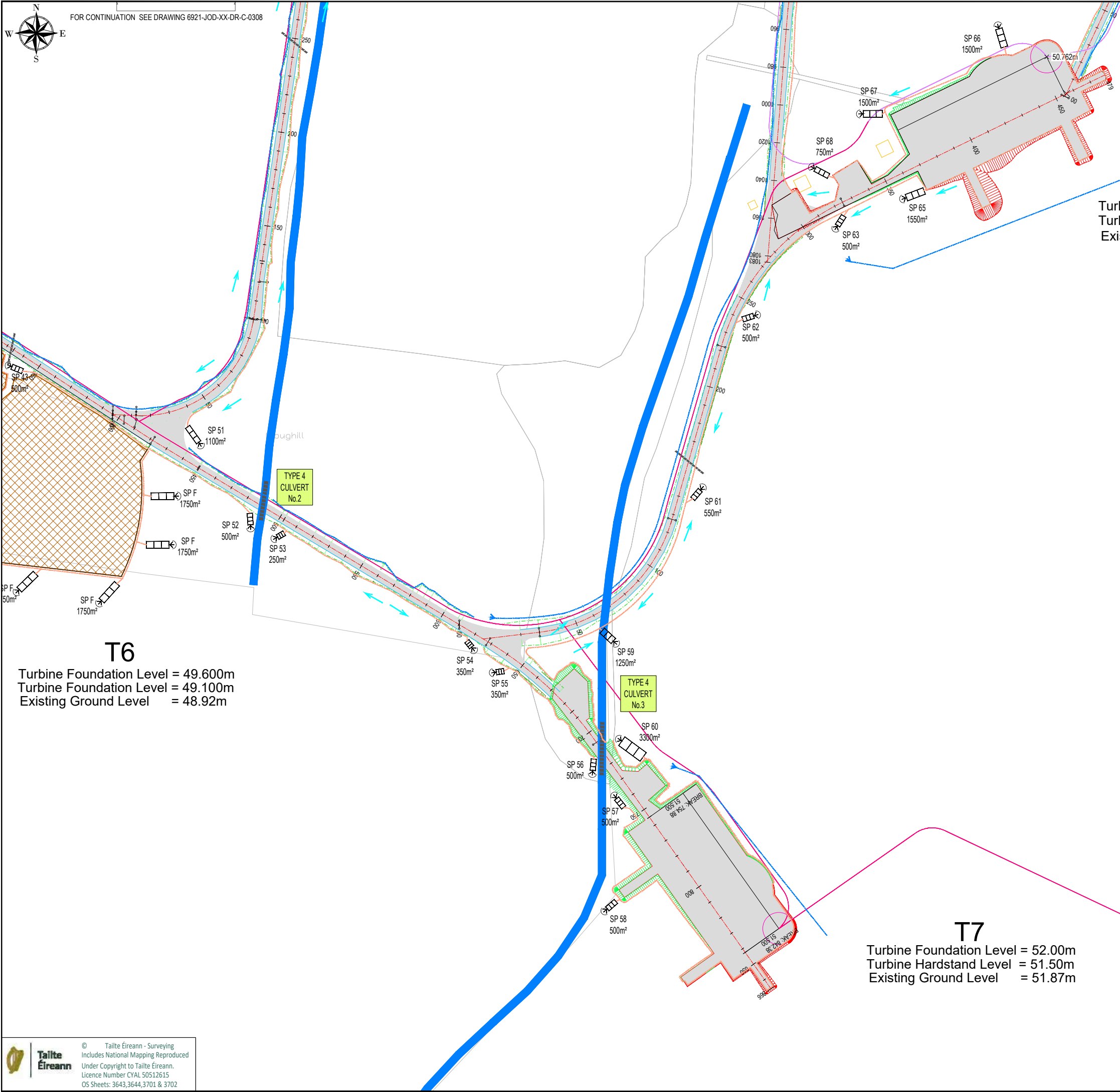
Client			
Project			
Cush Wind Farm, Co Offlay.			
Stage			
Planning			
Title			
Drainage Layout Plan Sheet 6 of 12			
Scales			
1:2000 (A3)			
Surveyed	Prepared	Checked	Approved
	AMcC	JMcE	JMcE
			Date
			June 2026



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Job Ref.	Drawing No.	Revision
6921	6921-JOD-XX-DR-C-0306	P01.5



T8
Turbine Foundation Level = 50.90m
Turbine Hardstand Level = 50.40m
Existing Ground Level = 50.76m

Pond Ref. SP	Development Area (m ²)	Dim. length (m)	Dim. Width (m)	Dim. Depth (m)
1	930	8	2.8	0.75
2	800	8	2.8	0.75
3	430	4	2.8	0.75
4	1750	9	4.5	0.75
5	650	6	2.8	0.75
6	3100	14	5.2	0.75
7	1700	9	4.5	0.75
8	1700	9	4.5	0.75
9	500	6	2.8	0.75
10	1150	8	3.6	0.75
11	825	8	2.8	0.75
12	550	6	2.8	0.75
13	330	4	2.8	0.75
14	1125	8	3.6	0.75
15	425	4	2.8	0.75
16	1050	8	3.6	0.75
17	2500	12	5.2	0.75
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19	2000	12	4.5	0.75
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23	650	6	2.8	0.75
24	550	6	2.8	0.75
25	550	6	2.8	0.75
26	1500	10	3.6	0.75
27	1500	10	3.6	0.75
28	1750	12	3.6	0.75
29	1750	12	3.6	0.75
30	700	6	2.8	0.75
31	700	6	2.8	0.75
32	1500	10	3.6	0.75
33	1600	12	3.6	0.75
34	1600	12	3.6	0.75
35	500	6	2.8	0.75
36	1200	10	2.8	0.75
37	720	6	2.8	0.75
38	1600	12	3.6	0.75
39	1450	10	3.6	0.75
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43	500	6	2.8	0.75
44	600	6	2.8	0.75
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51	1100	10	2.8	0.75
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58	500	6	2.8	0.75
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89	1800	12	3.6	0.75
E	3100	14	5	0.75
F	1750	12	3.6	0.75
G	1100	8	3.6	0.75
H	1750	12	3.6	0.75

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Legend

- Proposed Access Road in Cut
- Proposed Access Road in Fill
- Proposed Hardstand
- Proposed Clean Water Drainage
- Proposed Dirty Water Drainage
- SP 12 550m² Stilling Pond Number, Catchment Area & Flow Direction
- Proposed Culvert to Existing Open Drain
- Spoil Deposition Area
- Existing Streams
- Double Silt Fence
- Cable Route Phase 2
- Cable Routes

KEYPLAN

P01.5	Updated Control Room, Cabling & Settlement Pond Numbering	A.G	10.08.26
P01.4	Updated T8,T9,T10,T11 & Drainage Layout	A.G	11.06.26
P01.3	Silt Ponds added to Spoil Deposition Areas, Drainage Table Updated	AMcC	23.11.23
P01.2	Spoil Deposition Areas Updated	AMcC	13.11.23
P01.1	Issued For Comment	AMcC	13.04.23
rev.	modifications	by	date

Client

Cush Wind Farm

Project

Cush Wind Farm, Co Offlay.

Stage

Planning

Title

Drainage Layout Plan
Sheet 7 of 12

Scales

1:2000 (A3)

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Legend

- Proposed Access Road in Cut
- Proposed Access Road in Fill
- Proposed Hardstand
- Proposed Clean Water Drainage
- Proposed Dirty Water Drainage
- SP 12 550m² Stilling Pond Number, Catchment Area & Flow Direction
- Proposed Culvert to Existing Open Drain
- Proposed Double Silt Fence As Detail Drawing 6921-JOD-XX-DR-C-0324
- Proposed Drainage Check Weir (20m Intervals) As Detail Drawing 6921-JOD-XX-DR-C-0321
- Proposed Spoil Deposition Area

KEYPLAN

312

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OS Sheets: 3643,3644,3701 & 3702

P01.3	Spoil Deposition Area Updated	AMcC 13.11.23
P01.2	Issued For Comment. Site layout revised and drainage revised accordingly	AMcC 04.09.23
P01.1	Issued For Comment	AMcC 13.04.23
P01.1	Issued For Comment	AMcC 13.04.23
rev.	modifications	by date

Client

Cush Wind Farm

Project

Cush Wind Farm, Co Offlay.

Stage

Planning

Title

Soil Deposition Area
Silt Fencing Layout Plan

Scales

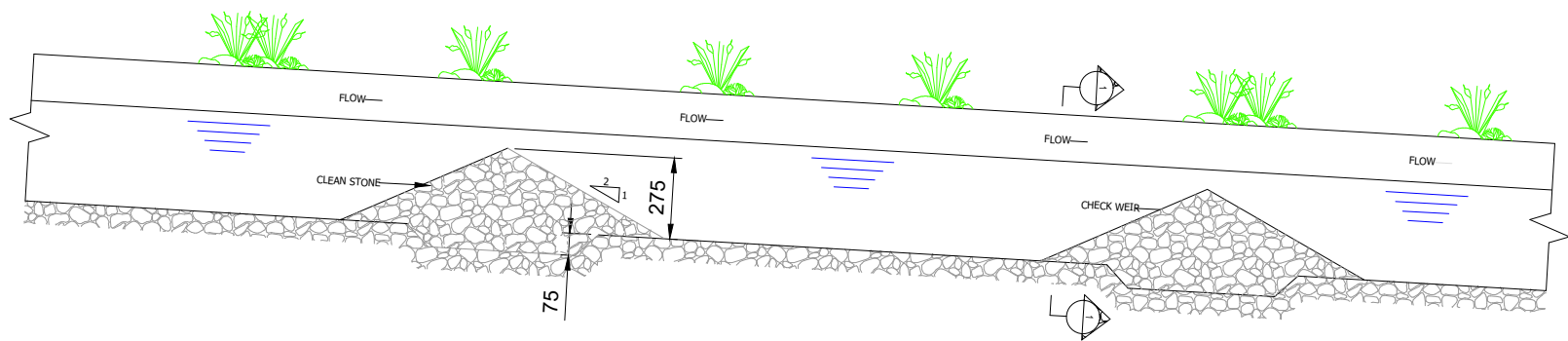
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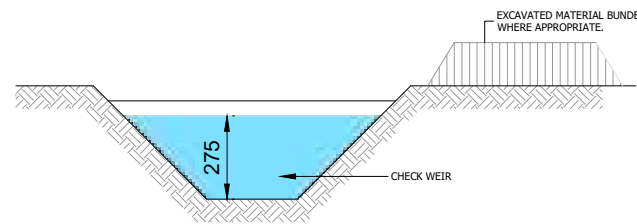
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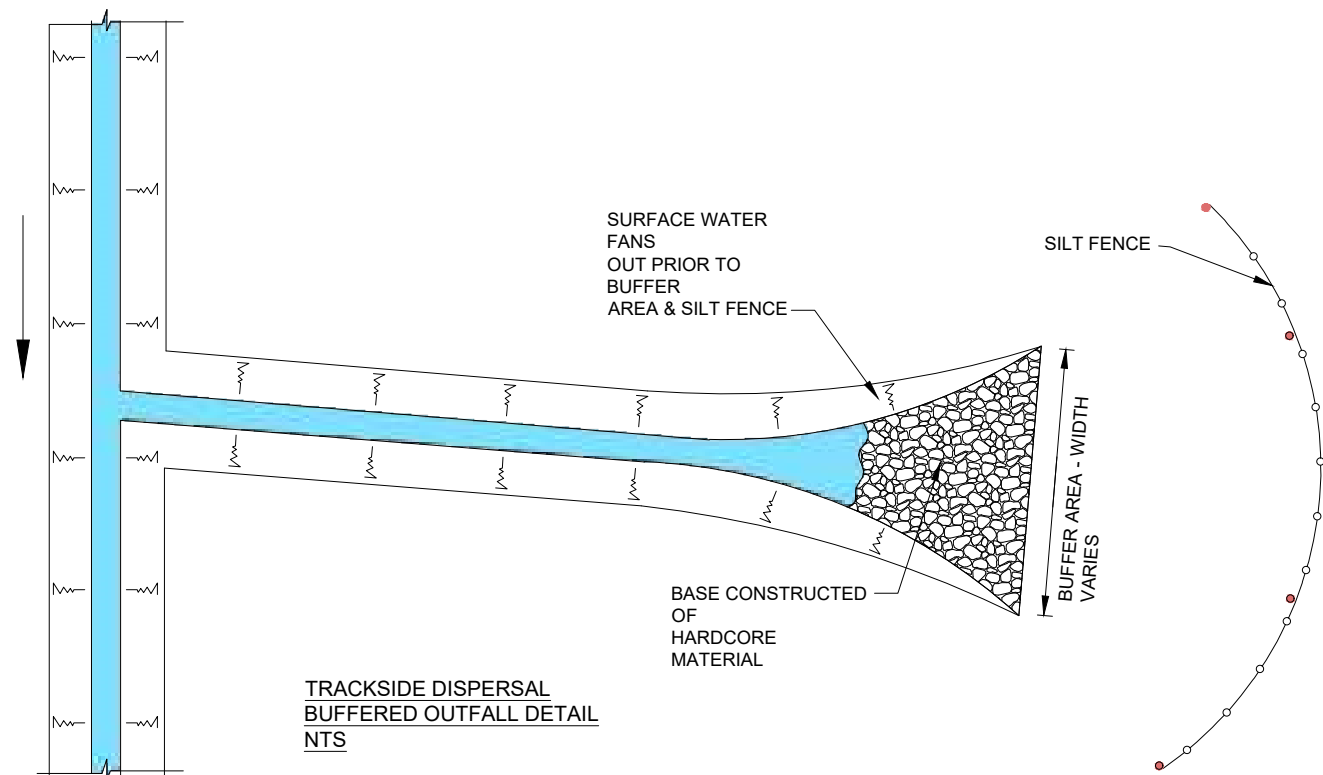
Job No.	Drawing no.	Revision
6921	6921-JOD-XX-DR-C-0312	P01.3



LONGITUDINAL SECTION THROUGH DRAINAGE WITH CHECK WEIRS
SCALE 1:25



SECTION 1-1
SCALE 1:25



TRACKSIDE DISPERSAL
BUFFERED OUTFALL DETAIL
NTS

DRAINAGE NOTES

- GENERAL:**
DRAINAGE BUFFER ZONE WIDTHS SHALL BE A MINIMUM OF 50m.
- CONSTRUCTION AND MAINTENANCE**
ROADSIDE DRAIN SHOULD NOT INTERCEPT LARGE VOLUMES OF WATER FROM THE GROUND ABOVE.
ROADSIDE DRAINS LIKELY TO CARRY HIGH SEDIMENT LOADS AND MUST DISCHARGE INTO A BUFFER OF ADEQUATE WIDTH.
DRAINS ON THE UPPER SIDE OF THE ROAD MAY NEED CULVERTS TO THE LOWER SIDE.
PROPER MAINTENANCE PROVISIONS MUST BE PUT IN PLACE SO AS TO ENSURE THE PROPER FUNCTIONING OF THE DRAINAGE SYSTEM INCLUDING REGULAR INSPECTIONS, CLEANING AND REPAIRS WHERE NECESSARY.
- DRAINS:**
DRAINS SHALL BE DESIGNED AND CONSTRUCTED TO MITIGATE CHANNEL EROSION, E.G. BY INSTALLATION OF PERFORATED PIPE WITH DRAINAGE STONE SURROUND.
DIVERTED RUNOFF FROM A DISTURBED AREA SHALL BE CONVEYED TO A SYSTEM OF STILLING PONDS AND BUFFERED OUTFALLS.
DIVERTED RUNOFF FROM AN UNDISTURBED AREA SHALL BE CONVEYED THROUGH A BUFFERED OUTFALL WITHIN AN UNDISTURBED STABILISED AREA AT NON-EROSIVE VELOCITIES.
ALL OBSTRUCTIONS WITHIN A DRAINAGE CHANNEL SHALL BE REMOVED AND DISPOSED OF, SO AS NOT TO INTERFERE WITH THE PROPER FUNCTION OF THE DRAINAGE SYSTEM.
CHECK DAMS SHALL BE CONSTRUCTED USING WELL GRADED 150mm DOWN ANGULAR GRAVEL PLACED OVER A GEO-TEXTILE LAYER. SEE DETAIL 1.
THE SPACING OF CHECK DAMS SHALL BE SUCH THAT THE PEAK OF THE DOWNSTREAM DAM IS NO LOWER THAN THE FOOT OF THE UPSTREAM DAM.
THE USE OF STRAW BALES WITHIN THE DRAINAGE SYSTEM SHOULD BE CONSIDERED ON A TEMPORARY BASIS DURING CONSTRUCTION AND MAINTENANCE WORK.
STRAW BALES SHOULD, HOWEVER, ONLY BE USED TO INTERCEPT SEDIMENT-LADEN RUNOFF FROM ALL DRAINAGE AREAS OF DISTURBED SOIL.
BALES SHOULD BE ANCHORED IN PLACE BY THE USE OF TIMBER STAKES OR RE-BARS DRIVEN THROUGH THE BALE, WHERE BALES ARE TO BE PLACED IN POSITION ADJACENT TO OTHER BALES (EG WITHIN A STILLING POND), THE FIRST STAKE IN EACH BALE SHOULD BE DRIVEN TOWARDS THE PREVIOUSLY LAID BALE AT AN ANGLE. THIS HAS THE EFFECT OF FORCING THE TWO BALES TOGETHER.
BALES SHALL BE REPLACED AS REQUIRED
BALES SHALL BE REMOVED WHEN THEY HAVE SERVED THEIR USEFULNESS.
- OUTFALLS:**
ALL DRAINAGE CHANNELS SHALL FAN/TAPER OUT BEFORE ENTERING THE BUFFER ZONE. PRIOR TO ENTERING THE TAPERED ZONE, THE BASE OF THE DRAINAGE CHANNELS TO BE CONSTRUCTED OF A HARDCORE MATERIAL TO AID THE SETTLEMENT OF SUSPENDED SOLIDS.
NON-DEVELOPMENT RUN-OFF SHALL BE RETURNED TO A SURFACE FLOW CONDITION E.G. BY USE OF LEVEL SPREADERS.
- STILLING PONDS:**
ANY SEDIMENT TRAPS/STILLING PONDS SHALL BE LOCATED OUTSIDE OF BUFFER ZONES AND HAVE NO DIRECT OUTFLOW INTO WATERCOURSES.
STILLING PONDS SHOULD BE SIZED TO ACCOMMODATE PEAK FLOWS CORRESPONDING TO A 1 IN 100 YEAR STORM EVENT FOR THEIR RESPECTIVE CATCHMENT AREAS.
MAINTENANCE WORKS INCLUDING THE REMOVAL OF SETTLED MATERIALS SHOULD ONLY BE CARRIED OUT IN DRY CONDITIONS
CARE SHOULD BE TAKEN WHEN REMOVING SETTLED MATERIALS SUCH THAT THE PONDS ARE NOT OVER DEEPEMED.
IN THE DESIGN OF STILLING PONDS, CONSIDERATION SHOULD BE GIVEN TO IMPLEMENTING MEASURES SUCH THAT THERE IS NO POSSIBILITY TO DIRECT FLOW THROUGH THE POND E.G. OFFSET INLETS AND OUTLETS FROM THE CENTRE AXIS ETC.

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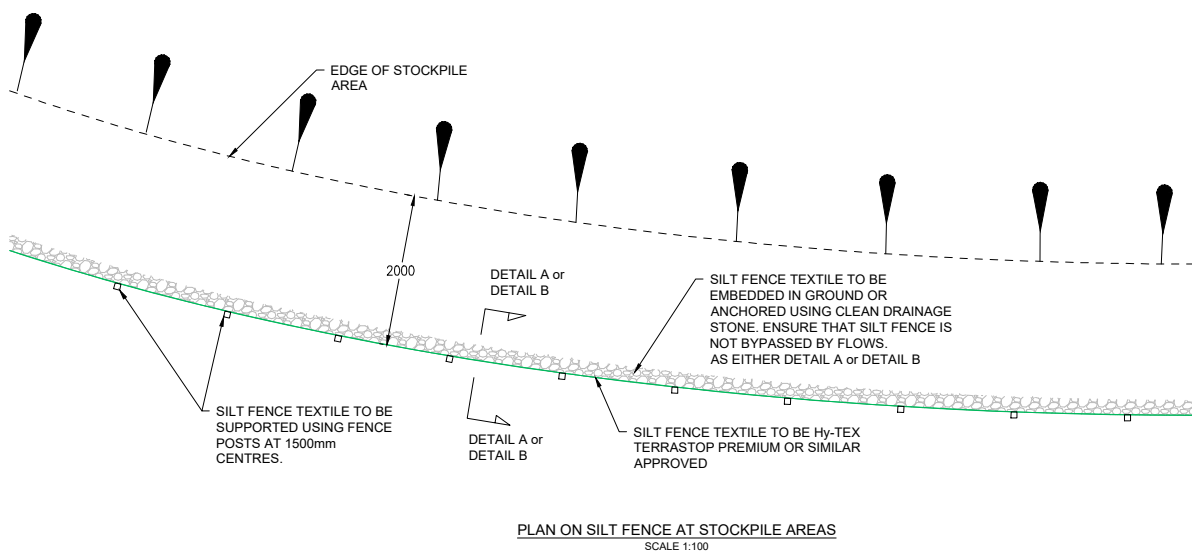
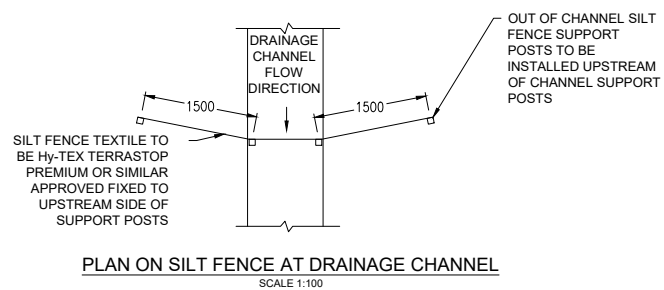
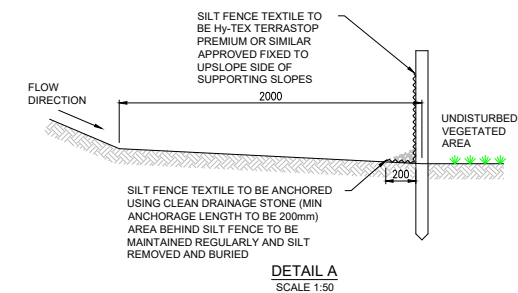
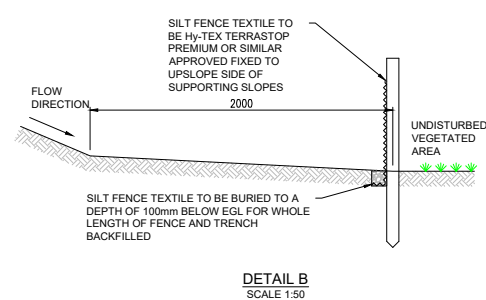
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Project	Cush Wind Farm, Co Offlay.				
Stage	Planning				
Title	Drainage Details Sheet 1 of 4				
Scales	1:25 (A3)				
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Project

Cush Wind Farm, Co Offlay.

Stage

Planning

Title

Drainage Details
Sheet 2 of 4

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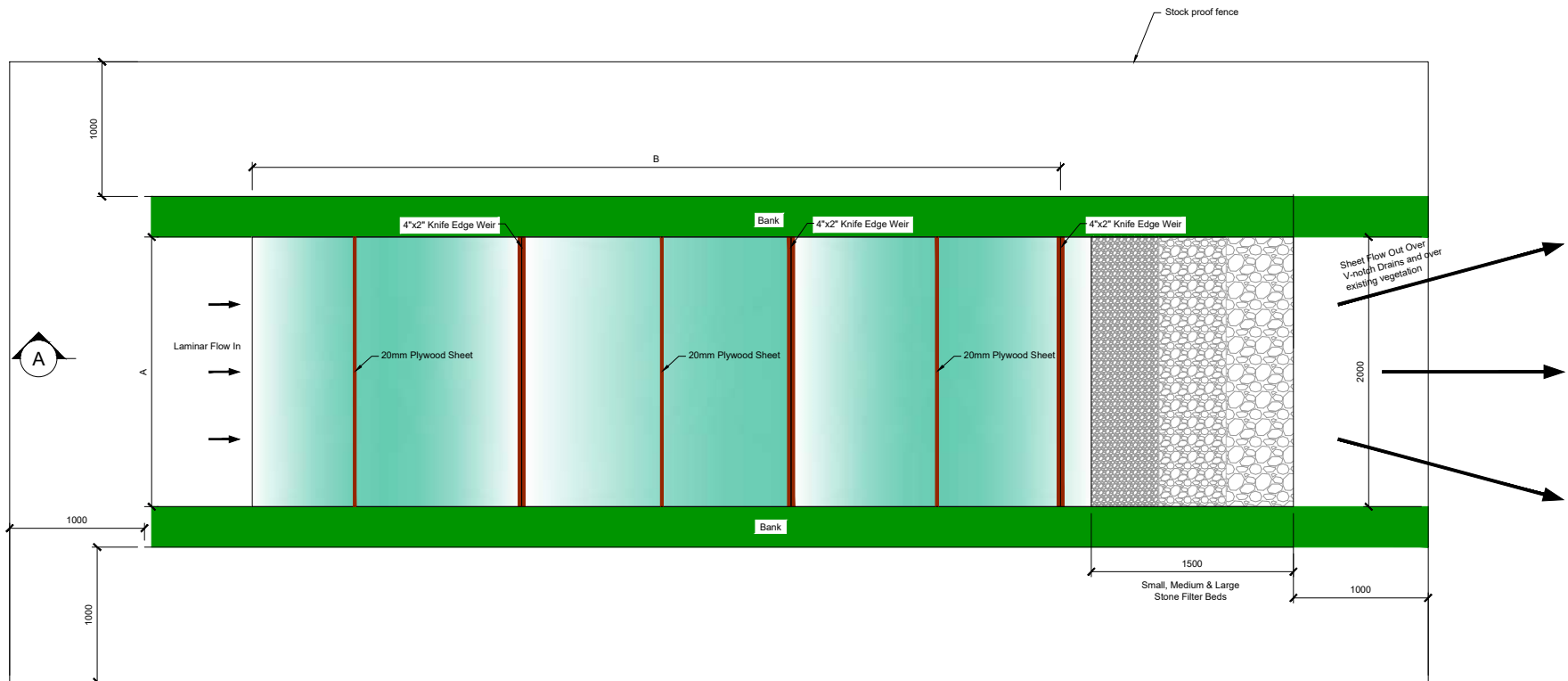
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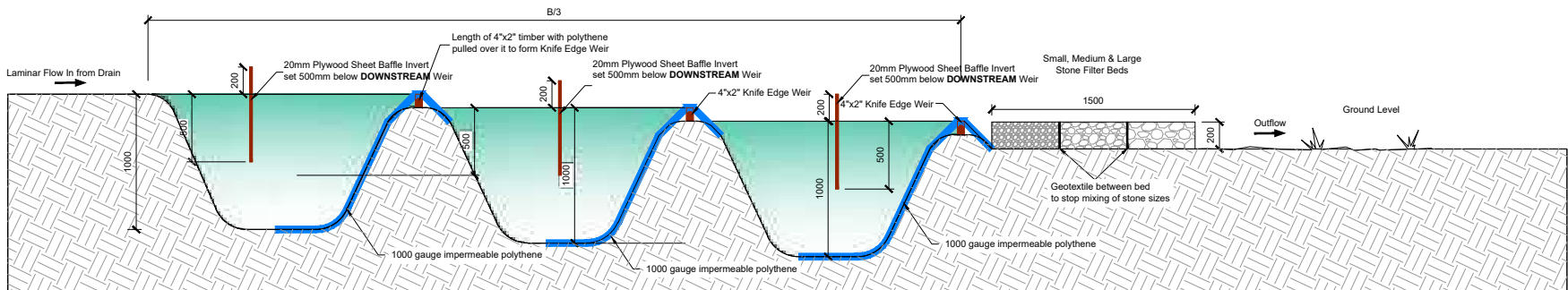
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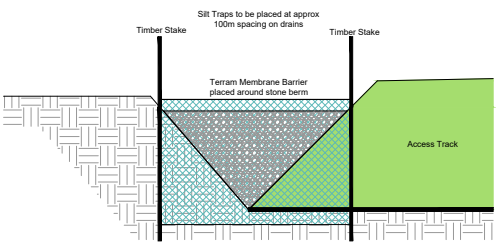
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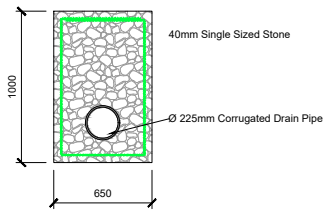
PLAN VIEW OF SETTLEMENT PONDS (WITH DISCHARGE TO DRAINS WHERE APPLICABLE)
SCALE: 1:50



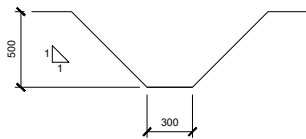
SECTION
SCALE: 1:50



SEDIMENT FENCE DETAIL
SCALE: N.T.S



PERMANENT PERIPHERAL LAND DRAIN
SCALE: 1:50



TEMPORARY "V" DITCH DRAIN PROFILE
SCALE: 1:50



COMPLETED SETTLEMENT POND SYSTEM
SCALE: NTS

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Project	Cush Wind Farm, Co Offlay.				
Stage	Planning				
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6921	6921-JOD-XX-DR-C-0315	P01.1

ANNEX 5 – WATER QUALITY MONITORING PLAN





Cush Wind Farm
Phase II

Planning-Stage Construction Environmental Management Plan

Annex 5: Water Quality Monitoring Plan

Cush Wind Limited

DOCUMENT CONTROL

Stage	Date	Name
Content	23/10/2026	Declan Owens
Approval	23/10/2026	Gavin Daly

RECORD OF CHANGES

Revision	Issue Date	Summary of Changes	Approved
00	23/10/2026	Content	Declan Owens
01			
02			

DISTRIBUTION LIST

#	Purpose	Company	Name (Optional)
1	Review	Cush Wind Limited	James Carville
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3			
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1.0 INTRODUCTION

Galetech Energy Services (GES), on behalf of Cush Wind Limited, has prepared this Water Quality Monitoring Plan (WQMP) to outline the procedures to be followed during the monitoring of surface waters prior to, during and post-construction of the Cush Wind Farm – Phase II.

1.1 PURPOSE OF THIS REPORT

Many construction and industrial sites have the potential to cause a deterioration in downstream water quality through pollution events from hydrocarbons and siltation/sedimentation. The purpose of this report is to verify the efficacy of pollution prevention and mitigation measures implemented at the Cush Wind Farm (Phase II) during construction.

This is a live document and will be updated by the appointed Contractor prior to the commencement of development. Prior to the commencement of construction, the updated WQMP will be reviewed by the Environmental Manager (EM) and Ecological Clerk of Works (ECoW), as necessary, to confirm the appropriateness of the measures set out therein.

1.2 REQUIREMENT FOR WATER QUALITY MONITORING

As described above, construction activities associated with the development of a wind farm can give rise to a risk of pollution. A deterioration in downstream water quality could arise from:-

- Land Slide;
- Fire;
- Leaking plant or equipment;
- Containment Failure;
- Overfilling of containment vessels;
- Wind-blown waste, litter or dust;
- Flooding on site;
- Leaking Portaloo;
- Fuel drips or spills during re-fuelling;
- Leak from fuel or chemical containers;
- Sediment-laden runoff from earthworks and dewatering;
- Concrete-contaminated water;
- Inadvertent HDD drilling-fluid releases;
- Failure of drainage infrastructure; and,
- Failure of pumps and pipelines.

Any of these incidents could affect downstream surface waters which, in turn, could result in adverse effects on water quality, aquatic species and habitats.

1.3 REFERENCE DOCUMENTS

The production of this WQMP has been supported by best practice manuals and will be accounted for in the further development of the appointed contractor's detailed

CEMP.

Other project documents have been used to develop this WQMP; including a Planning-Stage Construction Environmental Management Plan, Peat & Spoil Management Plan, Surface Water Management Plan, and Environmental & Emergency Response Plan.

2.0 DESCRIPTION OF THE PROJECT

Cush Wind Limited proposes to construct Cush Wind Farm Phase II, comprising a three-turbine extension to the permitted Cush Wind Farm Phase I. The project comprises:

- 3 no. wind turbines with overall tip heights within the range of 199.1 m to 200 m, rotor diameters within the range of 158 m to 175 m and hub heights within the range of 111.6 m to 120.9 m;
- all associated turbine foundations and crane hardstanding areas;
- construction of approximately 1.7km of new internal site access tracks and upgrading of existing and permitted access tracks and access arrangements;
- use of the construction compounds permitted as part of Cush Wind Farm Phase I;
- 1 no. electrical switch room building and associated compound, including a new site entrance from the L300321 local road;
- underground electrical and communications cabling within the wind farm site;
- storage of excavated peat and spoil within designated peat and spoil deposition areas;
- site drainage, surface water management and environmental protection measures;
- reinstatement, environmental stabilisation and drainage management works, having regard to the wider rehabilitation objectives for Galros Bog;
- a c.5 km underground electricity line extending from the proposed electrical switch room to facilitate connection of the proposed wind farm to the national electricity network;
- temporary and permanent accommodation works along the turbine component haul route to facilitate the delivery of turbine components; and
- all associated and ancillary site development, excavation, construction, landscaping, reinstatement and environmental mitigation works.

The wind farm site is located in rural County Offaly, approximately 4 km north of Birr and c.28 km south-west of Tullamore. It extends across the townlands of Galros East, Whigsborough, Ballycollin, and Eglis, County Offaly.

The c.5 km underground electricity line will extend from the proposed electrical switch room, located on the southwestern side of the wind farm site, to the connection point at the proposed Mullanafawnia 110 kV substation. The Mullanafawnia 110 kV substation is third-party infrastructure that is subject to a separate consenting process and does not form part of the project.

The turbine component haul route and associated accommodation works extend through Counties Galway, Roscommon, Westmeath and Offaly. Turbine components

will be transported from the Port of Galway through Counties Galway, Roscommon and Westmeath to the wind farm site in County Offaly.

As well as the reference documents listed in **Section 1.3**, various environmental reports have been prepared for the project including:-

- Environmental Impact Assessment Report (Galetech Energy Services);
- Biodiversity Chapter (SLR Consulting Ireland);
- Land & Soils Chapter (Hydro Environmental Services);
- Water Chapter (Hydro Environmental Services); and,
- Natura Impact Statement (SLR Consulting Ireland).

3.0 RESPONSIBILITIES

3.1 CONTRACTOR

The appointed Contractor will be responsible for appointing an independent Environmental Manager to coordinate implementation of this WQMP and for providing the personnel, equipment, laboratory services and resources required. The Contractor will implement corrective actions identified through monitoring and will ensure that suitably trained site personnel complete the daily inspections specified in **Section 4.0**.

3.2 ENVIRONMENTAL MANAGER

An independent Environmental Manager (EM) will be appointed prior to construction and will be responsible for implementing and coordinating this WQMP, in liaison with the Project Manager, Contractor and Ecological Clerk of Works (ECoW). The EM's responsibilities will extend to the wind farm site, underground electricity line route and turbine haul route accommodation works.

Before construction commences, the Contractor will provide the EM with the construction programme. At the beginning of each working week thereafter, the Contractor will provide an updated schedule of works identifying the proposed activities and working locations. The EM will use this information, together with weather forecasts, site conditions and monitoring results, to determine the monitoring and attendance required.

The EM will prepare and deliver environmental site induction and relevant training to construction personnel, in liaison with the Project Manager and Contractor, including the protection of watercourses, drainage features and the Rath Group Water Scheme source protection area.

The EM will:-

- Coordinate baseline, construction and post-construction water quality monitoring, including field testing and laboratory analysis, in accordance with this WQMP;
- Undertake visual inspections at least weekly of active working areas and nearby drainage features and watercourses for evidence of erosion, sediment release, contamination or damage to existing drainage;
- Undertake visual inspections at least weekly of the installed surface water management system, including clean-water interception drains, dirty-water swales, silt traps, settlement ponds, check dams and buffered outfalls, to assess

their condition and effectiveness;

- Arrange additional inspections during higher-risk activities and following heavy rainfall, and coordinate the implementation of the rainfall-triggered precautions and floodplain managed-retreat measures specified in the SWMP;
- Coordinate the collection of water samples at the SW1–SW4 monitoring locations, supplemented by upstream and downstream locations where required to monitor individual working areas. The construction-stage monitoring arrangements will be agreed with the Local Authority prior to construction;
- Attend critical work phases, including watercourse crossing works, turbine foundation concrete pours and underground electricity line HDD works, and check that the required drainage and pollution-prevention measures are in place before those activities commence;
- Check the implementation of the specific water-protection measures applicable to works within and adjacent to the Rath Group Water Scheme source protection area;
- Record inspection findings and monitoring results, promptly notify the Project Manager and Contractor of pollution incidents, deteriorating water quality or ineffective drainage controls, and coordinate corrective action and follow-up monitoring;
- Undertake daily monitoring of wind farm excavations during the construction phase. If high levels of seepage inflow occur, excavation work at the affected location will cease immediately and a geotechnical assessment will be undertaken before excavation resumes; and,
- Maintain records of inspections, sampling, laboratory results, incidents and corrective actions, and prepare monitoring reports in accordance with this WQMP and the requirements of the planning permission.

4.0 WATER SAMPLING METHODOLOGY

Water quality monitoring will be undertaken before, during and following construction of Cush Wind Farm Phase II, including the wind farm site, underground electricity line and turbine haul route accommodation works. The programme will comprise visual inspections, field measurements and laboratory analysis. Its detailed scope, sampling frequencies, parameters and assessment criteria will be agreed with Offaly County Council prior to construction.

The surface water monitoring locations SW1–SW4 identified in **Chapter 7** of the project EIAR will form the core monitoring network. Additional upstream and downstream locations will be established where required to monitor individual working areas, including watercourse crossings, HDD works and other works with a potential pathway to receiving waters.

Monitoring locations will be selected with regard to the coordinated drainage arrangements for the permitted Phase I wind farm and proposed Phase II extension. Where drainage infrastructure or receiving waters serve both phases, the monitoring programme will identify the relevant contributing areas and, where practicable, include locations that assist in distinguishing the effects of Phase II works from other activities. Available Phase I monitoring results will inform interpretation where relevant but will not replace the Phase II baseline monitoring.

As a minimum, the general monitoring programme will include:-

- One round of baseline sampling before ground disturbance begins, with additional baseline sampling where required to establish representative conditions;
- Daily visual inspections by suitably trained personnel at active works near watercourses and drainage features, and in areas of intensive ground disturbance;
- Additional visual inspections during and following heavy rainfall, where safe to undertake;
- Weekly visual inspections by the EM, supplemented by daily EM monitoring of wind farm excavations and additional attendance during critical work phases;
- Monthly field measurements and laboratory sampling throughout construction;
- Additional targeted monitoring during higher-risk activities or where inspections or monitoring results indicate potential deterioration; and,
- At least one round of post-construction sampling following completion of construction and reinstatement. Further monitoring will be undertaken where results indicate unresolved deterioration or drainage controls have not stabilised.

Daily inspection records will identify the working location, activities underway, weather and flow conditions, water colour and clarity, and any visible sediment plume, oil sheen, unusual deposits or other evidence of contamination. The records will also identify any corrective action taken. Field measurements will supplement these inspections during higher-risk works and where potential contamination is suspected.

Each monitoring location will be recorded by grid reference, photographs and a monitoring-location drawing. Locations will be marked on the ground where practicable and safe. The same locations will be used consistently, with any changes or additional locations documented.

Sampling will follow documented procedures appropriate to the parameters being assessed. Field instruments will be calibrated and maintained, and samples will be collected, labelled, preserved, transported and submitted to a suitably accredited laboratory in accordance with its instructions. Records will include the sampling time, sampler, weather, recent rainfall, flow conditions and relevant construction activities.

4.1 HYDROCHEMISTRY

The monitoring programme will include field measurements of pH, temperature, electrical conductivity and dissolved oxygen, together with laboratory analysis of total suspended solids. The complete analytical suite will be agreed with Offaly County Council prior to construction, having regard to the **Chapter 7** of the EIAR baseline results, receiving-water sensitivities and construction activities.

Additional parameters for consideration are listed below:-

- Dissolved Organic Carbon (DOC);
- Total Oxidized Nitrogen (TON);
- Ammoniacal Nitrogen;
- Ammonia;

- Potassium;
- Phosphate;
- Biochemical Oxygen Demand (BOD);
- Chemical Oxygen Demand (COD); and,
- Total Petroleum Hydrocarbons (TPH).

Results will be assessed against baseline conditions, corresponding upstream results, previous monitoring results and the agreed assessment criteria. Particular attention will be given to changes associated with sediment release, concrete works, fuel handling and HDD activities. Monitoring will support the specific protection measures for the Rath Group Water Scheme source protection area set out in **Chapter 7** of the EIAR and the SWMP.

5.0 REPORTING

Each month, the EM will prepare a report on the results of the water quality monitoring. The results will assist in determining the requirements for improvements in drainage, surface water management, and pollution prevention measures. Pollution incidents and significant deterioration in water quality will be reported promptly through the CEMP emergency-response procedure and will not await the monthly reporting cycle.

The EM will also present the results to staff and construction personnel to ensure full awareness of any necessary improvements. This shall be carried out at monthly-meetings and reported within the overall Monthly Environmental Report to be prepared by the EM. The monthly reports on water quality will be provided to Cush Wind Limited and will be made available to the local authority, as may be necessary.

The monthly reports on water quality will consider all visual results, field monitoring results and results of laboratory analysis undertaken that month. Reports will describe how the results compare with baseline data as well as previous monthly reports on water quality. The reports will describe whether any deterioration or improvement in water quality has been observed and whether any effects are attributable to construction activities and what remedial measures or corrective actions have been, or are required to be, implemented.

Upon completion of all post-construction monitoring, the EM will prepare a final report on water quality. This will detail the overall performance against baseline data, details on any impacts attributed to construction works and recommendations for remedial works if required. The final report will be provided to the local authority.

6.0 EMERGENCY RESPONSE

Where a pollution incident threatens to enter, or has entered, a watercourse or drainage feature, the Contractor will immediately implement the emergency-response procedures contained in the CEMP and SWMP. Incidents will include sediment releases, fuel or chemical spills, concrete-contaminated water and inadvertent releases of HDD drilling fluid.

The activity causing or threatening pollution will be stopped immediately. The Project Manager, EM and ECoW will be notified, and, where safe, the source will be isolated and appropriate containment measures implemented to prevent further release.

The EM will arrange prompt upstream and downstream inspections and incident-specific sampling, where safe and practicable. Sampling locations, parameters and frequency will reflect the substance released, receiving environment and potential

pathways. The EM will consult with Offaly County Council and other relevant authorities, as appropriate, regarding further sampling, assessment, remedial measures and follow-up monitoring. Where the Rath Group Water Scheme source could be affected, the scheme operator will be notified promptly.

The incident and response will be documented, including its likely cause, affected drainage pathways, notifications, monitoring results and corrective actions. The affected activity will recommence only when the necessary corrective measures are in place and the Project Manager, in consultation with the EM and ECoW, has confirmed that the pollution risk has been controlled. Follow-up monitoring will continue until the incident has been satisfactorily resolved.

Where a pollution incident has occurred as a result of construction works, the EM will consult with the local authority (authorities) to determine sampling requirements and any additional survey requirements. Where it is demonstrated that the pollution occurred as a result of non-compliance with measures set out in project documentation (including the Environmental Impact Assessment Report, Natura Impact Statement, Construction Environmental Management Plan, and Surface Water Management Plan), the costs of any additional sampling or remedial measures shall be borne, in full, by the Contractor.



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