

Ecological Monitoring and Review – Year 5

Llanwern Solar, Gwent Levels

31 July 2026

Ecology
Arboriculture
Land Management



Report Details

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FINAL	13 January 2026	Hannah Spencer MZool	Jon Garner BSc MCIEEM	Jon Garner BSc MCIEEM	

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Site Details

Site Name and Location	Llanwern Solar, Gwent Levels
Central OS Grid Reference	ST 374 849
Client	Gwent Farmer's Community Solar Partnership Ltd
Boundary	



Executive Summary

Site Location and Description	The Site is located within the Gwent Levels in south Wales, surrounded by farmland and south of the Llanwern Steelworks Site. The Site is split into three distinct parcels containing solar panels and mitigation land.
Aims	This report provides the results of Year 5 monitoring and aims to establish the effectiveness of the management measures against agreed objectives set out in the Ecological Monitoring and Contingency Plan (Green Ecology, 2019) and any subsequent agreed adaptive actions.
2025 Survey Work	Habitat monitoring, lapwing surveys, breeding bird surveys, aquatic & terrestrial invertebrate surveys and water vole surveys (otter observations also recorded).
2025 Adaptive Actions	Actions taken by the Management Company (Vaughan, 2025): - De-silting of reens in line with Year 2 of the 8-year rotation - Soil nutrient testing within Shrill Carder Bee Mitigation Area and NRW Consultation on results - Landowners engaged for future seeding work - Lapwing Mitigation Area grazing timings and grazing exclusions enforced by landowner - Grasslands containing solar panels have had selective mowing implemented in 2025 to promote diverse, flowering field margins and enhance pollinator habitat - Following the 2023 herbicide application, immediate corrective actions were taken to mitigate unintended ecological effects and realign management with agreed conservation outcomes. - Formal NRW herbicide and SSSI consents secured (July 2025) - SCB area in area 1 reseeded and showing good wildflower establishment, providing forage for SCB in 2025
Survey Findings	
Habitats (including grassland, hedgerows and watercourses).	- Hedgerow and reen habitats are progressing towards target conditions as laid out in the LEMP - Grassland habitats within crane and shrill carder bee arrays are progressing towards target conditions as laid out in the LEMP. - Grassland habitats within the solar arrays are not currently meeting target conditions for wildflowers and diverse sward. - Buffers outside of the Solar Array Area fencing are developing a good sward with tussocky rushes but overall low wildflower diversity.
Breeding lapwing	Lapwing monitoring returned presence of lapwing using the retained lapwing areas and the Solar Array Areas 2 and 3 although lapwing were not recorded to be breeding on Site during 2025. Lapwing were not recorded using the lapwing mitigation area for breeding but have been recorded as using the mitigation area for winter foraging.
Breeding birds	Birds were recorded using the Site in numbers expected of the habitats within the Site. Site supports a good population of birds and diversity of species.
Aquatic invertebrates	A good diversity of aquatic invertebrates were recorded within the reens within the Site. The assemblage has improved since the baseline position due to the habitat improvement works that have been undertaken.
Terrestrial invertebrates	A good population of shrill carder bee were recorded within the shrill carder bee wildflower fields.
Water vole	Water vole were recorded on site for the first time with burrows found within solar array areas 2 and 3. Incidental sightings of water vole were also recorded within the survey area.

Summary of Progress Towards Objectives

Hedgerow and reed habitats are progressing towards favourable conditions, shrill carder bee and crane mitigation fields are also progressing towards favourable conditions, lapwing mitigation land and grassland underneath solar arrays will be on track with management. Lapwing were not recorded breeding within the mitigation land but are breeding around the site, other breeding birds were recorded as to be expected. Wintering lapwing are using the Lapwing Mitigation Land for winter foraging. Invertebrates are responding well to the habitat improvements and water vole have been recorded on site for the first time.

Adaptive Management Recommendations

Lapwing Mitigation Area	 Historic grips to be re-instated to help wet up the area.
Grasslands containing solar panels	 Grass height to be maintained short at a maximum buffer of 1m from the solar panels to prevent shading of panels  Grass outside of this buffer to be allowed to develop a tall and diverse sward. With no grazing or cutting in the summer flowering period.

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1 Introduction

This report presents the results of the fifth year of ecological monitoring for Llanwern Solar, Gwent Levels. The surveys were commissioned by Gwent Farmers' Community Solar Partnership Ltd. The area within the application boundary is hereafter referred to as the 'Site', the Location of which is shown in **Figure 1** as the 'Red Line Boundary'.

This document has been prepared to provide sufficient information to satisfy Condition 14 of the planning consent. This states:

ECOLOGICAL MONITORING & CONTINGENCY: Prior to the commencement of any works of ecological mitigation / compensation the applicant shall produce an 'Ecological Monitoring & Contingency Plan'. The plan shall set out the principle aims and objectives of the ecological work to be undertaken as part of this approval and shall identify a monitoring and reporting schedule that shall have regard to the objectives of the plan. Monitoring Reports shall be submitted to the Council within 3 months of their completion. Objectives shall be short term (5 years and less), mid-term (6-10 years) and long term (11-30 years). The plan shall allow for contingency actions to be taken if monitoring shows stated objectives are not being achieved. Any change in the ecological mitigation proposed for the site shall be submitted to and agreed in writing by the Council. Thereafter any contingency shall be carried out fully as agreed.

An Ecological Monitoring and Contingency Plan was produced in 2019 which sets out the ecological features to be monitored and the objectives for each feature (Green Ecology, 2019a). Since commencement of development, annual monitoring reports have been completed, of which this document presents Year 5.

1.1 Description of Proposed Development

The development consists of the erection of a solar energy hub, comprising ground mounted solar panels, underground cabling, grid connection hub and associated infrastructure for a temporary period of 40 years on land south of the Llanwern Steelworks site (central OS grid reference: ST 3780 8445), hereafter referred to as the 'Site'. The Site was granted planning permission on 8th November 2018 (DNS Application Ref: APP/G6935/A/16/3150137).

1.2 Aims

The overarching aim of the monitoring reports is to establish the success and effectiveness of the measures undertaken to avoid, mitigate or compensate for impacts to biodiversity related to the Llanwern Solar development and to provide contingency plans if monitoring shows that habitat management or habitat creation is deficient in any way.

In Year 5, in accordance with Ecological Monitoring and Contingency Plan (Green Ecology, 2019a), the following ecological features were the focus of monitoring:

-  Habitats (including grassland, hedgerows and watercourses);
-  Breeding birds;
-  Breeding lapwing;
-  Aquatic invertebrates;
-  Terrestrial invertebrates; and
-  Water vole.

Refer to **Section 3** for detailed objectives for each ecological feature.

2 Pre-Development (Baseline) Conditions

2.1 Pre-Development Survey Work

Table 1 summarises the surveys undertaken to provide the baseline data for the ecological features on- and off-Site, which are subject to this year's monitoring programme. Full details are provided within the relevant reports and plans submitted alongside the planning application and produced by ECUS, David Boyce (2015, 2017) and Green Ecology (2017).

Table 1: Baseline Surveys

Ecological features	Survey Types	Dates	Relevant Reports/ Plans
Habitats (including grassland, hedgerows and watercourses)	 Extended Phase 1 Habitat Survey and ecological walkover	2016 and 2019	Phase 1 Habitat Map October 2016 (Ref: GB/6307/1) Environmental Statement 2016 (Ref: 1045592)
Breeding lapwing	 Breeding Bird Survey	2015 and 2017	ES Appendix 12.4a Gwent Farmers Community Solar Scheme – Survey of Breeding Birds Gwent Levels Farmers' Community Solar Scheme, Whitson, Newport Breeding Bird Surveys 2017 (0419-BBS-MW) Gwent Levels Farmers' Community Solar Scheme, Whitson, Lapwing Management Plan, December 2019 (0419-LMP-MW) Environmental Statement 2016 (Ref: 1045592)
Breeding birds	 Breeding Bird Survey	2015 and 2017	ES Appendix 12.4a Gwent Farmers Community Solar Scheme – Survey of Breeding Birds (2015) ES Appendix 12.4b Gwent Farmers Community Solar Scheme – Survey of Breeding Birds (2017) Environmental Statement 2016 (Ref: 1045592)
Water Vole and Otter	 Water Vole and Otter Survey	2015 and 2017	ES Appendix 11.8 Gwent Farmers Community Solar Scheme – Water Vole and Otter Survey Environmental Statement 2016 (Ref: 1045592)
Invertebrates	 Invertebrate Survey	2015	ES Appendix 11.7a Gwent Farmers Community Solar Scheme 2015 Invertebrate Survey Report Environmental Statement 2016 (Ref: 1045592)

Ecological features	Survey Types	Dates	Relevant Reports/ Plans
Shrill Carder Bee	 Invertebrate Survey	2017	ES Appendix 11.7b Gwent Farmers Community Solar Scheme 2017 Shrill Carder Bee Survey Report

2.2 Pre-development Habitats

2.2.1 Solar Array Fields and Solar Array Margins

The baseline condition of these areas was improved and semi-improved grassland, bounded by reens and ditches, which together formed part of the coastal and floodplain grazing marsh (Priority Habitat Section 7, Environment (Wales) Act 2016) on the Gwent Levels which were grazed by both cattle and sheep and occasionally horses.

2.2.2 Lapwing Mitigation Area

These are the fields that have been designated as the managed lapwing mitigation area post-development (see **Figure 1**) and their baseline condition was heavily grazed improved grassland bounded by reens and ditches.

2.2.3 Retained Lapwing Area

These are offsite fields that are to be used to compare impacts that the solar array construction and operation have on the breeding lapwing population. These fields are to continue to be sympathetically sheep-grazed post-development (see **Figure 1**) to support breeding lapwing. The baseline condition for these fields was heavily grazed improved grassland bounded by reens and ditches.

2.2.4 Common Crane and Shrill Carder Bee Mitigation Fields

These are the fields that are now managed for wildflowers and hay to support crane and specific areas set out for shrill carder bee as 'Wildflower Seed Mix Areas' (**Figure 1**). The area totals 11.4ha and the baseline condition was improved grassland and semi-improved grassland at least partly bounded by reens and ditches/hedgerows.

2.2.5 Hedgerows

Varied; species-rich to species-poor and defunct with and without trees. Most qualified as a Habitat of Principal Importance under Section 7 of the Environment (Wales Act) 2016. Many of them have been unmanaged and have grown up on both sides of the boundary ditches and reens which has prevented ditch and reen management.

2.2.6 Reens and ditches and appropriate buffers

Watercourses on Site form Gwent Levels Whitson and Nash and Goldcliff SSSIs which are designated for their aquatic plants and invertebrates. The condition of the reens and ditches was variable across the Site with many of the smaller reens and ditches having suffered due to a lack of management, resulting in encroachment of hedgerows on both sides of many watercourses.

2.3 Pre-development Monitoring

2.3.1 Breeding Crane

One pair of cranes bred in Wales for the first time in 400 years in 2016 close to the Site on private land. Cranes had been seen to use fields on Site for foraging and have also been observed in fields close to the north of the Site for rearing flightless young.

2.3.2 Breeding Lapwing

During 2015 and 2017 surveys, up to eight pairs of lapwing were found on or near to the Site accounting for almost 1% of the Welsh breeding population. Although only 2-4 pairs were recorded within the development boundary, eight pairs were recorded in fields adjacent to the Site and potentially subject to disturbance.

2.3.3 Breeding Birds

A total of 78 species were recorded during the 2017 Breeding Bird Surveys. Fifteen were Red-listed and 19 Amber-listed in BoCC3 (Wales) (Johnstone and Bladwell, 2016), and 13 were Red-listed and 20 Amber listed in BoCC4 (Eaton *et al*, 2015). Fourteen species were listed in Section 7 of the Environment (Wales) Act 2016.

Of these notable species, five species were Severn Estuary SPA & Ramsar Site qualifying species (or Assemblage species): shelduck *Tordana tordana*, mallard *Anas platyrhynchos*, lapwing *Vanellus vanellus*, redshank *Tringa totanus* and curlew *Numenius arquata*. Five were 'Birds Directive' Annex 1 species: Little egret *Egretta garzetta*, marsh harrier *Circus aeruginosus*, peregrine falcon *Falco peregrinus*, common crane, *Grus grus* and kingfisher *Alcedo atthis*.

2.3.4 Shrill Carder Bee

The Site was found to support a significant population of the shrill carder bee during surveys in 2017. The largest concentration of records of shrill carder bee, of 75 individuals, was from the western block of fields, which is now Solar Array Area 1.

2.3.5 Invertebrates

Invertebrate surveys undertaken during 2015 recorded 12 key species across the Site. The key species are defined as being listed as Nationally Scarce categories a or b, Near Threatened or listed within the Red Data Book Category 2. This list comprises a weevil, a wood ant, two soldierfly species, two water beetle species, two ground beetle species, three rove beetles, a clown beetle and a great diving beetle species.

2.3.6 Riparian Mammals

During the 2017 surveys, presence of water vole was confirmed at two crossing points and considered likely at a further four crossing point locations given the quality of habitats. No otter or signs of otter were recorded within the Site.

3 Objectives

The objectives for each feature and statement of predicted change (i.e. summary of the likely net change in biodiversity that will occur as a result of the development once mitigation, compensation and enhancements are complete) and the timescales in which the objectives are to be completed are provided in **Table 2**. The objectives in **Table 2** originate from the LEMP (Green Ecology, 2019b), the Ecological Monitoring and Contingency Plan (EMCP), Lapwing Monitoring Plan (Green Ecology, 2019c) and Common Crane Mitigation Plan (Green Ecology, 2019d). Locations of the different habitat parcels are shown in **Figure 1**.

Table 2: Ecological Features and management objectives from LEMP, Monitoring and Contingency Plan and Species-Specific Management Plans

Ecological Feature		Management Objectives	Statement of Predicted Change
Habitats (including grassland, hedgerows and watercourses).	Solar Array Fields (Retained Grassland)	<u>LEMP:</u> - Manage the areas of grassland beneath the solar panels using sensitive low intensity sheep grazing to enhance the ecological value of the grassland; - Manage specific areas specifically to encourage and support shrill carder bee; - Monitor and manage, as appropriate, the spread of scrub and invasive species. <u>EMCP</u> Short-term objective (≤5 years): - The grasslands beneath the solar panels on Site will be maintained to provide breeding and foraging habitats for invertebrates and birds particularly in the 7-12.5m field margins.	The Solar Array Fields will be managed to provide an enhanced ecological value of the grassland.
	Lapwing Mitigation Area	<u>LEMP/Lapwing Management Plan:</u> - Establish the new stocking regime and rush management as per the Lapwing Management Plan. - Hedgerow and vegetation removal and maintenance as per the Lapwing Management Plan. - Any pesticide use ceased and herbicide use limited to spot treatments only. - An electric predator fence may be erected around the lapwing mitigation field once vegetation removal is complete and if the results of ecological monitoring up to year 5 indicates that this is required to protect nesting lapwing.	The off-Site Lapwing Mitigation Area will be successfully enhanced to provide short, extensively grazed damp pasture with low stocking rates between the lapwing breeding season; March to June. The grassland is rich in earthworms, leatherjackets, other insects and their larvae that provide an important food source for lapwing.

Ecological Feature		Management Objectives	Statement of Predicted Change
		<u>EMCP</u> Short-term objective (≤5 years): Create, manage and maintain offsite field habitat secured for lapwing breeding habitat and increase local breeding population. Monitor fields adjacent to Site known to hold breeding lapwing.	
	Common Crane Mitigation Fields	<u>EMCP</u> Short-term objective (≤5 years): - Establish new wildflower grassland. Establish hay meadow management regime as per the Common Crane Mitigation Plan. - Maintain late-flowering grassland and hay meadow management as per the Common Crane Mitigation Plan.	Late-flowering grassland habitat will be established for the benefit the rare shrill carder bee. This will also provide benefits to other invertebrate, bird and mammal species. Managing as hay meadow will improve the crane chick rearing habitat.
	Wildflower Seed mix Areas (within Common Crane Mitigation Fields)	<u>LEMP</u> - No or very low fertilizer inputs; - No summer grazing; - Ensure that plentiful flower-rich forage habitat is available until late-September; - Height of cut: 50mm; - Cut traditionally managed hay meadows and mitigation areas by rotating a late-cut to provide bee foraging into late-September; - Arisings: Left to dry and shed seed for 1-7 days, resulting hay used for animal fodder; - Aftermath grazing: following hay cut. <u>EMCP</u> Short-term objective (≤5 years): - Enhance habitats on Site for shrill carder bee a qualifying species of both Gwent Levels Whitson and Nash and Goldcliff SSSIs by creating late-flowering grassland areas.	There is an increased abundance of shrill carder bee and an increased diversity and abundance of other invertebrate species, particularly those of national importance.

Ecological Feature		Management Objectives	Statement of Predicted Change
	Hedgerows	<u>LEMP</u> - Manage hedgerows on a regular, rotational basis to promote structural and botanical diversity; - Provide on-going management of standard hedgerow trees will aim to promote mature trees, including dead-wood habitat; - Maintain the connectivity of the Site to facilitate the movement of wildlife through and across the Site; - Provide visual screening where required and deliver good integration of the development into the landscape; - Enhance defunct and species-poor hedgerows to increase biodiversity, connectivity and strengthen local landscape character; and, - Allow and encourage a diverse ground flora to develop along hedgerow bases. <u>EMCP</u> Short-term objective (≤5 years): - Removing selected hedgerows as per Hedgerow Removal Plan (preconstruction); - Establish new hedgerow to create visual screening to mitigate human and common crane visual impacts of the grid yard and battery storage area and to mitigate for the loss of hedgerow habitat for nesting birds as a result of proposed SSSI reen enhancements	Hedgerows will have good structure, provide connectivity for faunal species and support a diverse flora.
	Reens and ditches and appropriate buffers	<u>LEMP</u> - Enhance the biodiversity of the ditch/ reen system; - Maintain the favourable status of the notified features of the SSSIs e.g. insects and plants; - Maintain high water levels in summer; - Enhance the adjacent buffer areas for flora and fauna; - Monitor and manage pollution and invasive species. <u>EMCP</u>	Ditches and reens will support a structurally diverse assemblage of vegetation.

Ecological Feature	Management Objectives	Statement of Predicted Change
	Short-term objective (≤ 5 years): 👉 Create a structurally diverse assemblage of vegetation along the ditches and reens on Site. 👉 To create a range of successional stages through management of small sections at a time following on from the hedgerow removal programme. This will benefit both aquatic and terrestrial invertebrates within the SSSI watercourses and improve habitats for other species including water vole and otter. 👉 Operate a ditch and reen management programme in consultation with Natural Resources Wales (NRW) as per the LEMP.	
Breeding birds	<u>LEMP</u> No management objectives directly for breeding birds within the LEMP. <u>EMCP</u> Short-term objective (≤ 5 years): 👉 To monitor land use by breeding bird species in solar array fields and mitigation fields on Site comparing with baseline survey data.	Habitats, including hedgerows and Solar Array Fields, will be enhanced for breeding birds.
Breeding lapwing	<u>LEMP</u> No management objectives directly for breeding lapwing within the LEMP. <u>Lapwing Management Plan:</u> Short-term objective (≤ 5 years): 👉 Create, manage and maintain offsite field habitat secured for lapwing breeding habitat and increase local breeding population.	“Lapwing Mitigation Fields” and “Retained Lapwing Fields” located adjacent to the Site known to hold breeding lapwing will support breeding lapwing in the same numbers or greater than the baseline. Locations shown in Figure 1 .

Ecological Feature	Management Objectives	Statement of Predicted Change
	 Monitor fields adjacent to Site known to hold breeding lapwing.	
Aquatic invertebrates	<u>LEMP:</u> No management objectives directly for aquatic invertebrates within the LEMP. <u>EMCP</u> Short-term objective (≤ 5 years):  Improve habitats for aquatic invertebrates by ditch and reen management.	Reens will support a diverse invertebrate population
Terrestrial invertebrates, including shrill carder bee	<u>LEMP</u> No management objectives directly for terrestrial invertebrates, including shrill carder bee, within the LEMP. <u>EMCP</u> Short-term objective (≤ 5 years):  Enhance habitats for shrill carder bee (and other invertebrates) by creating late flowering wildflower grassland areas.	There will be an increased abundance of shrill carder bee and an increased diversity and abundance of other invertebrate species, particularly those of national importance.
	 Monitor the effects of solar panels on areas where shrill carder bee is known to be present.	
	 See a population increase.	
Water vole	<u>LEMP:</u> No management objectives directly for water vole within the LEMP, however the LEMP states that:  Opening up of reens and ditches by clearing one side of double hedgerows to allow management of the watercourses will improve the habitat for water vole. <u>EMCP</u>	There will be enhanced habitat for water vole, through reen and ditch and appropriate buffer management.

Ecological Feature	Management Objectives	Statement of Predicted Change
	Short-term objective (≤5 years):  Monitor habitat improvements on reens and ditches where hedgerows have been removed to assess whether water voles have benefitted from the improvements, by increase an increase in numbers and/or distribution	

4 Methods

4.1 Data collection for Year 5 of Monitoring Programme

Table 3 summarises the surveys undertaken to collect data for the fifth year of the Monitoring Programme. Full details are provided below.

Table 3: Summary of Year 5 Monitoring Data Collection Surveys

Survey Type	Date (s)
Habitat Monitoring	Specific survey July 2025 and November 2025 Spot monitoring March – July 2025
Breeding Bird	April – June 2025
Breeding Lapwing	March – June 2025
Aquatic invertebrates	June 2025
Terrestrial invertebrates	August 2025
Water Vole	May 2025

4.2 Habitat Walkover Methods

A Site visit was made on 25th July 2025 to assess the solar array fields, margins and retained fields for progress against the objectives. The July specific habitat monitoring survey was undertaken following the Joint Nature Conservation Committee’s Phase 1 Habitat Survey methodology (JNCC 2010) and following the previous methodology where photographs were taken at specific GPS points across the Site and general observations were made on the progress of habitats across the Site. Shrill carder bee and crane mitigation fields where late flowering-grassland and hay meadows are being established respectively were also included (see **Appendix 3** for habitat locations; ‘Proposed new Wildflower Planting’ and ‘Proposed Hay Management’). The lapwing monitoring and mitigation fields were also assessed over the course of the monitoring surveys. Locations at which photographs were taken are shown in **Figure 2**, using the same locations as previous monitoring surveys, to compare changes over time.

Spot monitoring of the Site in 2025 involved general habitat observations during lapwing monitoring surveys and breeding bird surveys, an end of season visit occurred on 20th November 2025 by Ella Bond BSc (Hons).

4.3 Breeding Lapwing Methods

The lapwing survey methodology was based upon lapwing species-specific guidance and generic breeding wader guidance as detailed in Gilbert *et al.* 1998, following the same methodology as the 2015 and 2017 breeding bird surveys.

The extent of survey for lapwing covered the ‘Lapwing Mitigation Area’ and ‘Retained Lapwing Area’ as shown in **Figure 3**. Both of these areas are separate from, but adjacent to, the array areas. The array areas were targeted during the breeding bird surveys, as such, any lapwing using the solar array areas were recorded as part of the breeding bird surveys. Transects were plotted onto the relevant areas so that the surveyor was within 100m of all parts of the fields during the surveys. The survey season was extended to reflect the lapwing breeding season, dates and weather conditions for the ‘Proposed Lapwing Mitigation Area’ are summarised in **Table 4**.

Table 4: Dates, times and weather conditions for breeding bird survey

Visit	Date	Surveyor	Time	Weather
1	21/03/2025	GV	11:00 – 13:00	12°C, 0 rain, cloud cover 8 Oktas, W 3Bf
2	24/04/2025	GV	11:00 – 13:00	11°C, 0 rain, cloud cover 3 Oktas, E 2Bf
3	30/05/2025	GV	11:00 – 13:00	15°C, 0 rain, cloud cover 4 Oktas, SW 3Bf
4	27/06/2025	GV	11:00 – 13:00	18°C, 0 rain, cloud cover 5 Oktas, SW 3Bf
5	25/07/2025	GV	11:00 – 13:00	21°C, 0 rain, cloud cover 2 Oktas, W 2Bf

GV = Gavin Vella.

4.4 Breeding Bird Methods

A breeding bird survey was undertaken in spring 2025 according to an adapted Common Bird Census (CBC) methodology (Bibby *et al*, 2000; Gilbert *et al*, 1998), in keeping with previous monitoring surveys in years 1 and 3. Methods consisted of three walked transect routes divided across the three solar array areas of the Site. The transect that encompassed Solar Array Area 1 was extended to cover offsite parcels to the north to compare against the 2015/2017 survey effort.

Transects started at 6am in suitable weather conditions (avoiding cold, windy and wet days, although showery days make acceptable survey weather). Survey dates and weather conditions are summarised in **Table 5**.

Table 5: Dates, times and weather conditions for breeding bird survey

Visit	Date	Surveyor	Time	Weather
1	25/04/2025	GV, NS, DW	06:30 – 09:00	8°C, 0 rain, cloud cover 5 Oktas, E 2Bf
2	30/05/2025	GV, NS, DW	06:00 – 09:00	14°C, 0 rain, cloud cover 4 Oktas, SW 3Bf
3	27/06/2025	GV, NS, DW	06:00 – 09:30	28°C, 0 rain, cloud cover 4 Oktas, WSW 3Bf

GV = Gavin Vella; NS = Nick Saunders; DW = Daneil Webb BSc (Hons).

Notable bird species were recorded during the breeding bird survey, including WCA 1981 Schedule 1 species, birds listed on the UK Red-list of Birds of Conservation Concern 5 (BoCC; Stanbury *et al.*, 2021), birds listed on the Welsh Red-list of Birds of Conservation Concern 4 (BoCC; Johnstone *et al.*, 2022) where different from the UK-Wide BoCC5 list, species listed in Section 7 of the Environment (Wales) Act 2016 and Local BAP species. During the survey, information on species, their locations and behaviour was mapped and recorded. Breeding probability of each species is assigned based on the BTO breeding status codes¹. Survey findings are shown in **Figure 3** and detailed in **Appendix 3**.

4.5 Aquatic and Terrestrial Invertebrate Methods

Methodology for the aquatic and terrestrial invertebrate surveys are found within the Aquatic Invertebrate and Bumblebee Monitoring report produced by Boyce (2025) in **Appendix 4**.

4.6 Water Vole

A water vole and otter survey was undertaken on 11 June 2025 by Lee Jenkins (County recorder of otters for SEWBRc, NRW personnel Otter license no. S093108/1) and a health and safety operative. The survey involved a walkover of the reens and ditches at every crossing point and a survey of both banks where accessible for a length of approximately 50m either side of the crossing point.

¹ <https://www.bto.org/get-involved/volunteer/resources/guidance-for-volunteer-fieldworkers> Accessed on: 17/10/2025.

A detailed search was made along the reens for evidence of water vole, including burrows, droppings, footprints and feeding remains following current best practice methodology (Dean *et al.* 2016). During the survey, the main habitat type of each section of bank was recorded.

During this survey signs of otter were also searched for following current good practice guidelines (Chanin, 2003), including spraints, tar spots, slides and runs, holts and couches, footprints and feeding remains. Spraints were searched for on prominent features in or close to the water courses as they are often favoured by otters. Survey findings are shown in **Figure 5**.

4.7 Limitations

Care has been taken to ensure that balanced advice is provided on the information available and collected during the study period(s), and within the resources available for the project. However, the possibility of important ecological features being missed due to survey timings, absence during surveys or the year of survey cannot be ruled out. In addition, the lack of evidence or records of protected species on Site does not necessarily preclude their presence.

During the habitat walkover survey, no fixed transects were walked and no quadrats were monitored, the key areas were monitored as per previous monitoring efforts, shown in **Figure 3** and detailed in **Appendix 1**.

Breeding bird surveys were not able to be conducted within 30 minutes of sunrise during the May and June visits due to access constraints within the Solar Array Areas.

Lapwing monitoring methods differed from the pre-works breeding bird surveys in 2015 and 2017 as the transect route no longer encompasses the solar array areas. However, these areas were covered during the breeding bird surveys as such the results are considered to be comparable.

5 Monitoring Results

5.1 Solar Array Fields (Retained Grassland)

5.1.1 Management Objective

- 🐾 Manage the areas of grassland beneath the solar panels using sensitive low intensity sheep grazing to enhance the ecological value of the grassland;
- 🐾 Manage specific areas specifically to encourage and support shrill carder bee;
- 🐾 Monitor and manage, as appropriate, the spread of scrub and invasive species.

5.1.2 EMCP Objective

- 🐾 Establish late-flowering grassland habitats to benefit the rare shrill carder bee, a qualifying feature of both the Gwent Levels Whitson SSSI and Nash and Goldcliff SSSIs on which the entire development is located. This will also provide benefits to other invertebrate, bird and mammal species.

5.1.3 Management Specifications:

- 🐾 Grass height to be maintained within a 1m buffer surrounding the panels to prevent shading of panels;
- 🐾 Where practicable this will be undertaken with low intensity sheep grazing, rotated around the various field units or by mowing;
- 🐾 Grazing/mowing will be stopped before the start of March to encourage flowering, leaving some grassland within field margins free to flower and set seed throughout spring – summer.
- 🐾 Any scrub or trees invading the grassland or encroaching towards the solar arrays would be removed by spot herbicide application. This will be undertaken annually. All tree and shrub removal should be undertaken outside of the bird nesting season (March-September). If unavoidable, a thorough check of the site for nesting birds should be undertaken prior to any works affecting vegetation
- 🐾 Creation, enhancement and management of habitats in the margins around the solar panels to improve the habitats available for terrestrial invertebrates, including shrill carder bee.

5.1.4 Survey Findings

The grassland within the solar array fields comprised a uniformly short sward with low species richness, dominated by grasses but with a few forbs typical of grazed grassland such as dock, dandelion, creeping buttercup and thistles (creeping and spear). All three array areas were being grazed with sheep at an approximate rate of 5 sheep per hectare as per the Landscape and Ecology Management Plan (LEMP) (Green Ecology 2019b), though it was difficult to assess an accurate number of livestock units per hectare as line of sight was blocked due to the panel arrays, hedgerows and ditches.

The current management practices of maintaining a low-intensity stocking rate of approximately five sheep per hectare aligns with the prescribed approach to sensitive grazing beneath the solar panels. However, the continuous grazing throughout the spring–summer period has limited opportunities for flowering within the panel margins. To fully support the management objective of encouraging and supporting shrill carder bee within the Solar Array margins, it is recommended that grazing (and mowing) be temporarily halted or reduced during the peak flowering season.

No scrub or trees were recorded within the grasslands, as per the management objectives and specifications.

During Year 3, thistle cover within Array Area 1 was noticeably reduced following previous herbicide vegetation management. During this year's habitat monitoring, no signs of recent herbicide use were recorded in this area. However, thistle abundance in Array Area 1 remained lower than in Array Areas 2 and 3, where thin strips of thistles were present around field edges, suggesting that thistles have not yet fully recolonised within Array Area 1. Consented herbicide usage during year 5 focused on nettles and tall vegetation growing beneath the solar panels, this took place on 20th October 2025, details within **Appendix 6**.

During the summer visit, the grassland surrounding the bug hotel in Solar Array Areas 1 and 2 was uniformly short (c.5cm) sward with low species diversity, dominated by grasses and contained very few wildflowers, this was also the case during the autumn habitat survey. This management leaves little food source for the shrill carder bee and other terrestrial invertebrates that the bug hotels were intended to support.

It should be noted that the LEMP set out that the bug hotels should be placed adjacent to a ditch though distance was not specified and the management of ditches and reens prevents the placement of bug hotels within a close proximity. If the bug hotels are relocated to the ditch buffer areas they should be surrounded by more suitable habitat to support a variety of terrestrial invertebrates.

Grazing (conservation grazing levels) and mowing (strip mowing) were reduced during Spring–Summer to support flowering along the solar panel margins; however, this reduction was not sufficient to promote a strong flowering response, particularly given the unusually hot spring. As a result, few wildflowers were present at the time of the survey.

The land directly around the substation, located outside of the Site boundary, shows a composition of tall ruderal vegetation comprising creeping thistles, teasel and dock providing a tall and dense sward suitable for foraging invertebrates. This parcel receives minimal management and is not grazed compared to the Solar Array Areas. During the invertebrate surveys, these areas were recorded as supporting notably high numbers of shrill and brown-banded carder bees. In comparison, the managed areas within the Solar Array Areas showed a lower representation of similar tall-flowering ruderal species, likely reflecting the more prescriptive management regime outlined in the LEMP. These observations may help to inform future considerations of how management intensity influences habitat suitability for key invertebrate species for future LEMP revisions.

5.2 Lapwing Mitigation Area

5.2.1 Management Objectives

-  Establish the new stocking regime and rush management as per the Lapwing Management Plan.
-  Hedgerow and vegetation removal and maintenance as per the Lapwing Management Plan.
-  Any pesticide use ceased and herbicide use limited to spot treatments only.
-  An electric predator fence may be erected around the lapwing mitigation field once vegetation removal is complete and if the results of ecological monitoring up to year 5 indicates that this is required to protect nesting lapwing.

5.2.2 EMCP Objective

-  Create, manage and maintain offsite field habitat secured for lapwing breeding habitat and increase local breeding population. Monitor fields adjacent to Site known to hold breeding lapwing.

5.2.3 Survey Findings

Management of the Lapwing Mitigation Areas followed the LEMP recommendations, as the grassland within the lapwing mitigation area was noted as having good sward height with suitable tussocky structure at the end of the survey season, however, it is noted that the grassland was considered overall to be too dry during the breeding season to adequately support breeding lapwing, this is following a dry spring-summer season.

The autumn site visit found that the grassland sward height was approximately 10-20cm with a 15% cover of rush overall, which comprised dense tussocky clumps within the fields. The grassland was not overly wet, the only boggy areas were where ditches have been present. No livestock were within the fields at the time of survey but there were signs of recent presence. All fields had been previously grazed with the eastern field closest to the road seeming the most grazed. The field to the northwest had areas of bramble. The reens separating the fields were wet at the time of survey with dry grips also present. The grassland showed signs of progressing towards favourable conditions for winter foraging lapwing, which although is not an objective of the Lapwing Mitigation Area is promising for providing suitable habitat for lapwing as a species.

Lapwing were recorded in January 2026 after overwinter cattle grazing began in late December, with landowner commenting on the number of lapwing (approximately c.50) seen within the cattle poached fields.

The use of cattle to create bare/poached areas which will remain wet has been achieved by attracting animals to certain areas using a feed source. Once the desired level of ground disturbance has been achieved, the feed has been removed/moved in order to create a mosaic of disturbed areas with a grass sward height of approximately 50mm. Any feed remaining has been left or incorporated into the soil through the cattle poaching. As any remaining feed rots, it should attract worms and larvae which will provide a food source for lapwings. Care has been taken to create these areas in open ground and away from potential vantage points used by predators.

5.3 New Grassland - Wildflower Seed Mix Areas

5.3.1 Management Objective

-  Manage the areas of grassland beneath the solar panels using sensitive low intensity sheep grazing to enhance the ecological value of the grassland;
-  Manage specific areas specifically to encourage and support shrill carder bee;
-  Monitor and manage, as appropriate, the spread of scrub and invasive species

5.3.2 EMCP Objective

-  Enhance habitats on Site for shrill carder bee a qualifying species of both Gwent Levels Whitson and Nash and Goldcliff SSSIs by creating late-flowering grassland areas.
-  Monitor the effects of solar panels on areas where shrill carder bee is known to be present. Other rarer bee species and terrestrial invertebrates present on Site will also be subject to monitoring simultaneously.

5.3.3 Survey Findings

The Wildflower Seed Mix Area to the north-east of Array Area 2, was harrowed and over-seeded in late summer 2021 and had established well in 2023 with six species of grass and fifteen species of forbs identified in the sward. During the habitat walkover survey, it was determined that there was a good

diversity of flowering plants that are a favoured food source for Shrill Carder Bee. Fields were classified as good semi-improved grassland and were recorded to be abundant with red clover, common knapweed, common bird's-foot trefoil, meadow vetchling and thistles.

During a visit to the Site by NRW and NCC in May 2025, the Wildflower Seed Mix Area associated with Array Area 1 showed a good mix of herbaceous species with flowering plants developing. During the Site visit in July 2025, this area comprised tall tussocks of grass and rush but had few forbs. It is noted that the unusually hot weather in the mid-spring and early summer months may have sent flowering plants to seed earlier in this area and thus were not present during the later summer visit. The early succession of plants within this area may provide an early resource of food for pollinators.

5.4 Hedgerows

5.4.1 Management Objective

- 👉 Manage hedgerows on a regular, rotational basis to promote structural and botanical diversity;
- 👉 Provide on-going management of standard hedgerow trees will aim to promote mature trees, including dead-wood habitat;
- 👉 Maintain the connectivity of the Site to facilitate the movement of wildlife through and across the Site;
- 👉 Provide visual screening where required and deliver good integration of the development into the landscape;
- 👉 Enhance defunct and species-poor hedgerows to increase biodiversity, connectivity and strengthen local landscape character; and,
- 👉 Allow and encourage a diverse ground flora to develop along hedgerow bases.

5.4.2 EMCP Objectives

- 👉 Removing selected hedgerows as per Hedgerow Removal Plan (preconstruction);
- 👉 Establish new hedgerow to create visual screening to mitigate human and common crane visual impacts of the grid yard and battery storage area and to mitigate for the loss of hedgerow habitat for nesting birds as a result of proposed SSSI reen enhancements
- 👉 Limited hedgerow removal may be required in the future to facilitate ditch maintenance works and prevent shading of watercourses

5.4.3 Survey Findings

All hedgerow removal that was outlined within the EMCP was completed prior to the monitoring phase and no further hedgerow removal is anticipated.

Hedgerows on the boundaries of each array area are generally unmanaged and have been allowed to grow tall promoting structural and botanical diversity with benefits for pollinating insects and wintering birds arising from the flowers and berries these hedgerows provide. Hedgerows within the Solar Array Areas are rotationally cut on a three-year basis with management occurring in January-February as specified within the 2019 LEMP, outside of the breeding bird and active dormouse season.

Not all of the hedges within the array areas could be visited (outlined in **Figure 1.2**), but in array area 1, the retained hedges are being kept short as per the Monitoring and Contingency Plan.

5.5 Common Crane and Shrill Carder Bee Mitigation Fields

5.5.1 Management Objective

- 👉 Establish new wildflower grassland. Establish hay meadow management regime.
- 👉 Maintain late-flowering grassland and hay meadow management.

5.5.2 EMCP Objective

- 👉 Late-flowering grassland habitat will be established in the first 5 years post-construction for the benefit the rare shrill carder bee. This will also provide benefits to other invertebrate, bird and mammal species. Managing as hay meadow in the long-term (up to 40 years) will improve the crane chick rearing habitat.

5.5.3 Survey Findings

The grassland habitats within the crane mitigation areas for common crane are making steady progress to achieving the objectives set out within the Monitoring and Contingency Plan.

The invertebrate surveys found that the shrill carder bee mitigation fields had extensive areas of moderately tall to rank flower-rich grassland, which was providing excellent foraging and potential nesting habitat for Shrill Carder Bumblebee and other pollinators. The autumn Site visit found that the grassland had been cut short to a uniform height of approximately 8-10cm as per the management prescriptions. The field was dominated by grass which is expected after the autumn cut and no livestock were present. Reeds along the wet reen at the north-eastern boundary had all been cut.

5.6 Reens and ditches and appropriate buffers

5.6.1 Management Objectives

-  Enhance the biodiversity of the ditch/ reen system;
-  Maintain the favourable status of the notified features of the SSSIs e.g. insects and plants;
-  Maintain high water levels in summer;
-  Enhance the adjacent buffer areas for flora and fauna.

5.6.2 EMCP Objectives

-  Create a structurally diverse assemblage of vegetation along the ditches and reens on Site.
-  To create a range of successional stages through management of small sections at a time following on from the hedgerow removal programme. This will benefit both aquatic and terrestrial invertebrates within the SSSI watercourses and improve habitats for other species including water vole and otter.
-  Operate a ditch and reen management programme in consultation with Natural Resources Wales (NRW) as per the LEMP.

5.6.3 Survey Findings

Reens within areas 1, 2 and 3 were de-silted between 1st and 12th December 2025 when weather conditions were 6-8°C. Reen banks and buffers were cleared in areas 1, 2 and 3 between 15th-19th September 2025 when weather conditions were >10°C and dry. Cultivation of reen waste in areas 1, 2 and 3 occurred between 7th-19th September 2025 when weather conditions were >10°C and dry. Works were carried out by Llanwern Solar Services Ltd (**Appendix 6**). Due to the hedgerow management, light is able to reach the reens which has promoted the growth of emergent and submerged vegetation.

The results of the aquatic invertebrate survey suggest that the reens have improved as a result of management carried out, survey findings highlighted managed reens to have a well-developed submerged, floating and emergent vegetation and a diverse aquatic invertebrate assemblage.

In the buffer strips outside of the fencing, the sward was overall less structurally varied being uniformly tall with the overall sward height being 350-500mm. The tall sward generally has a greater species diversity compared to the array areas, but is still not hitting the target of enhancing for floral diversity. The buffers comprised mostly of grasses, rushes, sedges, dock species and nettle, with few flowering forbs during the survey. This was particularly the case near to the array entrances in Array Area 3. This area has a good deal of potential to improve with further grassland management to reduce the dominance of grasses.

5.7 Water Vole

5.7.1 Management Objective

- 🦉 Enhancement and management to improve the habitats available within the Site for water vole.

5.7.2 EMCP Objective

- 🦉 Monitor habitat improvements on reens and ditches where hedgerows have been removed to assess whether water voles have benefitted from the improvements, by increase an increase in numbers and/or distribution

5.7.3 Survey Findings

Solar Array Area 2 and 3 were reported to have wet reens with suitable vegetation for water vole. Evidence of water vole burrows and nibbled vegetation were recorded within both areas. Area 3 was reported to have a minimum of 5 water vole burrows in the stretches of reen targeted by the surveys.

Solar Array Area 1 to the west was extremely dry and little water in the reens. The offsite survey points north of Solar Array Area 1 were choked with vegetation and surveys could not be completed.

Incidental water vole sightings by the landowner were reported in March from within Solar Array Area 3.

This shows an increase in water vole activity on Site compared to the 2015 surveys where no evidence of water vole was reported, a comparison between the 2017 surveys and 2025 surveys are mapped within **Figure 5**.

5.8 Otter

Otter are not a key species for this Site, however, enhancement and management to improve the habitats available for water vole will also create habitat enhancements for otter. Installation of otter holts within the Site is under review.

5.8.1 EMCP Objectives

- 🦉 Ensure otters are not disturbed by construction activities.

5.8.2 Survey Findings

An otter spraint was recorded on a metal cable within the southern extent of Solar Array Area 3, this shows an increase in otter activity on Site compared to the 2015 and 2017 surveys where no evidence of otter was reported and one incidental record of otter spraint adjacent to the site in 2018, the location of the spraint is mapped within **Figure 5**.

5.9 Aquatic Invertebrates

5.9.1 Management Objective

- 🦉 Enhancement and management to improve the habitats available within the Site for aquatic invertebrates.

5.9.2 EMCP Objective

- 🦉 Improve habitats for aquatic invertebrates by ditch and reen management

5.9.3 Survey Findings

The results of the aquatic invertebrate survey suggest there has been little change from the previous survey. However, the condition of the sampled reens has shown improvement as a result of the management involving de-siltation and the boundary hedges being cut back to reduce shading on the southern side. The surveys in the managed reens found a diverse aquatic invertebrate assemblage that included a strong breeding population of the great silver water beetle, and of the six key invertebrate species recorded prior to works commencing, four of these were found at the site again this year. Further details are provided in **Appendix 4**.

5.10 Terrestrial Invertebrates Including Shrill Carder Bee

5.10.1 Management Objective

- 🐝 Enhance habitats on Site for shrill carder bee a qualifying species of both Gwent Levels Whitson and Nash and Goldcliff SSSIs by creating late-flowering grassland areas. Monitor the effects of solar panels on areas where shrill carder bee is known to be present. Other rarer bee species and terrestrial invertebrates present on Site will also be subject to monitoring simultaneously.

5.10.2 EMCP Objective

- 🐝 Enhance habitats for shrill carder bee (and other invertebrates) by creating late flowering wildflower grassland areas.
- 🐝 Monitor the effects of solar panels on areas where shrill carder bee is known to be present.
- 🐝 See a population increase.

5.10.3 Survey Findings

The surveys found that shrill carder bee and brown-banded carder bee to be present across the Site, with higher records within the Shrill Carder Bee Mitigation Fields and strips of flowering thistles within Solar Array Area 3.

The vegetative buffers between the Solar Array Areas and the outer fences had generally not been cut or intensely grazed and as such had taller grassland swards with well-developed flower resources. These areas appeared much more favourable for foraging bees and the mid-height swards also looked suitable for nesting carder bees.

The Lapwing Mitigation fields and Shrill Carder Bee Mitigation Fields both had extensive areas of moderately tall to rank flower-rich grassland, which provided excellent foraging and potential nesting habitat for Shrill Carder Bumblebee and other pollinators. Both bee species were recorded in these areas in line with the other surveyed areas across the Site, with the exception of shrill carder bee records within the Shrill Carder Bee Mitigation Fields which saw a higher number of recorded individuals. Neither of these areas were previously surveyed for shrill or brown banded carder bee.

The unmanaged land surrounding the Sub-Station in Array Area 2 outside of the Site boundary had higher numbers of both shrill and brown-banded carder bees compared to grassland areas within the Solar Arrays. Given its importance for pollinators, it is suggested that this parcel should continue to be managed as it is for the benefit of the adjacent areas of on-Site habitat.

Within the Solar Array Areas, sheep grazing pressure was intense and the grassland of the areas had been cut up to the inner fence prior to the survey, both of which severely limited the availability of flower resources (and potential nesting sites) for bumblebees. Due to the reen management works within Solar Array Area 3, there was an unmanaged strip of spear thistle growing from the reen castings, resulting in higher numbers of shrill carder bee compared to previous surveys and higher numbers of brown-banded

carder bees compared to the 2017 survey within Solar Array Area 3. Details provided within **Table 6** below.

The offsite control plot was surveyed for shrill and brown banded carder bee during the pre-works surveys. As the control plot lies outside of the Site boundary it is not managed for shrill carder bee and continues to be managed as grazed pasture, surveys within this land are to show a comparison between the Solar Array Fields, Shrill Carder Bee Mitigation Fields and the surrounding area. The control plot was recorded as growing back after a cut earlier in the year and had abundant dense patches of flowering white clover and tufted vetch. These were being visited by comparatively high numbers of both shrill and brown-banded carder bees, shown in **Table 6** below. Further details are provided in **Appendix 4**.

Table 6.1. Number of shrill and brown banded carder bee recorded each monitoring period

Site Area	Shrill Carder Bee			Brown Banded Carder Bee		
	2017	2023	2025	2017	2023	2025
Solar Array Area 1	75	28	28	77	74	28
Solar Array Area 2	1	13	12	6	4	15
Solar Array Area 3	5	7	23	55	9	36
Shrill Carder Bee Mitigation Fields	-	-	47	-	-	21
Lapwing Mitigation Fields	-	-	14	-	-	20
Control fields (offsite)	3	-	31	5	-	70

Table 6.2. Habitat monitoring of Shrill Carder Bee survey areas

Site Area	Habitat Monitoring Findings					
	2017 (Baseline)	2021 (Year 1)	2022 (Year 2)	2023 (Year 3)	2024 (Year 4)	2025 (Year 5)
Solar Array Areas 1, 2 and 3 Target Habitat: Late-flowering grassland comprising shrill carder bee forage plants	Habitat: Improved Grassland	Habitat: Improved Grassland Management: Not assessed during Year 1 monitoring	Habitat: Improved Grassland Management: Management of the grassland within the array areas was variable, with some areas cut short, potentially to avoid shading of the panels whilst other areas had been allowed to grow tall resulting in a variety of flowering plants in bloom, including dense stands of spear thistle in some locations.	Habitat: Improved Grassland Management: Management through grazing had created a structurally diverse sward but species richness was low. Flora dominated by grasses but with a few forbs typical of grazed grassland such as creeping cinquefoil, meadow buttercup and thistles (creeping, marsh and spear). There appeared to have been chemical control of thistles in array area 1.	Habitat: Improved Grassland Management: Sheep grazed with a uniformly low sward and low species richness, dominated by grasses but with a few forbs typical of grazed grassland such as creeping cinquefoil, meadow buttercup and thistles (creeping, marsh and spear, except within solar array area 1).	Habitat: Improved Grassland Management: Sheep grazed with a uniformly low sward and low species richness, dominated by grasses but with a few forbs comprising dock, dandelion, creeping buttercup and thistles (creeping and spear). All three array areas were being grazed with sheep at an approximate rate of 5 sheep per hectare
Shrill Carder Bee Mitigation Fields Target Habitat: Late-flowering Grassland comprising shrill carder bee forage plants; Good Semi-Improved Grassland (Phase 1)	Habitat: Improved Grassland	Habitat: Improved Grassland Management: All fields comprised long grass habitat There were no signs of sowing of any new wildflower grassland. Grassland comprises species-poor semi-improved neutral grassland dominated (90% average composition) by a wide range of native grass	Habitat: Semi-Improved Grassland Management: Managed for hay, dominated with grasses with few wildflowers	Habitat: Semi-Improved Grassland Management: Fields establishing well towards hay meadow after overseeding with six species of grass and fifteen species of forbs identified in the sward. Grasses were dominant but importantly five species of legume (clovers etc.) and patches	Habitat: Semi-Improved Grassland Management: Overgrazed with a low species diversity comprising mostly grasses and few forbs.	Habitat: Good Semi-Improved Grassland Management: Hay-meadow management resulting in a sward abundant with red clover, common knapweed, common bird's-foot trefoil, meadow vetchling and thistles.



		species but with an impoverished (10% average) herb/forb component dominated by meadow buttercup and dock species.		of knapweed were observed in all of the fields.		
Control fields (offsite) Target Habitat: No target.	Habitat: Improved Grassland managed as cow pasture	Not assessed during Year 1 monitoring	Not assessed during Year 2 monitoring	Habitat: Improved Grassland managed as cow pasture	Not assessed during Year 4 monitoring	Habitat: Improved Grassland managed as cow pasture

5.11 Breeding Lapwing

5.11.1 Objective

- 🐦 Create, manage and maintain offsite field habitat secured for lapwing breeding habitat and increase local breeding population. Monitor fields adjacent to Site known to hold breeding lapwing.

5.11.2 EMCP Objective

- 🐦 Create, manage and maintain *Lapwing Mitigation Fields* - habitat secured for lapwing breeding habitat and increase local breeding population.

5.11.3 Survey Findings

Monitoring in 2025 confirmed continued use of the Site and surrounding land by lapwing. Whilst breeding lapwing. Whilst breeding lapwing were not recorded within the designated Lapwing Mitigation Area during the survey period, lapwing continued to be observed across the wider Site and adjacent retained habitat areas during the winter period.

The ‘Solar Array Areas’ attracted low numbers of lapwing in numbers on par with the baseline surveys in 2015 and 2017, with singular records within Array Areas 2 and 3. This includes a record of lapwing courtship display presenting as “probable” breeding behaviour as per BTO breeding status codes² within Array Area 3. Whilst breeding success within these areas could not be confirmed, these observations demonstrate that lapwing continue to utilise a range of habitats across the Site and surrounding landscape.

The ‘Retained Lapwing Area’ attracted lapwing during the breeding season with a peak count of 7, however, it is not known if breeding was successful within this area. The March survey saw a peak count of 7 individual lapwing, of which 5 lapwing were recorded within the ‘Retained Lapwing Area’ and 2 lapwing recorded within an offsite field directly adjacent to the boundary. A total of 6 individual lapwing were recorded during the April survey, which included sightings from within the Solar Array Area. The June survey returned an offsite record of a lapwing with chicks within the field adjacent to the Retained Lapwing Area, confirming breeding in the offsite area surrounding the Site.

The ‘Lapwing Mitigation Area’ was not found to support breeding lapwing in 2025. No lapwing were observed within this area during the surveys. See **Figure 3** for sighting locations.

Lapwing breeding could not be confirmed within the Site in 2025 and numbers overall are lower than the pre-development baseline though they had increased compared to 2022 and 2023, showing a positive trend. Given the species' strong site fidelity and the influence of wider factors, including regional population trends, weather conditions and annual breeding success, population responses should be assessed over the longer term rather than on the basis of a single monitoring season.

Overall, the monitoring results indicate continued use of the Site and associated mitigation habitats by lapwing, with confirmed breeding occurring within the wider local population. Habitat management within the mitigation areas continues in accordance with the approved LEMP, and adaptive measures are being progressed to further enhance habitat suitability and support the long-term objective of maintaining and increasing the local breeding lapwing population.

² <https://www.bto.org/sites/default/files/u36/downloads/breedingcodes.pdf> Accessed on 30 July 2026

Table 6.3: Peak number of lapwing recorded per survey area

Year	Solar Array Fields	Lapwing Mitigation Area	Retained Lapwing Area
Baseline - 2015	4	0	18
Baseline - 2017	4	0	27
Year 1 - 2021	14 and 1 nest	0	20
Year 2 - 2022	10 and 2 nests	0	10
Year 3 - 2023	No surveys	0	19
Year 4 - 2024	No surveys	1	17
Year 5 - 2025	4	0	5

Peak count refers to the highest number of individual lapwings recorded on a single survey across the monitoring survey period.

5.12 Breeding Birds

5.12.1 Objective

- Creation, enhancement and management to improve the habitats available within the Site for breeding birds.

5.12.2 Survey Findings

A total of 58 bird species were recorded during the breeding bird surveys, of which, 37 are considered to be 'notable', including WCA 1981 Schedule 1 species, birds listed as Amber or Red on the UK list of Birds of Conservation Concern 5 (BoCC; Stanbury *et al.*, 2021), birds listed as Amber or Red on the Welsh list of Birds of Conservation Concern 4 (BoCC; Johnstone *et al.*, 2022), species listed in Section 7 of the Environment (Wales) Act 2016 and Local BAP species. Results of notable species are detailed in **Appendix 3 Table 9.1** and a full species list is provided in **Table 9.2**.

All of the notable species recorded as possible, probable and confirmed breeders within the Site were recorded in association with the grasslands, hedgerows and reens.

The hedgerows, reens and tall reedy vegetation around the edges of the Site and field boundaries are of importance to wren, dunnock and warbler species. A total of 6 warbler species were recorded within the Site, consisting of blackcap, Cetti's warbler, lesser whitethroat, reed warbler, sedge warbler and whitethroat.

Starling are considered to be breeding within Solar Array Area 2, as birds visiting a nest with food were recorded. Whitethroat, stock dove and moorhen are also confirmed breeding within the Site boundary as family units with recently fledged young were recorded.

Curlew, herring gull and lesser-black backed gull and sparrowhawk were recorded in flight within a height range to be potentially using the Site. None of these species are considered to be breeding on Site, though the Site offers suitable foraging habitat for these species. Crossbill and wheatear were recorded as birds on passage and not breeding within the Site.

A pair of shelduck were recorded attempting to land in Solar Array Area 1 however were put off by the presence of a bird surveyor, two pairs of shelduck were recorded in the land adjacent to Solar Array Area 3. These records imply that shelduck could be using the Site though breeding was not confirmed.

Skylark records were mostly from fields adjacent to the Site, however, there was a peak count of 2 singing males holding territory within/over fields of Solar Array Area 3, repeat records indicate that these birds were probable breeding though confirmed breeding cannot be ruled out.

The diversity and abundance of recorded breeding birds is typical of the habitats described within the Site, notable species are shown in **Figures 4a-d**. The number of bird species supported by the Site during this monitoring period is lower than the baseline however, a comparison is hard due to the baseline having a higher survey effort comprising of 6 transects and 12 vantage point surveys, the total number of birds recorded within the baseline surveys also account for birds flying over the Site.

6 Analysis and Review

For each Ecological Feature subject to the monitoring programme, a summary of Year 5 progress against management objectives and where the objectives have originated is compared against the baseline statement of predicted change. The progress of the objectives is considered, and if it is deemed unlikely for the objectives to be met within the timescales set, this will trigger a need for contingency measures³ to be implemented. See **Table 7**.

The responsible persons to action the contingency if required are identified as: Gwent Community Solar Partnership, Management Contractors via Wise Energy Environmental Analyst and landowners/tenant farmers via Wise Energy Environmental Analyst.

Table 7: A review of the progress of management objectives at the end of Year 5 of Ecological Monitoring

Ecological Feature	Objectives from Ecological Monitoring and Contingency Plan (Years 1-5)	Objectives met	Prescriptions from LEMP	Objectives met	Progress against short-term objectives and future actions	Contingency Requirements
<u>Retained Grassland</u> (Solar array fields)	Establish late-flowering grassland habitats to benefit the rare shrill carder bee, a qualifying feature of both the Gwent Levels Whitson SSSI and Nash and Goldcliff SSSIs on which the entire development is located. This will also provide benefits to other invertebrate, bird and mammal species.	✓	Grass height to be maintained to prevent shading of panels.	✓	Grassland within the Solar Array Areas has a low species diversity and uniform short sward c.5cm. A greater floral diversity is developing in the areas outside of the arrays. These areas should be cut at least once a year, no earlier than September. The cutting regime currently involves too many cut including during the flowering summer period. Despite there being improvements from year 4, grazing has been reduced but does not have the desired effect to produce a varied sward and promote wildflowers	A stricter regime of stock control will be implemented, as grazing levels within the arrays was too high and needs adjusting to promote growth of wildflowers. Cutting in the summer months needs to stop unless the height of the vegetation is in danger or shading the panels. The promotion of wildflowers includes thistles which must be allowed to grow so that shrill carder bee have sufficient forage as recommended by the invertebrate monitoring reports.
			Where practicable this will be undertaken with low intensity sheep grazing, rotated around the various field units or by mowing.	✓		
			Grazing/mowing will be stopped or reduced to encourage flowering, leaving some grassland within field margins free to flower and set seed throughout spring – summer.	Partial		
			Any scrub or trees invading the grassland or encroaching towards the solar arrays would be removed by spot herbicide application. This will be undertaken annually. All tree and shrub removal should be undertaken outside of the bird nesting season (March-September). If unavoidable, a thorough check of the site for nesting birds should be undertaken prior to any works affecting vegetation.	✓		

³ Note: contingency measures and remedial actions are emergency interventions out with the agreed management plan to get mitigation measures on track if they are deemed to be unsuccessful in the defined timescales.

Ecological Feature	Objectives from Ecological Monitoring and Contingency Plan (Years 1-5)	Objectives met	Prescriptions from LEMP	Objectives met	Progress against short-term objectives and future actions	Contingency Requirements
					beyond the solar panel and fencing buffers.	
<u>Lapwing Mitigation Area</u>	Create, manage and maintain offsite field habitat secured for lapwing breeding habitat and increase local breeding population. Monitor fields adjacent to Site known to hold breeding lapwing.	Partial	Liaison with the landowner and contractors will take place to ensure the correct stocking levels to ensure the desired target conditions;	✓	The Lapwing Mitigation Area continues to be managed in accordance with the approved LEMP, including maintaining rush cover within the target range of 10-30% and adhering to the prescribed stocking densities. Monitoring indicates that the habitat remains attractive to lapwing, with significant overwintering numbers recorded within the mitigation area, demonstrating continued use of the site and suggesting that the overall habitat condition is suitable for the species.	In line with the Monitoring and Contingency Plan, adaptive management measures are being explored to enhance water retention and increase habitat wetness within the mitigation area. This includes proposals to reinstate existing grips outside the breeding season, subject to the necessary approvals and support from NRW. In addition, alternative grazing approaches, including low-density overwinter cattle grazing, are being considered to create greater surface disturbance and improve foraging conditions for lapwing. These measures are intended to further improve habitat quality and increase the likelihood of attracting and supporting breeding lapwing over the longer term.
			Cattle should not be released directly into breeding wader fields after being over-wintered indoors, as they are excitable and likely to trample nests.	✓		
			Cattle should be outside for at least one week before being put onto breeding lapwing fields;	✓		
			By mid-March, grazing will aim for a short sward less than 5cm, with scattered area of bare ground and light hoof-printing;	✓		
			April-mid-July a slightly longer sward, but less than 7cm with scattered taller tussocks;	✓		
			May need to remove stock for part if not all the period from 15th March to the end of April when birds are on eggs to avoid trampling; No field operations from 1st April to 1st August.	✓	However, prolonged periods of dry weather and drought conditions have reduced soil moisture levels across the site, which may limit the availability of soil and surface-dwelling invertebrates that support breeding lapwing and chick foraging. While the management prescriptions have been	
			Rush cover should comprise 10% to 30% cover and be well scattered across the area. Rush control will be undertaken if rush cover exceeds this.	✓		
			Rushes will be topped close to the ground using a tractor-based mower, retaining 10% uncut.	✓		
			Rush control should not start until August 1st (to account for possible late breeding snipe) when ground is not wet. Rushes will not be cut during the breeding season March 1st to August 1 st .	✓		
			Graze with cattle immediately after cutting to help break up the mat of cut rush.	✓		

Ecological Feature	Objectives from Ecological Monitoring and Contingency Plan (Years 1-5)	Objectives met	Prescriptions from LEMP	Objectives met	Progress against short-term objectives and future actions	Contingency Requirements
			Tall trees and bushes within the hedgerow, scrub boundaries and any isolated trees e.g. hawthorns present in field centres will be felled as they can be used as look-out posts for avian predators such as corvids. New hedgerow growth will be cut back and the stumps retreated the following year. Where stumps fail to respond to herbicide, stumps will be manually removed. Where hedgerows are retained e.g. along Chapel Road, they be cut on a one – two-year rotation and kept to a height of no more than one – two metres Trees to be removed will be checked for their bat roost potential prior to felling and will be subject to further survey as required by the ecologist. If farmyard manure is applied, do not apply between 15th March and 30th June. Do not apply any organic or inorganic fertiliser or lime between 15th March and 30th June. No application of pesticides or diluted sheep dip. Herbicides should only be applied to control noxious weeds by spot treatments only in line with NRW licence conditions. Do not graze stock that has been recently treated with an Avermectin (especially if this is a bolus treatment). This has a detrimental impact on dung and soil breeding invertebrates on which the birds feed.	✓ ✓ ✓ ✓ ✓ ✓ ✓	implemented as intended, these wider environmental conditions are likely influencing the site's suitability for breeding pairs.	
<u>Shrill Carder Bee Mitigation Areas</u>	Enhance habitats on Site for shrill carder bee a qualifying species of both Gwent Levels Whitson and Nash and Goldcliff	✓	No or very low fertilizer inputs; No summer grazing;	✓ ✓	Habitat enhancement has been undertaken.	None required.

Ecological Feature	Objectives from Ecological Monitoring and Contingency Plan (Years 1-5)	Objectives met	Prescriptions from LEMP	Objectives met	Progress against short-term objectives and future actions	Contingency Requirements
<u>and Wildflower Seed Mix Areas</u>	SSSIs by creating late-flowering grassland areas.		Ensure that plentiful flower-rich forage habitat is available until late-September;	✓	Effects of solar panels is being monitored. Wildflower area adjacent to Solar Array Area 1 exhibited low species diversity but will be monitored over year 6.	Grazing to be delayed until end of September
	Monitor the effects of solar panels on areas where shrill carder bee is known to be present. Other rarer bee species and terrestrial invertebrates present on Site will also be subject to monitoring simultaneously.	✓	If the weather conditions are suitable to cut and remove the crop as hay for animal feed then the grass will be baled and taken off site. If this is not possible due to weather constraints, then flailing will be used, height of cut: 50mm;	✓		
			Arisings: Left to dry and shed seed for 1-7 days before removal;	✓		
			Aftermath grazing following grass cutting if possible	✓		
<u>Hedgerows</u>	Removing selected hedgerows as per Hedgerow Removal Plan (preconstruction);	✓	Manage hedgerows on a regular, rotational basis to promote structural and botanical diversity;	✓	Hedgerow habitats are progressing towards target conditions.	Continued management of hedgerows through rotational basis outside of the breeding bird and dormouse season (November-February inclusive), promotion of diverse ground flora.
			Provide on-going management of standard hedgerow trees will aim to promote mature trees, including dead-wood habitat;	✓		
	Establish new hedgerow to create visual screening to mitigate human and common crane visual impacts of the grid yard and battery storage area and to mitigate for the loss of hedgerow habitat for nesting birds as a result of proposed SSSI reen enhancements	✓	Provide visual screening where required and deliver good integration of the development into the landscape;	✓		
			Allow and encourage a diverse ground flora to develop along hedgerow bases.	✓		
<u>Reens, ditches and appropriate buffers</u>	Create a structurally diverse assemblage of vegetation along the ditches and reens on Site.	✗	Enhance the biodiversity of the ditch/ reen system;	✓	Reen habitats are progressing towards target conditions. Reen de-siltation to continue on a rotational basis. Reen buffers outside of the Solar Array Fencing showing a low species diversity.	Continued management of ditches and reens through de-silting and mowing the buffer strips in the Autumn to remove rank grasses to promote species diversity.
	To create a range of successional stages through management of small sections at a time following on from the hedgerow removal programme. This will benefit both aquatic and terrestrial invertebrates within the SSSI watercourses and improve habitats for other species including water vole and otter.	✓	Maintain the favourable status of the notified features of the SSSIs e.g. insects and plants;	✓		

Ecological Feature	Objectives from Ecological Monitoring and Contingency Plan (Years 1-5)	Objectives met	Prescriptions from LEMP	Objectives met	Progress against short-term objectives and future actions	Contingency Requirements
	Operate a ditch and reen management programme in consultation with Natural Resources Wales (NRW) as per the LEMP.	✓	Maintain high water levels in summer; Enhance the adjacent buffer areas for flora and fauna.	Partial ✓	Reens within Solar Array Area 1 were dry during May and July visits.	
<u>Common Crane Mitigation Fields</u>	Late-flowering grassland habitat will be established in the first 5 years post-construction for the benefit the rare shrill carder bee. This will also provide benefits to other invertebrate, bird and mammal species. Managing as hay meadow in the long-term (up to 40 years) will improve the crane chick rearing habitat.	✓	From March 15th to June 30th stocking density must not exceed one beast (cow/heifer/steer/bull) per hectare (ha) or five sheep /ha. Mixed grazing is acceptable.	✓	7.1 hectares of species-rich grassland have been gained. 4.3 hectares of grassland managed for hay.	None required based upon progress to date. Grass cutting and grazing is to be delayed and tied in with the <i>Shrill Carder Bee Mitigation Areas</i> and <i>Wildflower Seed Mix Areas</i> in late September.
			No or very low fertilizer inputs.	✓		
			Cease summer grazing.	✓		
			Manage mitigation areas to provide forage and cover until at least mid-August, but will likely be cut at same time as shrill carder bee grassland above.	✓		
			If the weather conditions are suitable to cut and remove the crop as hay for animal feed then the grass will be baled and taken off site. If this is not possible due to weather constraints, then flailing will be used.	✓		
			Arisings: Left to dry and shed seed for 1-7 days before removal.	✓		
			Aftermath grazing following grass cutting if possible.	✓		
<u>Breeding lapwing</u>	Create, manage and maintain <i>Lapwing Mitigation Fields</i> - habitat secured for lapwing breeding habitat and increase local breeding population.	Partial	As for <i>Lapwing Mitigation Area</i> above		Management of the Lapwing Mitigation Area continues in accordance with the approved LEMP, with target rush cover and prescribed grazing regimes being maintained. Monitoring	The Lapwing Mitigation Fields have been established and continue to be managed and maintained in accordance with the approved LEMP,

	Monitor <i>Retained Lapwing Fields</i> adjacent to Site known to hold breeding lapwing.	✓			has confirmed continued use of the site by lapwing, including strong overwintering numbers within the mitigation areas and observations of breeding behaviour within adjacent grassland areas of the solar farm. This indicates that the habitat is being regularly utilised by the local lapwing population and that the site is providing conditions consistent with those required by the species. As lapwing are a highly site-faithful species, often returning to the same breeding locations over successive years, population responses to habitat creation and enhancement measures can take time to become fully established. Continued use of the mitigation area by overwintering lapwing and evidence of breeding activity within the wider site are therefore considered positive indicators of progress towards the long-term objective of supporting and increasing the local breeding lapwing population.	securing habitat for breeding lapwing as required by the objective. Monitoring confirms continued use of the mitigation fields by lapwing, including significant overwintering numbers, demonstrating that the habitat is being utilised by the local population. However, the objective of increasing the local breeding population has not yet been fully realised. It should be recognised that breeding lapwing populations are influenced by a range of factors beyond site management, including wider regional population trends, weather conditions, predation pressure and annual breeding success. Consequently, population responses may not directly reflect habitat management actions alone. Monitoring has identified that prolonged dry weather conditions may be
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					Future monitoring will continue to assess lapwing use of the mitigation area and the effectiveness of habitat management. Adaptive management measures aimed at improving water retention and maintaining favourable ground conditions will also be explored, helping to enhance habitat suitability and maximise opportunities for breeding lapwing to establish within the mitigation area over time.	limiting the extent of suitable wet grassland habitat and reducing invertebrate availability, both of which are important for breeding lapwing and chick foraging. In response, adaptive management measures are being progressed in accordance with the Monitoring and Contingency Plan. Subject to the necessary approvals, existing grips are proposed to be reinstated during autumn/winter 2026 to improve water retention and create wetter ground conditions across the mitigation fields. These measures are intended to further enhance habitat quality and maximise opportunities for breeding lapwing to establish within the mitigation area, while recognising that measurable increases in the local breeding population may take time to emerge, particularly given the species' strong site
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						fidelity and wider population pressures.
<u>Water Vole</u>	Monitor habitat improvements on reens and ditches where hedgerows have been removed to assess whether water voles have benefitted from the improvements, by increase an increase in numbers and/or distribution	✓	Opening up of reens and ditches by clearing one side of double hedgerows to allow management of the watercourses.	✓	Reen and water vole habitats are progressing towards target conditions, resulting in presence of water vole burrows.	None required, the short-term objectives for water vole have been achieved.
			Creating more suitable burrowing habitat and allowing bankside vegetation to flourish providing an enhanced food resource.	✓		
<u>Otter</u>	Ensure otters are not disturbed by construction activities.	✓	Opening up of reens and ditches by clearing one side of double hedgerows to allow management of the watercourses.	✓	Reen and water vole habitats are progressing towards target conditions and signs of otter were recorded within Solar Array Area 3.	None required, the short-term objectives for otter have been achieved.

<u>Aquatic Invertebrates</u>	Improve habitats for aquatic invertebrates by ditch and reen management	✓	As per <i>Reens, ditches and appropriate buffers</i> section above		Reen habitats are progressing towards target conditions. Reen de-siltation to continue on a rotational basis.	Continued management of ditches and reens through de-silting and mowing the buffer strips in the Autumn to remove rank grasses to promote species diversity.
<u>Terrestrial Invertebrates</u>	Enhance habitats for shrill carder bee (and other invertebrates) by creating late flowering wildflower grassland areas.	✓	As for <i>Shrill Carder Bee Mitigation Area</i> and <i>Retained Grassland (Solar array fields)</i> above		Habitat enhancement has been undertaken successfully in the Shrill Carder Bee Mitigation Areas and Wildflower Seed Mix Areas. Buffer areas outside of the fencing is progressing towards wildflower targets. The effects of solar panels is being monitored, though grassland habitats within the solar arrays are not currently meeting target conditions for wildflowers and diverse sward. Wildflower area adjacent to Solar Array Area 1 exhibited low floral species diversity which will be monitored over year 6.	None required. Grazing to be delayed until end of September
	Monitor the effects of solar panels on areas where shrill carder bee is known to be present.	✓				
	See a population increase.	X				
<u>Breeding Birds</u>	To monitor land use by breeding bird species in solar array fields on Site comparing with baseline survey data.	✓	Planting of new hedgerow within the scheme	✓	Breeding bird surveys returned positive results, with populations and densities at an expected level for these habitat types.	Continued management of hedgerows through rotational basis, promotion of diverse ground flora.
			Improving the habitats within the scheme for breeding birds:	Partial:		
			 Hedgerows	✓		

			 Reens	✓	Hedgerow habitats are progressing towards target conditions, providing benefit for breeding birds.	
			 Solar Array Grassland	X		

7 Conclusions & Discussion

7.1 Habitats

7.1.1 Hedgerows

Hedgerows are progressing towards the targets as set out within the LEMP and Ecological Monitoring and Contingency Plan. Management through regular rotational trimming to promote structure and diversity and promote a biodiverse ground flora is required.

7.1.2 Reens and ditches and appropriate buffers

The reens and ditches are progressing towards the targets as set out within the LEMP and Ecological Monitoring and Contingency Plan with knock on benefits being seen in the results of the invertebrate monitoring. Continued management of ditches and reens through the phased mowing of buffer strips, mowing of bank-top vegetation and de-silting of the reens as per the LEMP in the Autumn to avoid impacts to water vole under best-practice guidelines. Reen and ditch management follows a 8-year rotational schedule as outlined within the LEMP (2026).

7.1.3 Grassland containing solar panels

Livestock density in Array Area 1 it not outside of the original recommendations set out in the LEMP but is still higher than optimal for achieving sensitive low-intensity grazing. Grazing in combination with grass cutting throughout the array area has left a low sward with low species diversity leaving few flowering plants for pollinators. This is something that could be reviewed in the updated LEMP.

Grassland sward height across the Site is to be maintained to prevent shading of panels. The LEMP sets out that this should be achieved where practicable with low intensity sheep grazing, rotated around the various field units or by mowing to ensure that vegetation does not cover the panels. Grazing/mowing should be stopped from April-mid September inclusive to encourage flowering, leaving some grassland within field margins free to flower and set seed throughout spring – summer. If vegetation is overshadowing the solar panels, a maximum 1m buffer is to be mown around the panels whilst leaving the remaining grassland to be able to grow.

As there were few wildflowers reported within the Solar Array Areas during the 2025 habitat and terrestrial invertebrate surveys with low numbers of thistles reported in the field margins, it is deemed that these areas are currently providing little forage for shrill carder bees or other invertebrates. This is thought to be due to grazing and or cutting currently continuing through the summer period. This is an area that can be further defined and improved upon in the updated LEMP. Control of thistles is only to occur if they will impact on the panel arrays and will be left alone elsewhere.

Any scrub or trees invading the grassland or encroaching towards the solar arrays can be removed by spot herbicide application. This will be undertaken annually, outside of this herbicide use should be kept to an absolute minimum across the site. All tree and shrub removal should be undertaken outside of the bird nesting season (March-September). If unavoidable, a thorough check of the site for nesting birds should be undertaken prior to any works affecting vegetation.

7.1.4 Common crane and Shrill Carder Bee mitigation fields

The management of the 'Common Crane and Shill Carder Bee Mitigation Fields' to the east of Solar Array Area 2 is progressing towards the targets set out within the original LEMP with fields dense with shrill carder bee foodplants and habitat which common crane would typically rear chicks within.

Furthermore, these fields have benefits for other wildlife by creating a floristically rich habitat that will attract other invertebrates, birds and bats.

7.2 Lapwing Mitigation Area and Breeding Lapwing

No breeding lapwing were recorded within the designated Lapwing Mitigation Area during the 2025 surveys. However, this should be considered in the context of the wider monitoring results, which demonstrate continued use of the Site and surrounding land by lapwing. Monitoring undertaken over the past five years has shown that lapwing continue to utilise habitats associated with the development, including the Retained Lapwing Areas, adjacent fields and, on occasion, the Solar Array Areas. Significant overwintering numbers have also been recorded within the mitigation fields, indicating that the habitat continues to provide value for the species.

The Lapwing Mitigation Area continues to be managed in accordance with the approved LEMP, with prescribed grazing regimes and rush cover targets being maintained. Whilst the habitat objective of creating, managing and maintaining land suitable for lapwing has been delivered, the objective of increasing the local breeding population has yet to be fully realised. It should be recognised that lapwing population trends are influenced by a range of factors beyond site management alone, including wider regional population declines, weather conditions, predation pressure and annual variation in breeding success. Furthermore, lapwing are highly site-faithful birds, often returning to established breeding locations over many years, meaning that population responses to habitat enhancement measures may take time to become fully established.

Low numbers of lapwing were recorded within Solar Array Areas 2 and 3. A lapwing was recorded exhibiting courtship display behaviour indicative of holding territory/attracting a mate, suggesting a potential breeding attempt. Whilst no nests or chicks were recorded on subsequent visits, the observation is notable as it demonstrates that lapwing are not actively avoiding the operational solar arrays and may utilise these areas where habitat conditions are suitable. Continued monitoring will help determine whether such use becomes more regular over time.

The Retained Lapwing Areas continue to support the greatest level of breeding activity on and around the Site, with three territories identified across the 2025 season. A peak count of seven lapwing was recorded during the surveys, with birds regularly using retained habitat and adjacent land. Importantly, successful breeding was confirmed in an adjoining field immediately south of the retained mitigation area, where a lapwing was recorded with chicks. This demonstrates that suitable breeding habitat continues to be present within the local landscape and provides evidence that lapwing remain willing to breed in close proximity to the solar development.

Although breeding was not confirmed within the designated mitigation area during 2025, lapwing abundance has increased compared with monitoring undertaken in 2022 and 2023, indicating a positive trajectory following the immediate post-construction period. Taken together, the continued use of the mitigation fields by overwintering lapwing, the presence of breeding territories within retained habitats, confirmed breeding immediately adjacent to the Site and observations of territorial behaviour within the solar arrays suggest that the Site continues to support lapwing and retains the potential to contribute to the long-term objective of enhancing the local breeding population.

In accordance with the Monitoring and Contingency Plan, adaptive management measures are being implemented to further improve habitat suitability. Particular focus is being placed on increasing soil moisture and wet grassland conditions through the reinstatement of historic drainage grips and enhancement of water retention within the mitigation fields. These measures are expected to improve the availability of surface and shallow soil invertebrates, which are an important food resource for both breeding adults and chicks. In addition, winter cattle grazing will be considered to create a more varied

sward structure and targeted areas of poached ground. Observations prior to these adaptive interventions indicate that winter conditions are already attractive to foraging lapwing, with flocks of approximately 50 birds recorded using the area during the winter period. The effectiveness of these management measures will continue to be monitored and adapted where necessary to maximise the suitability of the mitigation habitat for breeding lapwing over the longer term.

7.3 Breeding birds

The habitats within the Solar Array Areas are showing a good progression towards rich breeding bird habitat, the hedgerow and reed management has provided plenty of nesting opportunities for schedule 1 species Cetti's warbler along with supporting 5 additional warbler species. Schedule 1 species skylark also held regular territory over Solar Array Area 3, indicating that the grassland within this area is suitable for this species. Other species of conservation concern such as song thrush, linnet, dunnock and reed bunting were recorded in numbers expected of the Site using the hedgerows and reed margin habitats.

The creation of the Solar Array Areas has not deterred Ramsar target species shelduck from attempting to breed in the land adjacent to Array Area 3 where pairs of shelduck were seen during two of the three surveys, it is also noted that a pair of shelduck attempted to land within Array Area 1 but the presence of a surveyor deterred the birds from landing, suggesting that the Solar Array Area offers habitat of some value to this species.

Improving the Solar Array grassland to create a varied sward and higher floral diversity would further elevate the land for the majority of the birds recorded by increasing the foraging resources available.

7.4 Water Vole

Solar Array Area 1 reens were reportedly dry at the time of survey, resulting in a poor habitat for water vole, they are assumed to be absent from this extent of the Site. The Solar Array Areas 2 and 3 are showing promising results for water vole. Evidence of water vole burrows and nibbled vegetation were recorded within both areas, with surveys within Area 3 finding a minimum of 5 water vole burrows in the stretches of wet reed and incidental sightings of water vole in March by the landowner, shown in **Figure 5**.

The water vole surveys returned more evidence of water vole presence than the baseline surveys in 2015 and 2017, showing that the rotational management of the reens and allowing grassy vegetation to grow along the reens is improving the Site for this species.

7.5 Otter

There was one singular record of an otter spraint within the three Solar Array Areas, location shown in **Figure 5**. This shows an increase in otter activity on Site compared to the 2015 and 2017 surveys where no evidence of otter was reported. It is assumed that the rotational management of the reens and ditches is benefitting this species that was previously absent from the Site.

8 Adaptive Management (contingencies and remedial actions)

Discussions are ongoing between Wise Energy, GE Consulting and landowners to implement additional measures into the 'Lapwing Mitigation Area' to increase the potential for the area to attract lapwing with most focus being on reinstating historic grips. Consent has been granted by NRW and LDC to reinstate historic grips within one of the fields, further information is provided within the Year 6 LEMP. Advice is also being sought from the RSPB on how best to achieve the conservation objectives for lapwing.

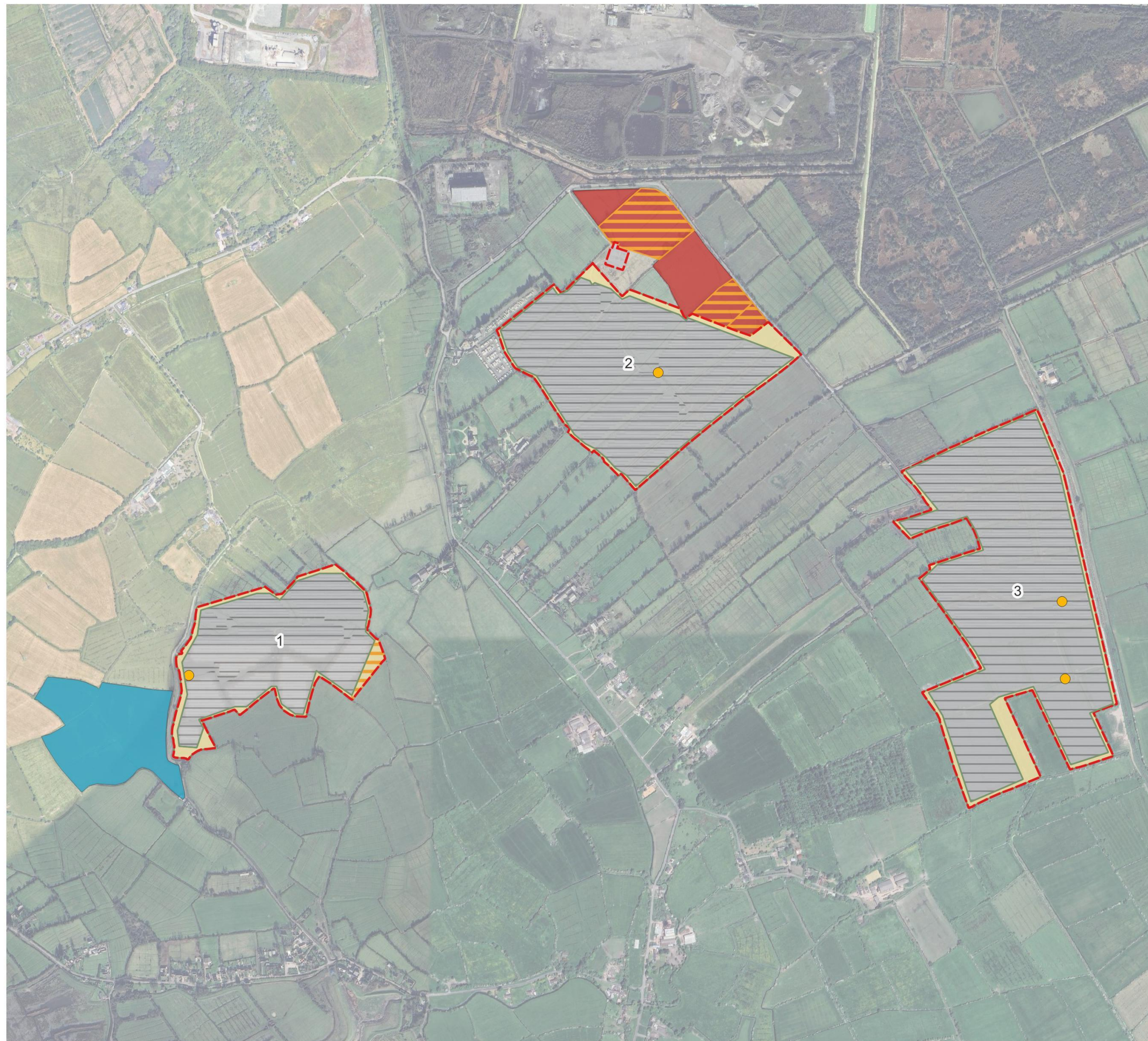
Installing an electric fence around the Lapwing Mitigation Area as suggested in the original LEMP is not considered necessary as there was no evidence of terrestrial predators preventing lapwing from using the site. The hedgerows are being managed as a predator control measure to reduce predator perches directly surrounding the fields, furthermore, lapwing have been recorded breeding within the Retained Lapwing Fields, which do not have any electric fencing and is not managed within the scope of the Site. The requirement for an electric fence within the Lapwing Mitigation Area can be reviewed once lapwing have attempted to nest.

Management within the Solar Array Areas is to include a stricter regime for controlling stock densities and cutting frequency during the spring-summer period.

A revised LEMP will be prepared to take the learnings from the first 5 years into an adapted approach for the next 5 years with new clear management objectives and specifications.

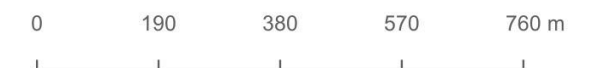
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Key:

-  Site Boundary
-  Bug Hotels
-  Wildflower Seed Mix Areas
-  Solar Array
-  Vegetated buffers outside of the fencing associated with the Reens and Ditches
-  Common Crane and Shrill Carder Bee Mitigation Fields
-  Lapwing Mitigation Fields
-  Substation



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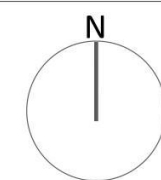
Figure 1:
Ecological Features and Habitats

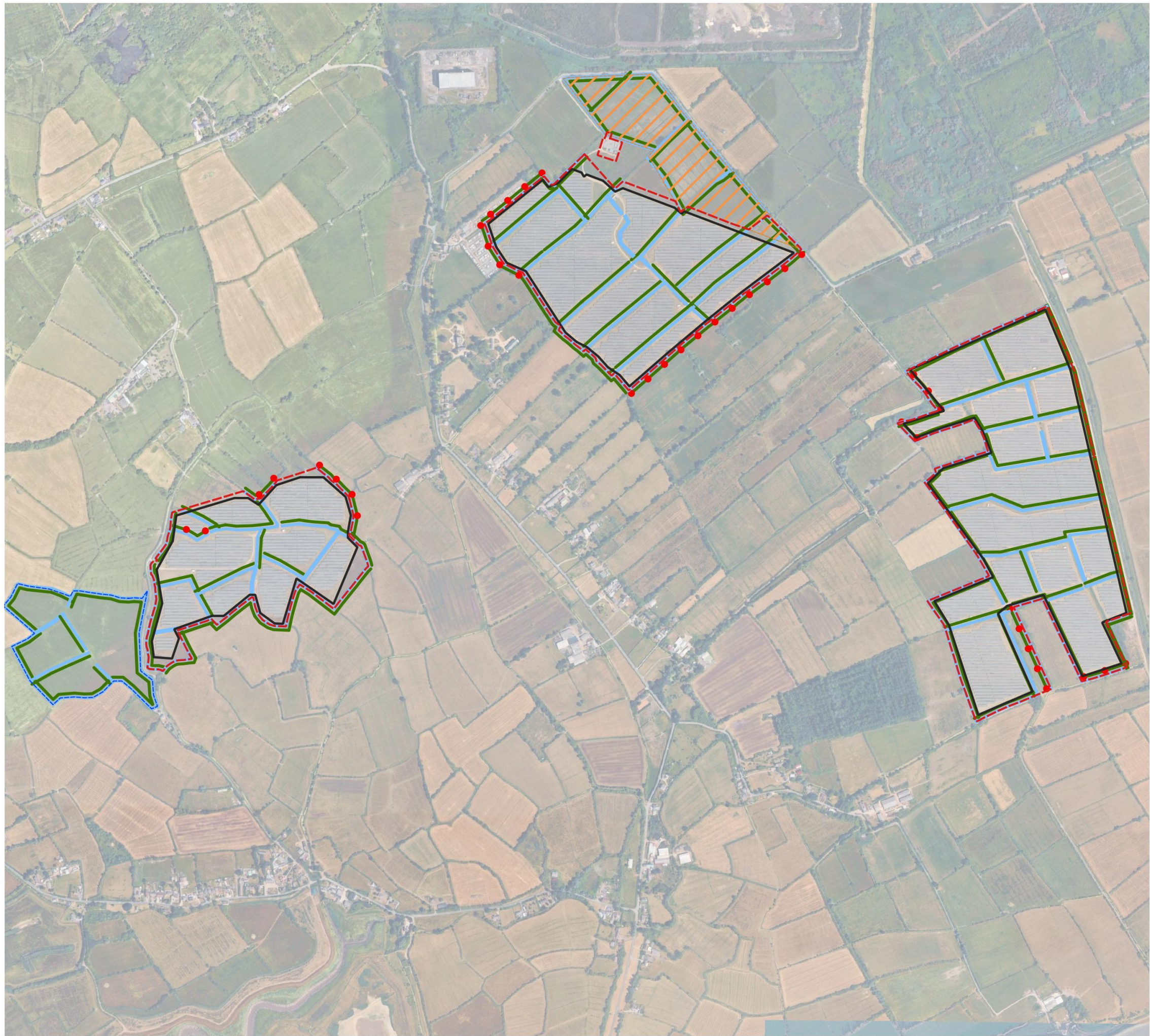
Project:
Llanwern Solar, Gwent Levels

Client:
Gwent Farmer's Community Solar Partnership Ltd

Date:
17/10/2025
Ref:
0419-EMR-F1

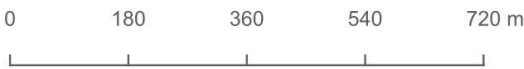
Drawn:
HS
Revision:
-





Key:

- Site Boundary
- Fence Boundary Around Solar Arrays
- Lapwing Mitigation Fields
- Common Crane and Shrill Carder Bee Mitigation Field
- Hedgerow
- Reens and Ditches
- Hedgerow and Reen
- Not Surveyed



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Figure 1b:
Ecological Features and Habitats- Hedgerows and Reens

Project:
Llanwern Solar, Gwent Levels

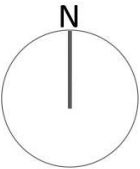
Client:
Gwent Farmer's Community Solar Partnership Ltd

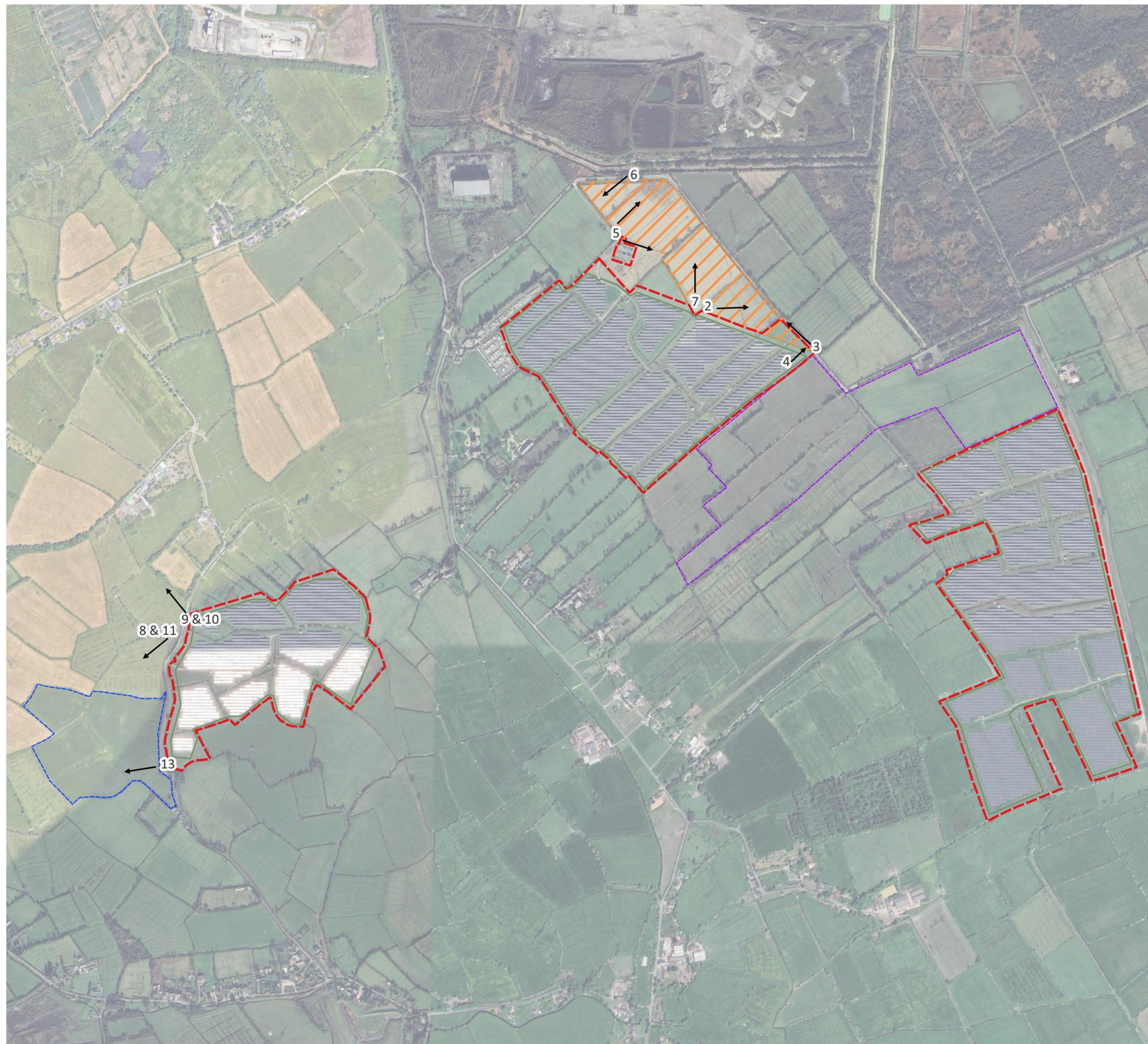
Date:
8/5/2026

Ref:
0419-EMR-F1b

Drawn:
HS

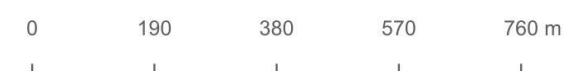
Revision:
-





Key:

-  Site Boundary
-  Lapwing Mitigation Area
-  Retained Lapwing Areas
-  Crane Mitigation Area



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Figure 2:
Habitat Walkover Photograph Locations

Project:
Llanwern Solar, Gwent Levels

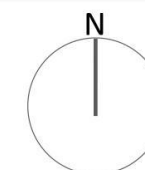
Client:
Gwent Farmer's Community Solar Partnership Ltd

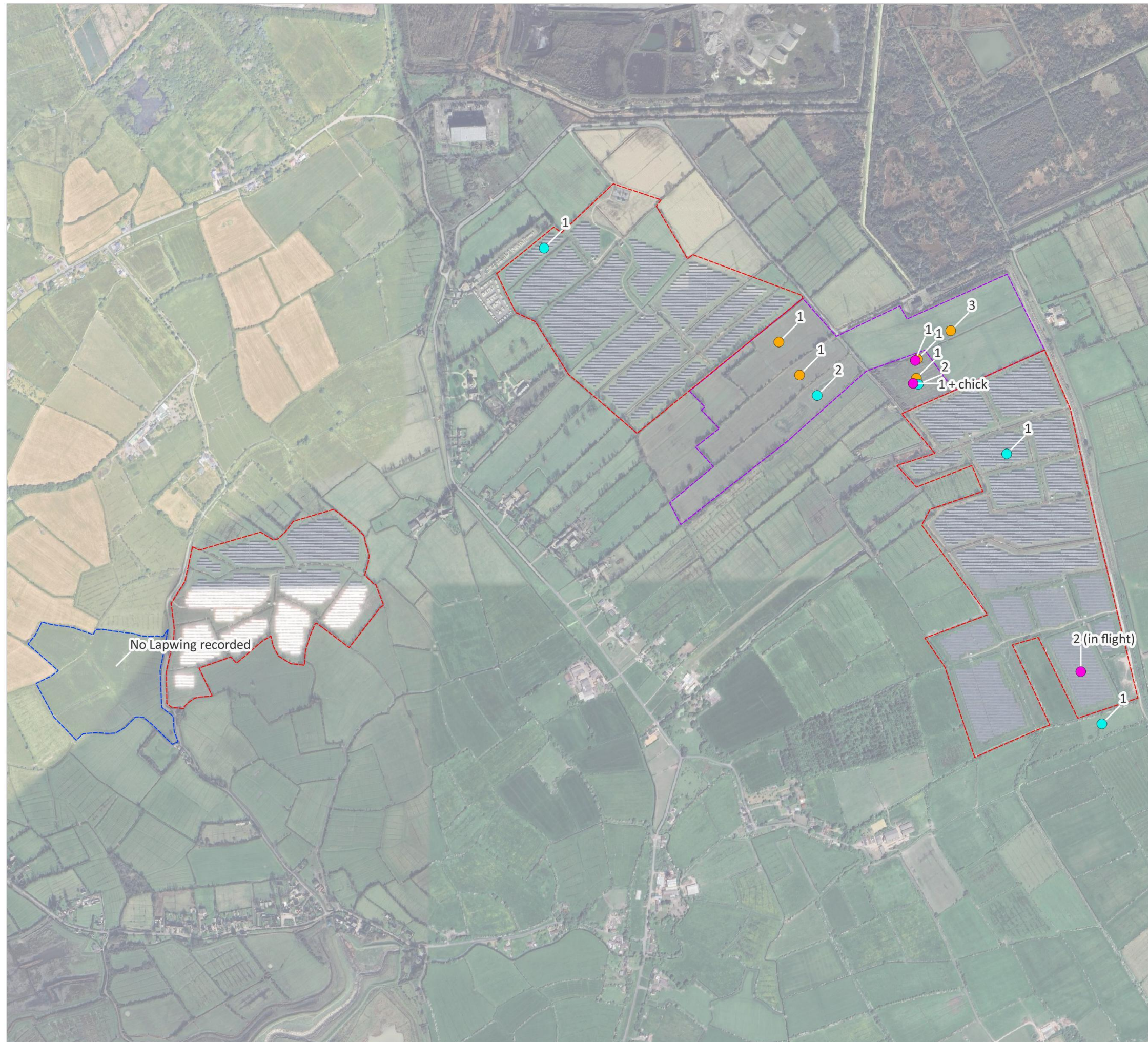
Date:
17/10/2025

Ref:
0419-EMR-F2

Drawn:
HS

Revision:
-





Key:

- Site Boundary
- Retained Lapwing Areas
- Lapwing Mitigation Area
- March
- April
- May



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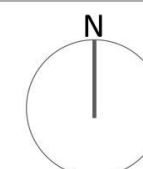
Figure 3:
Breeding Lapwing Survey Results 2025

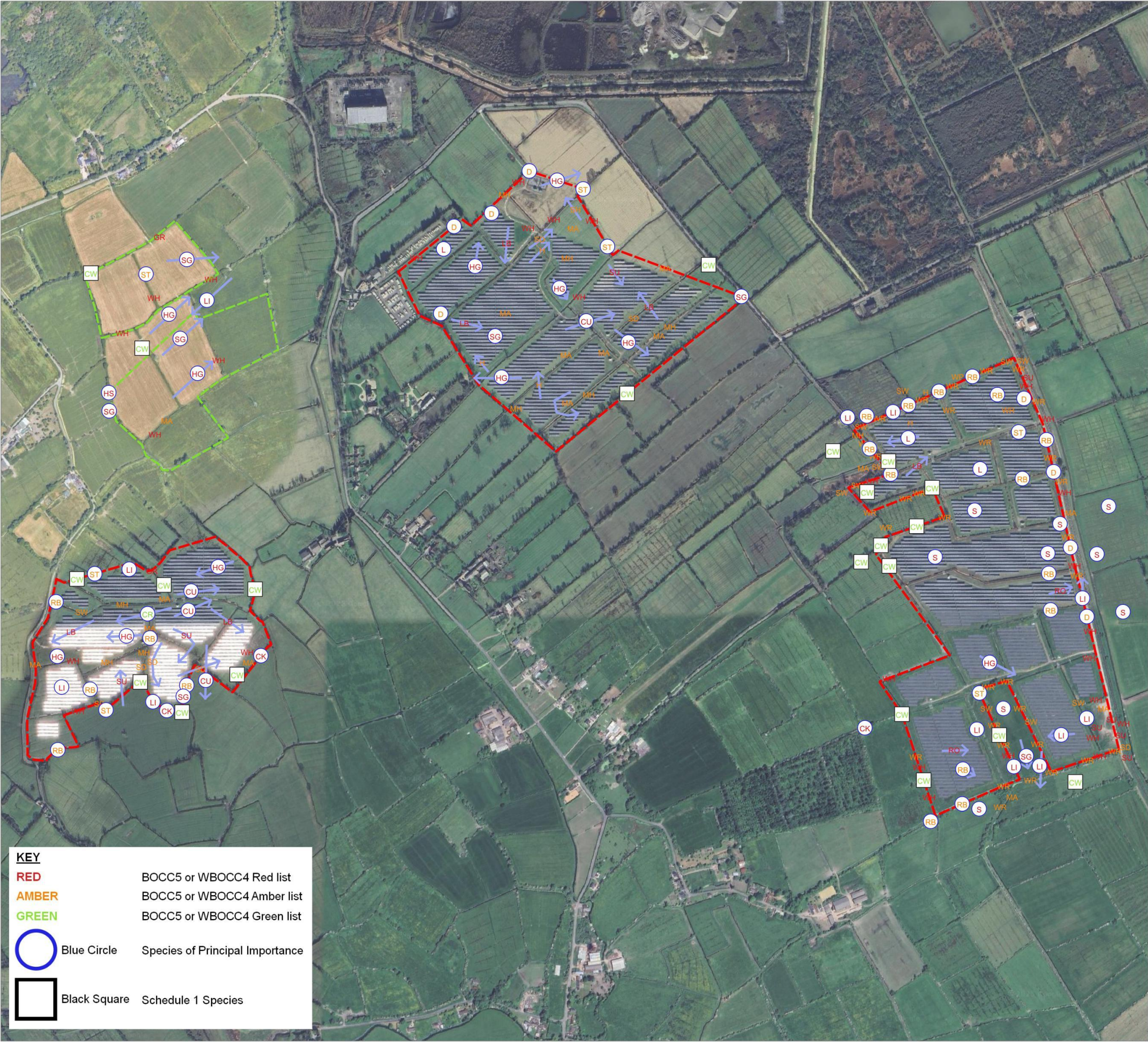
Project:
Llanwern Solar, Gwent Levels

Client:
Gwent Farmer's Community Solar Partnership Ltd

Date:
15/10/2025
Ref:
0419-EMR-F3

Drawn:
HS
Revision:
-





KEY

RED

AMBER

GREEN

BOCC5 or WBOCC4 Red list

BOCC5 or WBOCC4 Amber list

BOCC5 or WBOCC4 Green list

Species of Principal Importance

Schedule 1 Species

Key:

Site Boundary

Additional Survey Area

Cetti's Warbler

Cuckoo

Dunnock

Greenfinch

Grey Heron

Herring Gull

House Sparrow

Lapwing

Lesser Black-backed Gull

Linnet

Mallard

Rook

Sedge Warbler

Shelduck

Skylark

Song Thrush

Sparrowhawk

Starling

Stock Dove

Whitethroat

Woodpigeon

Wren

Curlew

Crossbill

Flight Line

0

100

200

300

400

500

600 m

Imagery ©2024 CNES / Airbus, Getmapping plc, Infoterra Ltd & Bluesky, Maxar Technologies. Map data ©2024 Google

Figure 4a:
Breeding Bird Survey Results

Project:
Llanwern Solar, Gwent Levels

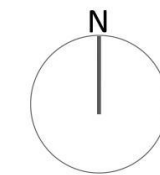
Client:
Gwent Farmer's Community Solar Partnership Ltd

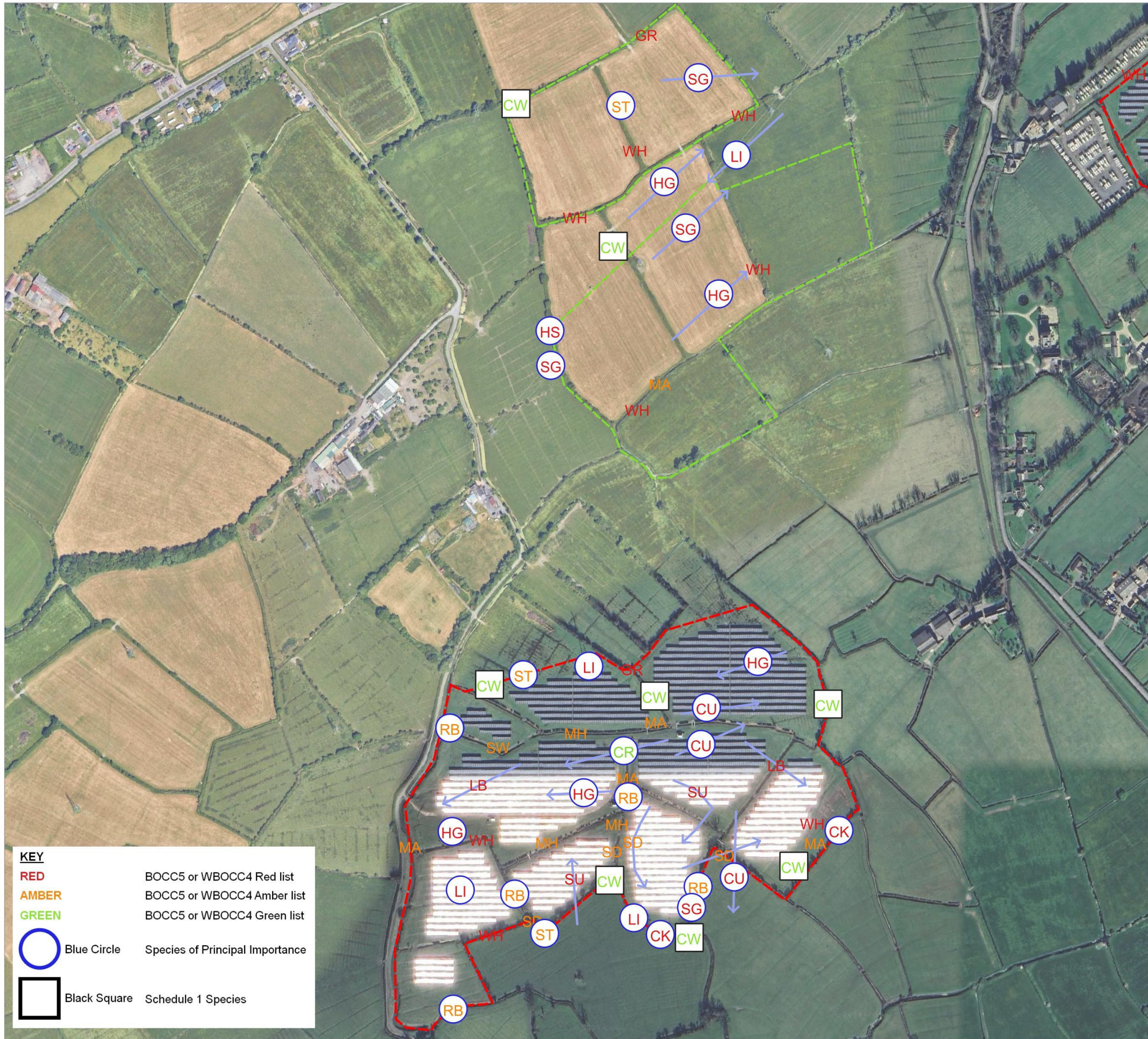
Date:
24/10/2025

Ref:
0419-EMR-F4a

Drawn:
HS

Revision:
-





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Figure 4b:
Breeding Bird Survey Results

Project:
Llanwern Solar, Gwent Levels

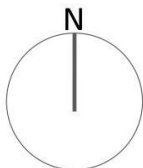
Client:
Gwent Farmer's Community Solar Partnership Ltd

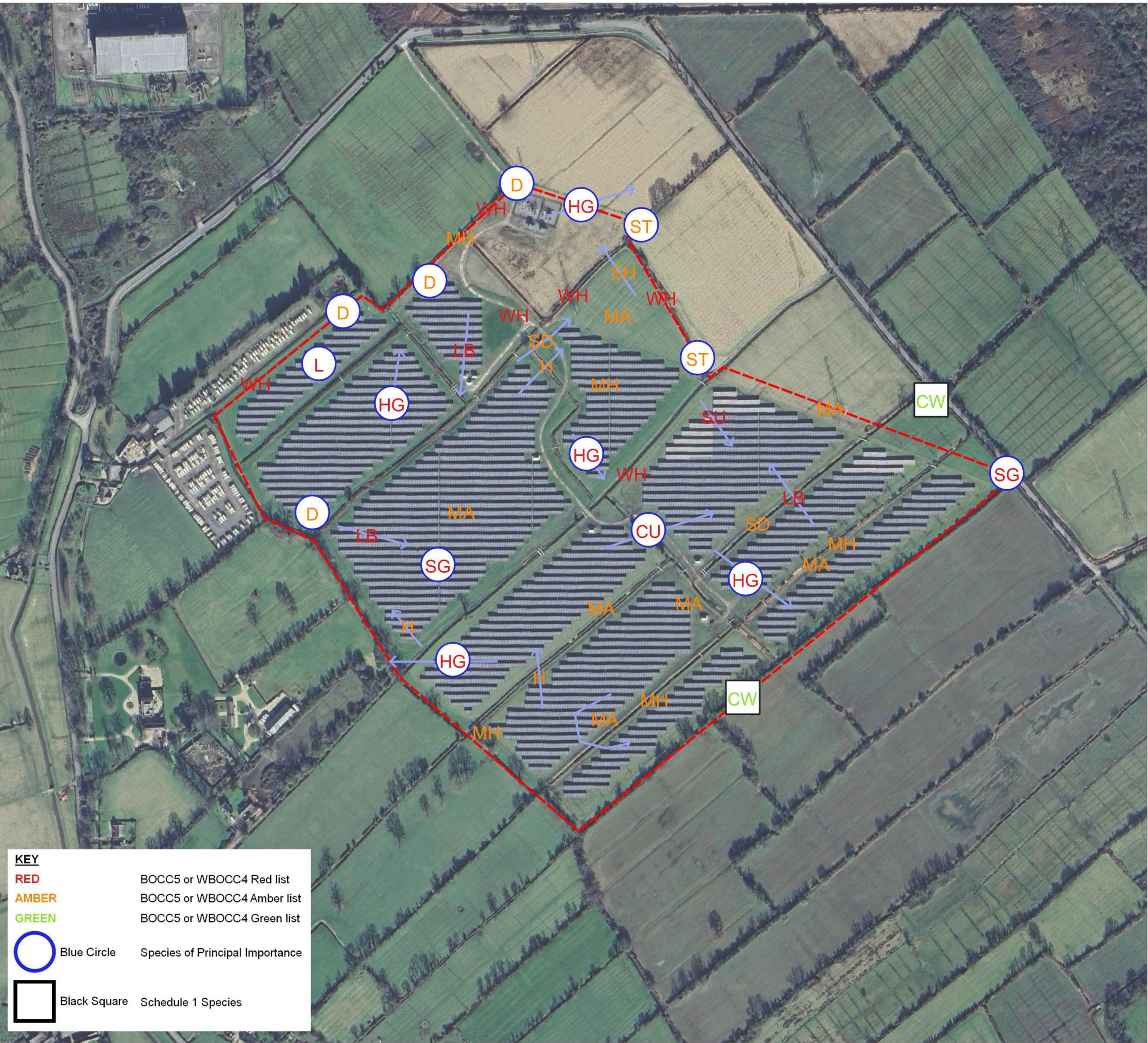
Date:
24/10/2025

Ref:
0419-EMR-F4b

Drawn:
HS

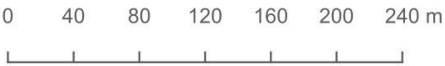
Revision:
-





Key:

- | | | | |
|-------------------|--------------------------|--------------|-------------|
| [Red dashed line] | Site Boundary | SU | Shelduck |
| [Green box] | Cetti's Warbler | ST | Song Thrush |
| [Blue circle] | Dunnock | SH | Sparrowhawk |
| [Amber letter] | Grey Heron | SG | Starling |
| [Red letter] | Herring Gull | SD | Stock Dove |
| [Blue letter] | Lapwing | WH | Whitethroat |
| [Red letter] | Lesser Black-backed Gull | CU | Curlew |
| [Amber letter] | Mallard | [Blue arrow] | Flight Line |
| [Amber letter] | Moorhen | | |



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Figure 4c:
Breeding Bird Survey Results

Project:
Llanwern Solar, Gwent Levels

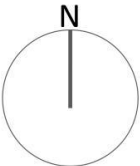
Client:
Gwent Farmer's Community Solar Partnership Ltd

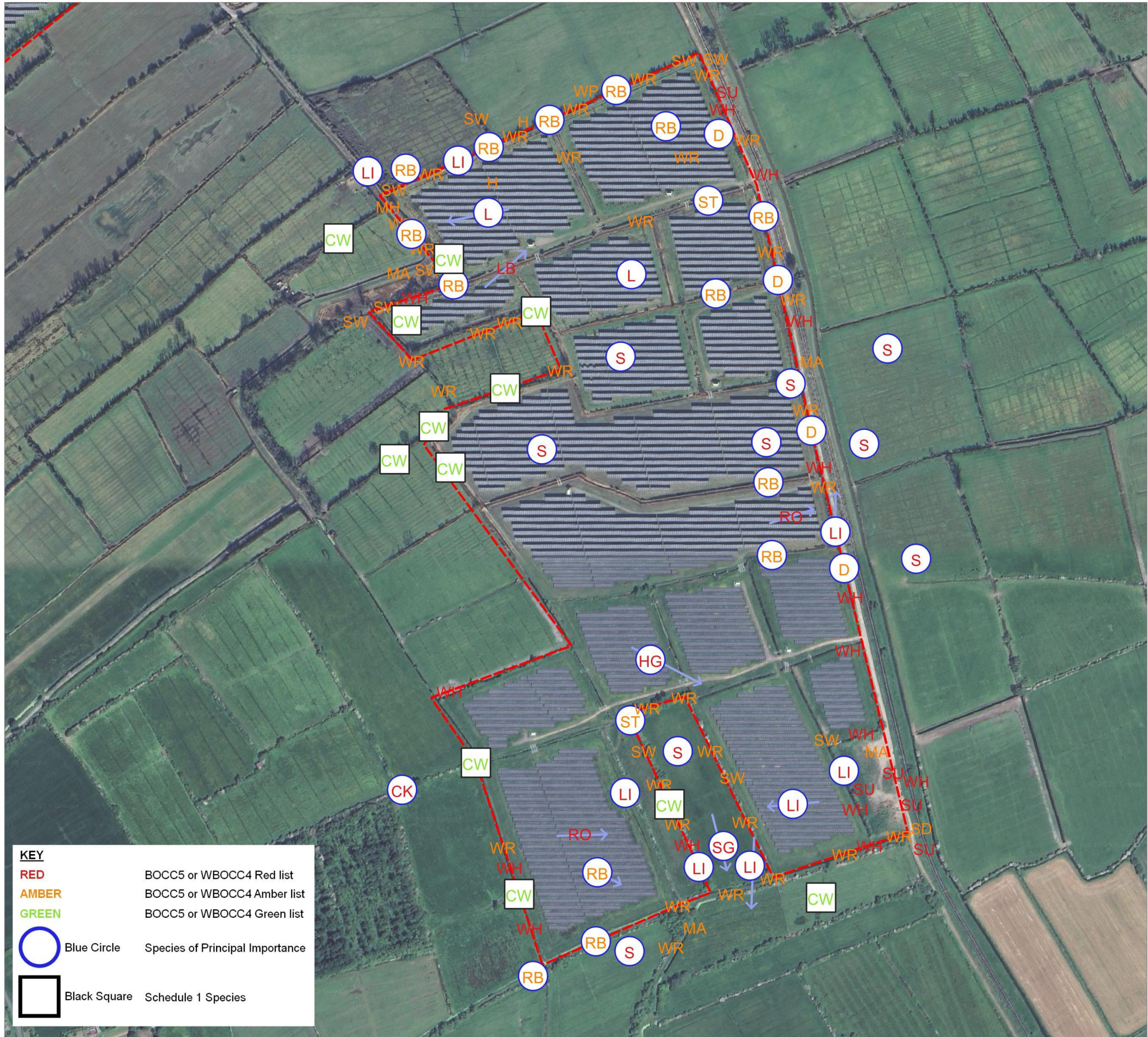
Date:
24/10/2025

Ref:
0419-EMR-F4c

Drawn:
HS

Revision:
-





KEY

RED

AMBER

GREEN

BOCC5 or WBOCC4 Red list

BOCC5 or WBOCC4 Amber list

BOCC5 or WBOCC4 Green list

Species of Principal Importance

Schedule 1 Species

Key:

Site Boundary

Cetti's Warbler

Cuckoo

Dunnock

Grey Heron

Herring Gull

Lapwing

Lesser Black-backed Gull

Linnet

MA

MH

RB

RO

SW

SU

S

ST

SG

SD

WH

WP

WR

Flight Line

Rook

Sedge Warbler

Shelduck

Skylark

Song Thrush

Starling

Stock Dove

Whitethroat

Woodpigeon

Wren

0 50 100 150 200 250 300 m

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Figure 4d:

Breeding Bird Survey Results

Project:

Llanwern Solar, Gwent Levels

Client:

Gwent Farmer's Community Solar Partnership Ltd

Date:

24/10/2025

Ref:

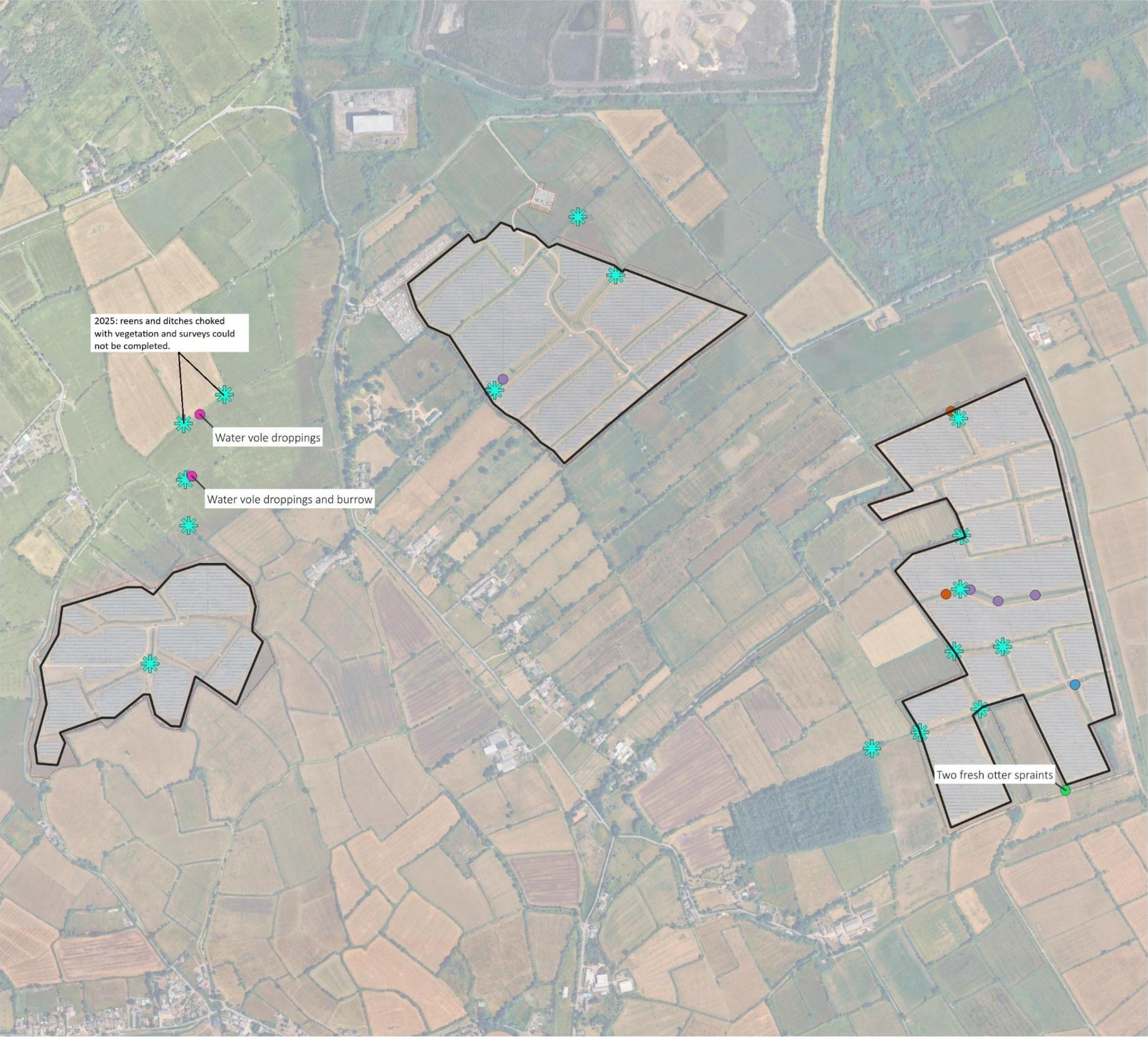
0419-EMR-F4d

Drawn:

HS

Revision:

-



Key:

- Site Boundary
- Water Vole Sampling Locations

Water Vole Sampling Results 2025

- Otter Spraint
- Water Vole Burrow
- Water Vole Sighting (March 2025)

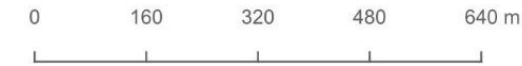
Sampling Results 2017-2018

Otter Results

- Otter Spraint (May 2018)

Water Vole Results

- Water Vole Evidence (June 2017)



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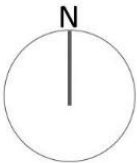
Figure 5:
Water Vole Survey Results

Project:
Llanwern Solar, Gwent Levels

Client:
Gwent Farmer's Community Solar Partnership Ltd

Date:
6/5/2026
Ref:
0419-EMR-F5

Drawn:
HS
Revision:
1



Appendix 1 – Habitat Summaries and Photographs

Results 2025

The below table contains habitat summaries with photographs relating to locations in **Figure 2**. It is to be noted that there is no Photo Location 1 or 12, no photo locations within the ‘Solar Array Areas’ and that Locations 8-11 are now outside of the Site boundaries.

Table 8.1 Habitat summaries

Shrill Carder Bee Mitigation Areas	
Photos 2, 3 4 and 7 below were taken of the land to the east of array 2, which has been reseeded to increase the abundance of wildflowers to benefit shrill carder bee and other invertebrates.	
2. 	3. 
4. 	7. 
Crane Mitigation Area	
Photos 5 and 6 show that the ‘Crane Mitigation Area’ fields have been allowed to grow tall. As recorded in 2023, there is still a much greater dominance of grasses, though thistles, legumes and knapweed are present indicating that management is adjusting the flora to the desired condition.	

5.



6.



Lapwing Mitigation Area

The tussocky grassland sward within the lapwing mitigation area is suitable for lapwing, however the ground is too dry for their breeding preferences.

10.



11.



13.



Retained grassland (array area)

The photos below do not correspond to photo locations within **Figure 2**, however have been included as a reference to show how the habitats are progressing.

The 'Bug hotel' habitat was installed in the summer of 2023 on the grassland within the arrays. However, the land directly around the bug hotel in array area 1 has been overgrazed with no wildflower., The buffers around the solar panels had also been cut and grazed leaving a very short sward with low species diversity. As the management around the bug hotel is leaving invertebrates with little shelter or forage, the bug hotel should be moved to a more appropriate location.

Sufficient light was reaching underneath the solar panels to allow growth of vegetation though this was lower than the areas immediately around the arrays. The shade was also allowing damper areas of grassland to persist which supported rushes and reeds in some cases.



Bug hotel in Area 1



Lapwing Mitigation Area - January 2026

The photos below were taken from within the Lapwing Mitigation Area. They do not correspond to photo locations set out in **Figure 2**, however these photos have been included to show how the habitats are progressing.

Lapwing (approximately 50 birds) were recorded within the north-eastern field adjacent to the road after the introduction of cattle and targeted movement of cattle feed around the field to provide poaching and disturbed grassland areas. The fields show to provide a wintering food source for lapwing.



Appendix 2 – List of Fauna Mentioned in Text

Fauna

Common name	Scientific name	Recorded on Site?
Crane	<i>Grus grus</i>	
Lapwing	<i>Vanellus vanellus</i>	✓
Otter	<i>Lutra lutra</i>	✓
Shrill carder bee	<i>Bombus sylvarum</i>	✓
Water vole	<i>Arvicola aquaticus</i>	✓

List of bird species is provided in **Appendix 4**.

Appendix 3 – Breeding Bird Survey Results

Table 9.1: Breeding bird survey results – notable species

Common name	Scientific Name	Conservation Status	Breeding Status	Area 1	Area 1	Area 1	Area 2	Area 2	Area 2	Area 3	Area 3	Area 3	Peak Count	Recorded on Site
				April	May	June	April	May	June	April	May	June		
Cetti's Warbler	<i>Cettia cetti</i>	Sch 1	Probable	5	4	1	1	2	0	10	7	2	10	✓
Chaffinch	<i>Fringilla coelebs</i>	Amber (Wales)	Probable	0	0	0	0	0	0	1	2	1	2	✓
Crossbill	<i>Loxia curvirostra</i>	Sch 1	Non-breeding	0	0	4	0	0	0	0	0	0	4	✓
Cuckoo	<i>Cuculus canorus</i>	Red (Wales), S7, Red (UK)	Probable	1	1	0	0	0	0	2	1	0	2	✓
Curlew	<i>Numenius arquata</i>	Red (Wales), S7, Red (UK)	Non-breeding	9	0	1	7	0	0	0	0	0	7	✓
Dunnock	<i>Prunella modularis</i>	Amber (Wales), S7, Amber (UK)	Probable	0	0	0	3	2	1	0	4	2	4	✓
Gadwall	<i>Mareca strepera</i>	Amber (UK)	Possible	0	0	0	0	0	0	2	0	0	2	
Goldcrest	<i>Regulus regulus</i>	Red (Wales)	Possible	0	0	0	0	0	0	0	0	4	4	✓
Green Woodpecker	<i>Picus viridis</i>	Amber (Wales)	Possible	0	0	0	0	0	1	0	0	0	1	✓
Greenfinch	<i>Chloris chloris</i>	Red (Wales), Red (UK)	Possible	1	2	1	0	0	0	0	0	0	2	✓
Grey Heron	<i>Ardea cinerea</i>	Amber (Wales)	Non-breeding	1	1	0	2	1	3	0	1	1	2	✓
Grey wagtail	<i>Motacilla cinerea</i>	Amber (Wales), Amber (UK)	Possible	0	0	0	0	0	0	0	1	0	1	
Herring Gull	<i>Larus argentatus</i>	Red (Wales), S7, Red (UK)	Non-breeding	17	8	4	7	3	2	1	3	1	17	✓
House Martin	<i>Delichon urbicum</i>	Amber (Wales), Red (UK)	Non-breeding	0	1	0	0	0	3	0	0	0	3	✓
House Sparrow	<i>Passer domesticus</i>	Amber (Wales), S42, Red (UK)	Possible	0	0	4	0	0	0	0	0	0	4	✓
Kestrel	<i>Falco tinnunculus</i>	Red (Wales), S7, Amber (UK)	Possible	0	0	0	0	0	1	0	0	0	1	✓
Lapwing	<i>Vanellus vanellus</i>	Red (Wales), S7, Red (UK)	Probable	0	0	0	1	0	0	4	2	0	4	✓
Lesser Black-backed Gull	<i>Larus fuscus</i>	Red (Wales), Amber (UK)	Non-breeding	1	0	1	4	0	2	1		2	4	✓
Linnet	<i>Linaria cannabina</i>	Red (Wales), S7, Red (UK)	Possible	7	0	0	0	0	0	8	9	6	9	✓
Little Egret	<i>Egretta garzetta</i>	Annex 1	Possible	0	1	0	0	0	0	0	0	0	1	✓

Magpie	<i>Pica pica</i>	Amber (Wales)	Probable	0	0	0	0	0	0	3	3	9	9	✓
Mallard	<i>Anas platyrhynchos</i>	Amber (UK)	Probable	9	2	1	19	1	1	5	2	0	19	✓
Mistle Thrush	<i>Turdus viscivorus</i>	Amber (Wales), Red (UK)	Probable	0	0	0	0	1	2	0	0	0	2	✓
Moorhen	<i>Gallinula chloropus</i>	Amber (UK)	Confirmed breeding in Area 1	1	1	1	1	4	0	0	1	0	4	✓
Reed Bunting	<i>Emberiza schoeniclus</i>	S7, Amber (UK)	Probable	4	0	1	0	0	1	4	4	8	8	✓
Rook	<i>Corvus frugilegus</i>	Red (Wales), Amber (UK)	Non-breeding	0	0	0	0	0	0	9	1	0	9	✓
Sedge Warbler	<i>Acrocephalus schoenobaenus</i>	Amber (UK)	Probable	1	0	0	0	0	0	5	7	4	7	✓
Shelduck	<i>Tadorna tadorna</i>	Red (Wales), Amber (UK)	Probable	2	2	0	2	0	0	4	5	0	5	✓
Skylark	<i>Alauda arvensis</i>	Amber (Wales), S7, Red (UK)	Probable	0	0	0	0	0	0	6	6	4	6	✓
Song Thrush	<i>Turdus philomelos</i>	S7, Amber (UK)	Probable	2	1	0	1	1	0	4	1	3	4	✓
Sparrowhawk	<i>Accipiter nisus</i>	Amber (UK)	Possible	0	0	0	0	1	0	0	0	0	1	✓
Starling	<i>Sturnus vulgaris</i>	Red (Wales), S7, Red (UK)	Confirmed breeding in Area 2	0	6	6	1	2	6	0	1	0	6	✓
Stock Dove	<i>Columba oenas</i>	Amber (UK)	Probable	1	0	6	1	1	6	1	0	2	6	✓
Wheatear	<i>Oenanthe oenanthe</i>	Amber (Wales), Amber (UK)	Non-breeding	0	0	0	0	0	0	1	0	0	1	✓
Whitethroat	<i>Sylvia communis</i>	Red (Wales), Amber (UK)	Confirmed	4	4	3	3	4	1 + family	18	11	18	18	✓
Woodpigeon	<i>Columba palumbus</i>	Amber (UK)	Possible	0	0	0	0	0	0	1	0	1	1	✓
Wren	<i>Troglodytes troglodytes</i>	Amber (UK)	Probable	0	0	0	0	0	0	21	31	20	31	✓

Red (UK) = Red listed Bird of Conservation Concern 5 (BoCC5) (Stanbury et al., 2021); **Amber (UK)** = Amber listed BoCC5; **Sch1** = listed on Schedule 1 of the Wildlife & Countryside Act 1981 (as amended); **Red (Wales)** = Red listed Bird of Conservation Concern Wales 4 (Wales BoCC4) (Johnstone et al, 2022); **Amber (Wales)** = Amber listed Wales BoCC4; **S7** = Species of Principal Importance under Section 7 of the Environment (Wales) Act 2016;

Table 9.2: Breeding bird survey results – complete species list

Common Name	Scientific Name	Common Name	Scientific Name
Blackbird	<i>Turdus merula</i>	Little Egret	<i>Egretta garzetta</i>
Blackcap	<i>Sylvia atricapilla</i>	Long-tailed tit	<i>Aegithalos caudatus</i>
Blue tit	<i>Cyanistes caeruleus</i>	Magpie	<i>Pica pica</i>
Buzzard	<i>Buteo buteo</i>	Mallard	<i>Anas platyrhynchos</i>
Carrion crow	<i>Corvus corone</i>	Mistle Thrush	<i>Turdus viscivorus</i>
Cetti's Warbler	<i>Cettia cetti</i>	Moorhen	<i>Gallinula chloropus</i>
Chaffinch	<i>Fringilla coelebs</i>	Mute Swan	<i>Cygnus olor</i>
Chiffchaff	<i>Phylloscopus collybita</i>	Pheasant	<i>Phasianus colchicus</i>
Cormorant	<i>Phalacrocorax carbo</i>	Pied wagtail	<i>Motacilla alba</i>
Crossbill	<i>Loxia curvirostra</i>	Raven	<i>Corvus corax</i>
Cuckoo	<i>Cuculus canorus</i>	Reed Bunting	<i>Emberiza schoeniclus</i>
Curlew	<i>Numenius arquata</i>	Reed Warbler	<i>Acrocephalus scirpaceus</i>
Duncock	<i>Prunella modularis</i>	Robin	<i>Erithacus rubecula</i>
Gadwall	<i>Mareca strepera</i>	Rook	<i>Corvus frugilegus</i>
Goldcrest	<i>Regulus regulus</i>	Sedge Warbler	<i>Acrocephalus schoenobaenus</i>
Goldfinch	<i>Carduelis carduelis</i>	Shelduck	<i>Tadorna tadorna</i>
Great spotted woodpecker	<i>Dendrocopos major</i>	Skylark	<i>Alauda arvensis</i>
Great tit	<i>Parus major</i>	Song Thrush	<i>Turdus philomelos</i>
Green Woodpecker	<i>Picus viridis</i>	Sparrowhawk	<i>Accipiter nisus</i>
Greenfinch	<i>Chloris chloris</i>	Starling	<i>Sturnus vulgaris</i>
Grey Heron	<i>Ardea cinerea</i>	Stock Dove	<i>Columba oenas</i>
Grey wagtail	<i>Motacilla cinerea</i>	Stonechat	<i>Saxicola rubicola</i>
Herring Gull	<i>Larus argentatus</i>	Swallow	<i>Hirundo rustica</i>
House Martin	<i>Delichon urbicum</i>	Wheatear	<i>Oenanthe oenanthe</i>
House Sparrow	<i>Passer domesticus</i>	Whitethroat	<i>Sylvia communis</i>
Jackdaw	<i>Coloeus monedula</i>	Woodpigeon	<i>Columba palumbus</i>
Kestrel	<i>Falco tinnunculus</i>	Wren	<i>Troglodytes troglodytes</i>
Lapwing	<i>Vanellus vanellus</i>		
Lesser Black-backed Gull	<i>Larus fuscus</i>		
Lesser whitethroat	<i>Sylvia curruca</i>		
Linnet	<i>Linaria cannabina</i>		

Appendix 4 – Aquatic Invertebrate and Bumblebee Monitoring, 2025



LLANWERN, NR. NEWPORT
AQUATIC INVERTEBRATE AND BUMBLEBEE MONITORING,
2025

DC Boyce
Ecologist
November 2025



1. INTRODUCTION

This report describes a programme of aquatic invertebrate and bumblebee monitoring undertaken for GE Consulting on the solar farm at Llanwern, near Newport. It is situated on the Gwent Levels; an extensive area of coastal grazing marshes just to the south of the Llanwern steelworks, approximately six kilometres to the southeast of the city of Newport. The villages of Whitson and Goldcliff lie immediately to the south of the site. The site will be hereafter referred to as 'Llanwern'. The location of the site is shown on Figure 1.

It has been subject to earlier aquatic invertebrate surveys in 2015 (Boyce, 2016) and 2022 (Boyce, 2022) since which time, most of the area has been developed as a solar farm. There have also been earlier terrestrial invertebrate surveys: in 2015, 2017 and 2023 (Boyce, 2015, 2017 and 2023b). The 2017 and 2023 surveys particularly focused on the collection of data on the status of the Shrill Carder *Bombus sylvarum* and Brown-banded Carder *B. humilis* Bumblebees at Llanwern. The former is a severely declining species in the UK, with the Gwent Levels being one of only two remaining British strongholds. Both these bumblebees are Species of Principal Importance for the conservation of biodiversity in Wales, which are listed on Section 7 of the Environment (Wales) Act, 2017.

In 2025, both the aquatic invertebrates and bees have been surveyed again using the same methodologies as those employed previously. The aim of this work was to monitor the impact of the change of use on the important aquatic invertebrate assemblages and species recorded here. All of Llanwern is located within either the Whitson or Nash and Goldcliff Sites of Special Scientific Interest (SSSI), with the aquatic invertebrate assemblage being a designated feature for which both of these SSSIs are notified

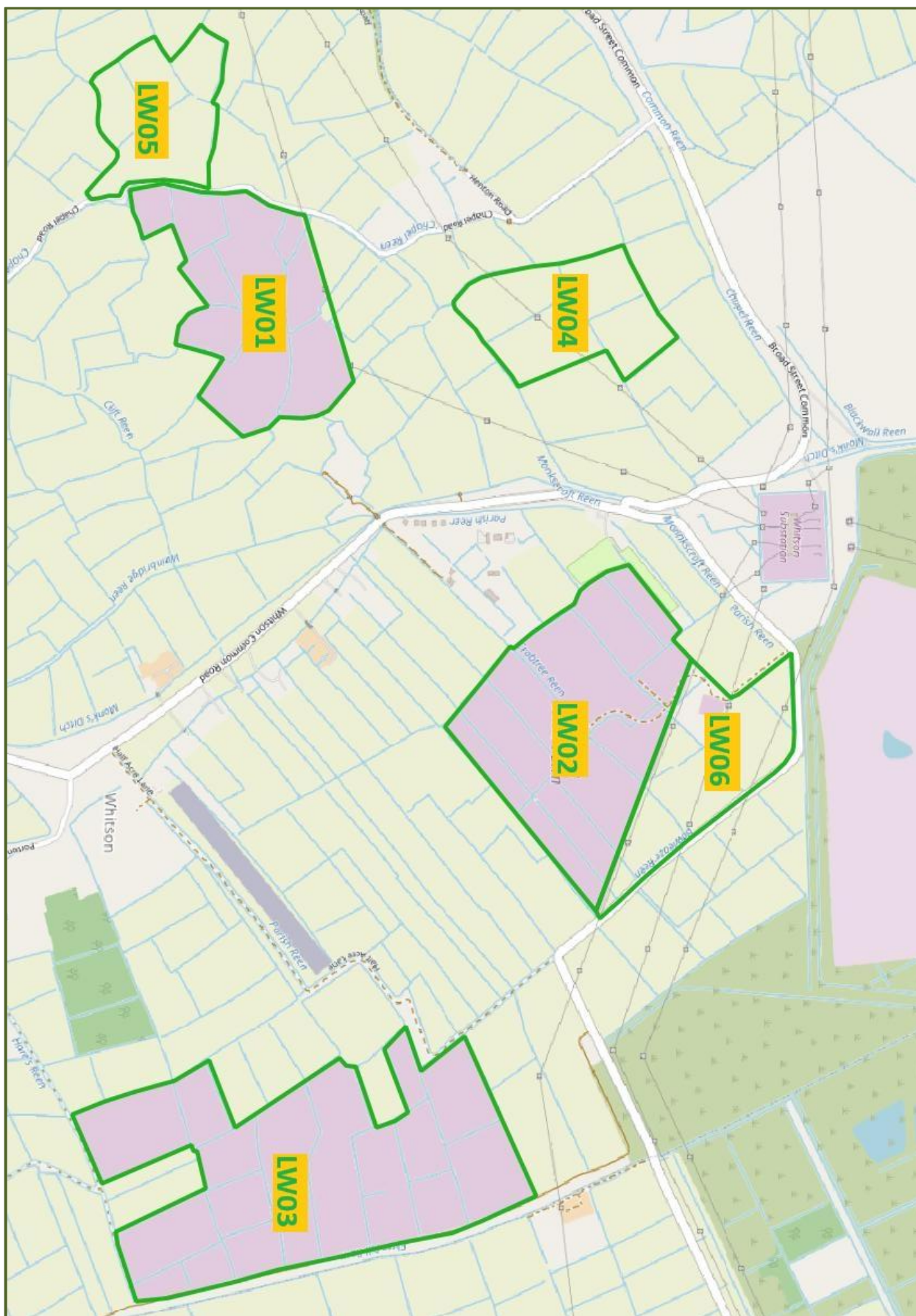


Figure 1. Llanwern, location of survey blocks

2. METHODOLOGY

2.1. AQUATIC INVERTEBRATE SAMPLING

In 2015, the site was divided into three survey blocks, which corresponded to the three main areas of the proposed solar farm. These are shown as LW01-03 on Figure 1. Aquatic invertebrate sampling was carried out at each of these in 2015 and repeated in 2022.

The 2022 and current aquatic survey focused on the collection of data from the five ditches (known locally as ‘reens’) in which the baseline 2015 survey had found key invertebrate species. As defined here, key invertebrate species are those that have a formal threat and/or rarity status. However, it was necessary to relocate two of the sub-samples of sample station LW03-AQ1 (sub-samples 7B2 and 7B3 of the 2022 survey). These were collected in shallow field grips in 2022 and the extremely dry weather conditions in spring 2025 meant they were completely dry by the time of the visit. It was therefore decided to move them into the reens marking the southern and eastern edges of this field, the latter boundary being the location of the LW03-AQ1c sub-sample.

A sixth sample station was established in the ‘control’ survey block (LW04), which was sampled in 2015 but not in 2022. The location of the six aquatic invertebrate sample stations is shown on Figure 2. Invertebrate sampling of reen sections was carried out according to standard methods developed for a national survey of the ecology of ditch systems by Buglife (Palmer *et. al.* 2013). These are the same methods that have been employed by Natural Resources Wales (NRW) to undertake Condition Assessment of the aquatic invertebrate assemblage on all of the Gwent Levels SSSIs, including a few of the reens on this site (Boyce, 2010, 2013). Repeat monitoring of the condition of reens on the Nash and Goldcliff SSSI has been undertaken by NRW this year (Boyce, 2023a).

Aquatic sampling was undertaken on the 5th and 6th of June 2025. At each of the six sample stations, three sub-samples were collected in the same locations that they had been in 2015 and 2022. These sub-samples were collectively considered to constitute a single sample station. Each sample has been allocated a code (eg. LW01-AQ1) and the three sub-samples are identified with a lower case letter following this (eg. LW01-Aq1a). An eight-figure GPS-derived grid reference is given for each sample point in Table 1 and their location is also shown on Figure 2.

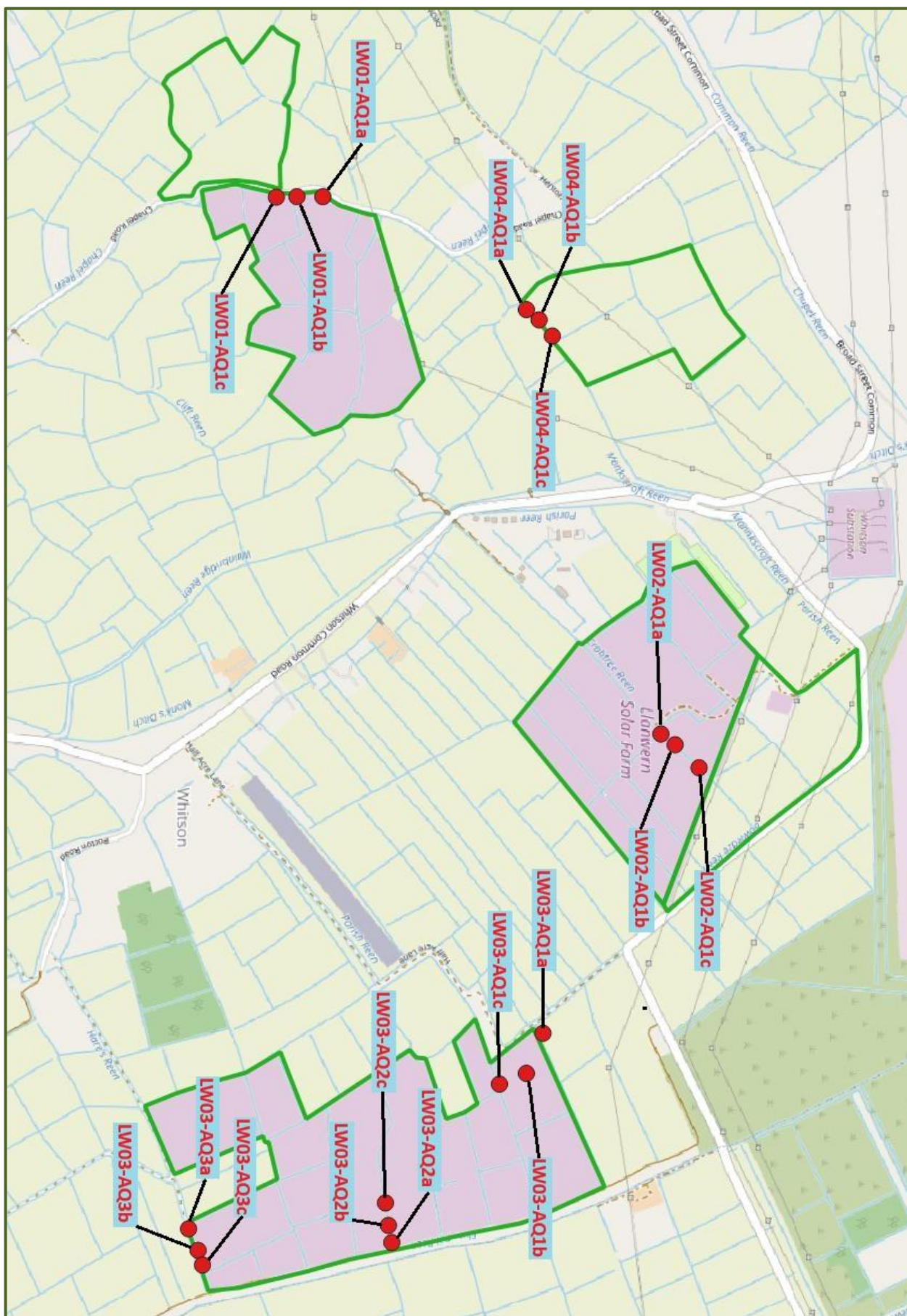


Figure 2. Llanwern, location of aquatic invertebrate sub-samples

TABLE 1: SAMPLE STATIONS AT LLANWERN, 2025			
Sample station	Sample points	Grid ref	Sample date
LW01-AQ1	LW01-AQ1a	ST36208404	05/06/2025
	LW01-AQ1b	ST36208397	05/06/2025
	LW01-AQ1c	ST36208392	05/06/2025
LW02-AQ1	LW02-AQ1a	ST37658496	05/06/2025
	LW02-AQ1b	ST37688500	05/06/2025
	LW02-AQ1c	ST37748506	05/06/2025
LW03-AQ1	LW03-AQ1a	ST38468464	06/06/2025
	LW03-AQ1b	ST38578459	06/06/2025
	LW03-AQ1c	ST38608452	06/06/2025
LW03-AQ2	LW03-AQ2a	ST39038423	06/06/2025
	LW03-AQ2b	ST38988422	06/06/2025
	LW03-AQ2c	ST38928421	06/06/2025
LW03-AQ3	LW03-AQ3a	ST38998368	06/06/2025
	LW03-AQ3b	ST39058371	06/06/2025
	LW03-AQ3c	ST39098372	06/06/2025
LW04-AQ1	LW04-AQ1a	ST36508459	05/06/2025
	LW04-AQ1b	ST36538463	05/06/2025
	LW04-AQ1c	ST36578466	05/06/2025

Before beginning to collect aquatic invertebrates and macrophytes, a GPS reading of the location of each sample was recorded. In each sub-sample, a pond net was used to collect material from patches of vegetation that exhibited the greatest small-scale mosaic structure until the net began to fill to the point that it became more difficult to push. This generally took between 1-3 minutes and the net was usually about a quarter to a third full of plant material (about 2-3 litres by volume). The sample was then spread out onto a white polythene sheet and invertebrates were recorded/collected for 8 minutes as the material was teased apart. Part of the debris was then put into a white tray with c. 2cm of water, so that feeble animals could swim free and be collected using a tea strainer. The latter element of the sub-sample only took about 1 minute.

Finally, all of the debris was tipped into a bucket of water, the larger pieces quickly being removed (dunking them up and down while doing so to release caught-up animals), most of the water was then decanted, with the heavy residue being tipped into the white tray (with c. 1cm of water). By tipping the contents to one end of the tray, then slowly tipping it back again, the snails were left stranded in a pile. They could then be scooped up for preservation or sorted quickly for tiny species (*Gyraulus*, *Hippeutis*, *Valvata*, etc.). Further details of the sampling method can be found in Palmer *et. al. (ibid.)*. Taxonomic groups to be covered by this contract were: Coleoptera, Hemiptera and Mollusca, but in the latter case, excluding small bivalve molluscs such as the various *Pisidium* spp. In addition, larvae of either the Hairy Dragonfly *Brachytron pratense*, or soldierflies (Stratiomyidae) were collected and identified to species.

At each of the six sample stations, data from the sub-samples was pooled into a single table for each (see Tables A1 to A6). Also included in all these tables is an indication of the abundance of the taxon in each sub-sample, where D = 1-10, C = 11-100, B = 101-1000 and A = >1000. A checklist of all aquatic invertebrates collected during this contract is given in Table 2.

Tables A1 to A6 of Appendix 1 give the species status and marsh fidelity scores for each species as listed by Palmer *et. al. (ibid.)*. Using these figures, a Species Quality Score (SQS), Species Quality Index (SQI) and Habitat Quality Score (HQS) have been calculated for each of the five sample stations, which is given at the bottom of these tables and also in the data summary (Table 4). Further information on the calculation of these metrics can be found in Palmer *et. al. (ibid.)*. Tables A1 to A6 also give a Species Richness Score (SRS, simply the total number of native aquatic species recorded during sampling) for each of the sample stations.

In sub-section 3.1, the results of the 2025 aquatic survey are laid out and following this, sub-section 4.1 summarises trends in the aquatic invertebrate fauna across the three surveys and suggests management that will maintain and enhance the interest of the site.

2.2. BUMBLEBEE SURVEY

The current study focused on monitoring the populations of Shrill Carder *Bombus sylvarum* and Brown-banded Carder Bumblebees *B. humilis*. However, the survey has also recorded all other bumblebees and some other solitary bees with national threat and/or rarity status, for which the Gwent Levels is known to be important.

As with the aquatic invertebrates, the core area surveyed in 2025 is the three blocks into which the solar farm is divided, (LW01-03 on Figure 1 above). It was also requested that the bumblebee survey this year should be extended to include the control plot (LW04), where no solar development has occurred and agricultural management by cutting and grazing has continued and also to cover the block on the northern boundary of LW02, which includes both the Shrill Carder Bumblebee Mitigation fields and the land around the sub-station (LW06 on Figure 1). As in the previous two surveys, the bumblebee monitoring has been further sub-divided into survey units (SU) based on the individual fields within each block. These are shown in Appendix 1.

Access restrictions were a major constraint in 2025, with the surveyor being unable to access the core survey area (LW01-03) on the first and most of the second days. This left insufficient time to look at most of the buffer strips that lie between the inner and outer fences around these three blocks and meant LW01 had to be surveyed at great speed in sub-optimal weather conditions. However, access restrictions to the core area meant more time was spent looking at the mitigation and control sites and also allowed the Lapwing Mitigation Fields (LW05 on Figure 1) to be surveyed.

The bumblebee survey was undertaken over three days; from the 6th to the 8th of August 2025. The timing of the survey coincided with the period when numbers of Shrill Carder Bumblebee workers and males reach peak abundance (usually the first half of August on the Gwent Levels). The bumblebee monitoring exercise repeated the methodology used during the earlier 2015 baseline survey of the site and the subsequent 2023 monitoring

exercise, with each survey block divided into survey units, corresponding to the individual fields into which it is divided.

Bumblebee monitoring was carried out in every main field across the six survey blocks. However, as noted above, time constraints prevented access to most of the buffer areas between the fenced boundaries of LW01-03. The survey focused on recording foraging workers at favoured nectar and pollen sources. A 'W-walk' was carried out across each field that aimed to come within 10 metres of all significant stands of flower-rich grassland and hedge and ditch margin where there were nectar/pollen sources. This means that survey time is considerably greater in those fields where there is still flower-rich semi-improved grassland or improved grasslands with abundant flowering clovers *Trifolium* spp. In fields that were cut, heavily grazed or where there was grass-dominated improved grassland, survey was restricted to a boundary walk looking at ditch and hedge margins, where there were sometimes still some flowers or patches of Bramble *Rubus fruticosus*.

In each survey unit, presence/absence of all bumblebee species was noted, with the number of Shrill and Brown-banded Carder Bumblebees being counted, along with the flower species at which they were seen foraging. Where possible, bumblebees were identified in the field to species level, with any specimens of 'difficult' species netted for examination in a tube with a hand lens. Fortunately, the Shrill Carder Bumblebee is easily distinguished in the field. Workers of the White-tailed and Buff-tailed Bumblebees (*Bombus lucorum* and *B. terrestris* respectively) are indistinguishable without microscopic examination. As these are both common and widely distributed species, they were recorded as *B. lucorum/terrestris*. Males and queens of these two were recorded to species level. However, note also that *B. lucorum* is a complex of three very similar sibling species, which are only reliably distinguished by DNA analysis. For the purposes of this study, all records of '*B. lucorum*' refer to the *B. lucorum* aggregate.

In sub-section 3.2, the results of the 2025 bumblebee survey are laid out and following this, sub-section 4.2 looks at changes in the status of the Shrill Carder Bumblebee across the period covered by the three surveys and suggests management that will maintain and enhance bumblebee populations at Llanwern.

3. RESULTS

Sub-section 3.1 sets out the results of the aquatic invertebrate monitoring in 2025 and following this, sub-section 3.2 summarises the findings of the bumblebee surveys this year.

3.1. AQUATIC INVERTEBRATES AT LLANWERN, 2025

Table 3 lists all aquatic invertebrates recorded at Llanwern in 2025 with their national threat/rarity status, where applicable and the sample stations station(s) they were recorded from. Following this, the various metrics developed by Palmer *et. al. (ibid.)* to assess the quality of the aquatic invertebrate assemblage in grazing marsh ditches are set out for each of the six sample stations in Table 4. The notes below the figures explain the various metrics used. The full results tables for the aquatic invertebrate survey are at Appendix 1. These include columns giving the Conservation Status and (where applicable) Marsh Fidelity Scores for each species.

Sub-section 3.1.1 gives accounts of all key species recorded at Llanwern during the aquatic surveys in 2025. These include brief notes on identification, ecology, UK and Welsh distribution. Key species are defined here as being those with a formal UK threat or rarity designation (referred to hereafter as a conservation status). The relevant threat and rarity listings applicable at Llanwern this year are explained below.

NT. – IUCN Red List, Near Threatened. A taxon is considered Near Threatened when it has been evaluated against the criteria but does not qualify for a threatened category currently, but is close to meeting these criteria, and/or is likely to qualify in the near future due to an ongoing decline in its distribution and abundance.

NS. – Nationally Scarce. Taxa which are estimated to occur within the range of 16 to 100 10km squares, but which do not qualify for inclusion within the RDB or IUCN threatened or near threatened categories, and where division into Na or Nb status has not been attempted.

TABLE 3: CHECKLIST OF AQUATIC AND WETLAND INVERTEBRATES RECORDED AT LLANWERN, 2025

Scientific name	English name	Status	Sample station(s)
<i>Bithynia tentaculata</i>	Common Bithynia		LW01-AQ1; LW02-AQ1; LW03-AQ1,AQ2,AQ3; LW04-AQ1
<i>Lymnaea stagnalis</i>	Great Pond Snail		LW01-AQ1; LW02-AQ1; LW03-AQ1,AQ3; LW04-AQ1
<i>Lymnaea palustris</i> agg	Marsh Pond Snail		LW03-AQ2
<i>Ampullaceana balthica</i>	Wandering Pond Snail		LW01-AQ1; LW02-AQ1; LW03-AQ1,AQ2,AQ3; LW04-AQ1
<i>Physa</i> sp	Bladder Snail		LW01-AQ1; LW02-AQ1; LW03-AQ1,AQ2,AQ3; LW04-AQ1
<i>Anisus vortex</i>	Whirlpool Ram's-horn Snail		LW01-AQ1; LW02-AQ1; LW03-AQ1,AQ2,AQ3; LW04-AQ1
<i>Hippeutis complanatus</i>	Flat Ram's-horn Snail		LW03-AQ1,AQ2
<i>Planorbarius corneus</i>	Great Ram's-horn Snail		LW01-AQ1; LW02-AQ1; LW03-AQ1,AQ3; LW04-AQ1
<i>Planorbis planorbis</i>	Margined Ram's-horn Snail		LW01-AQ1; LW02-AQ1; LW03-AQ1,AQ2,AQ3; LW04-AQ1
<i>Sphaerium corneum</i>	Horny Orb Mussel		LW03-AQ1; LW04-AQ1
<i>Sphaerium lacustre</i>	Lake Orb Mussel		LW01-AQ1; LW03-AQ3; LW04-AQ1
<i>Theromyzon tessulatum</i>	Duck Leech		LW01-AQ1; LW04-AQ1
<i>Erpobdella testacea</i>	A leech		LW02-AQ1
<i>Erpobdella octoculata</i>	A leech		LW01-AQ1; LW02-AQ1; LW03-AQ1,AQ2
<i>Caenis robusta</i>	An angler's curse mayfly		LW03-AQ2; LW04-AQ1
<i>Coenagrion puella</i>	Azure Damselfly		LW01-AQ1; LW02-AQ1; LW03-AQ2,AQ3; LW04-AQ1
<i>Ischnura elegans</i>	Blue-tailed Damselfly		LW01-AQ1; LW03-AQ2
<i>Brachytron pratense</i>	Hairy Dragonfly		LW01-AQ1
<i>Anax imperator</i>	Emperor Dragonfly		LW01-AQ1
<i>Libellula quadrimaculata</i>	Four-spotted Chaser dragonfly		LW03-AQ1
<i>Mesovelia furcata</i>	A Mesoveliid water bug		LW01-AQ1; LW02-AQ1
<i>Hydrometra stagnorum</i>	Common Water Measurer		LW01-AQ1
<i>Microvelia reticulata</i>	A Veliid water bug		LW03-AQ2
<i>Gerris lacustris</i>	A pond skater		LW02-AQ1; LW03-AQ1
<i>Nepa cinerea</i>	Water Scorpion		LW03-AQ1
<i>Ilyocoris cimicoides</i>	Saucer Bug		LW01-AQ1; LW02-AQ1; LW03-AQ1,AQ2,AQ3; LW04-AQ1
<i>Notonecta glauca</i>	Common Backswimmer		LW02-AQ1; LW03-AQ1; LW03-AQ1,AQ2,AQ3; LW04-AQ1
<i>Plea minutissima</i>	A Pleid water boatman		LW01-AQ1; LW02-AQ1
<i>Corixa punctata</i>	A water boatman		LW01-AQ1; LW02-AQ1; LW03-AQ1,AQ2; LW04-AQ1
<i>Hespercorixa linnaei</i>	A lesser water boatman		LW03-AQ3
<i>Sigara dorsalis</i>	A lesser water boatman		LW01-AQ1

<i>Gyrinus caspius</i>	A whirligig beetle		LW03-AQ1
<i>Gyrinus substriatus</i>	A whirligig beetle		LW01-AQ1
<i>Peltodytes caesus</i>	A Haliplid water beetle	NS	LW01-AQ1
<i>Haliplus ruficollis</i>	A Haliplid water beetle		LW01-AQ1; LW02-AQ1; LW03-AQ1; LW04-AQ1
<i>Haliplus sibiricus</i>	A Haliplid water beetle		LW03-AQ1; LW04-AQ1
<i>Haliplus flavicollis</i>	A Haliplid water beetle		LW03-AQ1
<i>Haliplus lineatocollis</i>	A Haliplid water beetle		LW01-AQ1; LW02-AQ1
<i>Noterus clavicornis</i>	A diving beetle		LW01-AQ1; LW02-AQ1; LW04-AQ1
<i>Agabus bipustulatus</i>	A diving beetle		LW03-AQ1,AQ2,AQ3
<i>Agabus nebulosus</i>	A diving beetle		LW03-AQ1
<i>Ilybius guttiger</i>	A diving beetle		LW03-AQ1
<i>Ilybius montanus</i>	A diving beetle		LW02-AQ1; LW03-AQ1,AQ2,AQ3
<i>Ilybius quadriguttatus</i>	A diving beetle		LW04-AQ1; LW03-AQ2
<i>Colymbetes fuscus</i>	A diving beetle		LW03-AQ1
<i>Rhantus suturalis</i>	A diving beetle		LW03-AQ1,AQ2
<i>Liopterus haemorrhoidalis</i>	A diving beetle		LW02-AQ1
<i>Hydaticus transversalis</i>	A diving beetle	NS	LW01-AQ1
<i>Hydroporus angustatus</i>	A diving beetle		LW01-AQ1; LW03-AQ1,AQ2
<i>Hydroporus incognitus</i>	A diving beetle		LW01-AQ1
<i>Hydroporus palustris</i>	A diving beetle		LW01-AQ1; LW02-AQ1; LW03-AQ3
<i>Hydroporus planus</i>	A diving beetle		LW03-AQ1,AQ3
<i>Hydroporus pubescens</i>	A diving beetle		LW03-AQ2,AQ3
<i>Hydroporus tessellatus</i>	A diving beetle		LW03-AQ1,AQ3
<i>Graptodytes pictus</i>	A diving beetle		LW01-AQ1
<i>Hygrotus inaequalis</i>	A diving beetle		LW01-AQ1; LW02-AQ1; LW03-AQ1
<i>Hyphydrus ovatus</i>	A diving beetle		LW01-AQ1; LW02-AQ1; LW03-AQ1
<i>Odacantha melanura</i>	A ground beetle	NS	LW01-AQ1
<i>Helophorus aequalis</i>	A Helophorid water beetle		LW01-AQ1; LW03-AQ1,AQ2; LW04-AQ1
<i>Helophorus brevipalpis</i>	A Helophorid water beetle		LW01-AQ1; LW02-AQ1; LW03-AQ1,AQ2,AQ3; LW04-AQ1
<i>Helophorus minutus</i>	A Helophorid water beetle		LW02-AQ1; LW03-AQ1,AQ2,AQ3; LW04-AQ1
<i>Laccobius bipunctatus</i>	A Hydrophilid water beetle		LW01-AQ1
<i>Hydrophilus piceus</i>	Great Silver Water Beetle	NT; NS	LW03-AQ1,AQ2
<i>Hydrobius fuscipes</i>	A Hydrophilid water beetle		LW03-AQ1
<i>Anacaena globulus</i>	A Hydrophilid water beetle		LW01-AQ1; LW04-AQ1
<i>Anacaena limbata</i>	A Hydrophilid water beetle		LW01-AQ1; LW02-AQ1; LW03-AQ1,AQ2,AQ3; LW04-AQ1

<i>Anacaena lutescens</i>	A Hydrophilid water beetle		LW04-AQ1
<i>Enochrus testaceus</i>	A Hydrophilid water beetle		LW01-AQ1; LW03-AQ1; LW04-AQ1
<i>Enochrus coarctatus</i>	A Hydrophilid water beetle		LW01-AQ1; LW03-AQ2
<i>Helochaeres lividus</i>	A Hydrophilid water beetle		LW03-AQ2
<i>Hydraena riparia</i>	A Hydraenid water beetle		LW01-AQ1
<i>Ochthebius minimus</i>	A Hydraenid water beetle		LW03-AQ1,AQ2,AQ3
<i>Stenus latifrons</i>	A rove beetle		LW01-AQ1
<i>Stenus binotatus</i>	A rove beetle		LW01-AQ1
<i>Scirtes hemisphaericus</i>	A marsh beetle		LW01-AQ1; LW02-AQ1
<i>Scirtes orbicularis</i>	A marsh beetle	NS	LW03-AQ3
<i>Coccidula rufa</i>	A ladybird		LW01-AQ1; LW02-AQ1
<i>Donacia marginata</i>	A reed beetle		LW03-AQ2
<i>Donacia semicuprea</i>	A reed beetle		LW01-AQ1; LW04-AQ1
<i>Plateumaris sericea</i>	A reed beetle		LW02-AQ1
<i>Prasocuris junci</i>	A leaf beetle		LW03-AQ3
<i>Odontomyia ornata</i>	Ornate Brigadier soldierfly	NS	LW03-AQ2; LW04-AQ1
<i>Odontomyia tigrina</i>	Black Colonel soldierfly		LW03-AQ2
<i>Crangonyx pseudogracilis</i>	A freshwater shrimp		LW01-AQ1; LW02-AQ1; LW03-AQ1,AQ2,AQ3; LW04-AQ1
<i>Asellus aquaticus</i>	A water louse		LW01-AQ1; LW02-AQ1; LW03-AQ1,AQ2,AQ3; LW04-AQ1
<i>Asellus meridianus</i>	A water louse		LW03-AQ1,AQ2

Table 4 gives the invertebrate Species Richness Score, Species Quality Score, Species Quality Index and Habitat Quality Score for the six sample stations. Note that all the scores are arrived at by pooling the results from the three sub-samples collected at each sample station.

TABLE 4: SUMMARY OF AQUATIC INVERTEBRATE MONITORING RESULTS, LLANWERN, 2025				
Sample station	SRS - 15/22/25	SQS - 15/22/25	SQI - 15/22/25	HQS - 15/22/25
LW01-AQ1	19/33/ 41	20/41/ 51	1.05/1.24/ 1.24	2.78/9.09/ 8.54
LW02-AQ1	15/26/ 29	16/31/ 32	1.07/1.19/ 1.10	0/5.77/ 0
LW03-AQ1	36/41/ 42	49/51/ 50	1.36/1.24/ 1.19	6.94/4.88/ 4.76
LW03-AQ2	24/38/ 34	28/52/ 48	1.17/1.37/ 1.41	6.25/10.53/ 10.40
LW03-AQ3	29/34/ 24	35/44/ 28	1.21/1.29/ 1.17	3.45/10.29/ 4.17
LW04-AQ1	27/ 32	31/ 39	1.15/ 1.22	3.13/ 6.25
Notes on Table 4: SRS = Species Richness Score – number of aquatic invertebrates recorded in the sample station. SQS = Species Quality Score – sum of Species Conservation Status scores. SQI = Species Quality Index – SQS divided by SRS. HQS = Habitat Quality Score – sum of those species assigned a Marsh Fidelity letter, where ‘B’ species score 0.5 and ‘A’ species score 1.0. The resultant figure is then divided by the SRS and multiplied by 100. Sample stations where there are no grazing marsh indicators will score 0.00. The alien freshwater shrimp <i>Crangonyx pseudogracilis</i> is excluded from the above calculations. For each of these metrics, scores are given for all three years in which they have been sampled with the 2025 scores being emboldened. Note that at the LW04 control site, there are only earlier figures available from 2015. The individual Species Conservation Status and Marsh Fidelity scores (where appropriate) can be found in the last column of the full results tables at Appendix 1.				

3.1.1. KEY AQUATIC AND WETLAND SPECIES RECORDED AT LLANWERN IN 2025

This section lists the key aquatic and wetland invertebrates recorded during the aquatic invertebrate sampling at Llanwern in 2025. In all, six key species were recorded. The Black Colonel soldierfly *Odontomyia tigrina*, which was listed as a key species in 2015 and was also recorded here in 2022, no longer has Nationally Scarce status, so is not treated below.

3.3.1. A water beetle *Peltodytes caesus* (Duftschmid, 1805). **NS.**

A small yellow-brown Haliplid water beetle with diagnostic pointed tips to the coxal processes. It is a very characteristic species of coastal grazing marshes, where it favours well-vegetated ditches with a soft, muddy bottom. It can also be found less frequently in nutrient-rich bodies of still water at inland sites. Sometimes *P. caesus* can be found in mildly brackish conditions, though most sites are fresh water. Both adults and larvae feed on filamentous algae and possibly also stoneworts. *P. caesus* is very scarce, with most recent records from grazing marsh ditches in south-east England and East Anglia. It is a southern species that has not been found north of Lancashire. In the west, its main strongholds are on the Somerset and Gwent Levels. Elsewhere in Wales, it is a great rarity with just a couple of sites. In 2025, it was recorded in sample station LW01-AQ1, where it had also been collected in 2022.

3.3.2. A diving beetle *Hydaticus transversalis* (Pontoppidan, 1763). **NS.**

The yellow sides and transverse lines across the base of the wing cases and the black basal crescent on the otherwise orange-yellow thorax make this medium-sized black diving beetle unmistakable. It favours open, late-successional pools and ditches with abundant aquatic vegetation for breeding. *H. transversalis* is a very scarce insect in Britain, with surviving populations mostly being in the fens of Cambridgeshire, Huntingdonshire and Norfolk and the Somerset and Gwent Levels. Away from these main populations, there are now just a few isolated colonies and it has certainly become extinct in some former breeding areas. A single adult was recorded at sample station LW01-AQ1 at Llanwern in 2025.

3.3.3. A ground beetle *Odacantha melanura* (Linnaeus, 1767). **NS.**

There is only one British species of *Odacantha* and it is unmistakable, having bright red elytra and legs and most of the rest of the body being black, with a metallic blue or green reflection. It is a specialist inhabitant of reed-beds and other types of tall fen vegetation. It has its main British populations in the fen country of East Anglia and in south-east England. In the west, it is confined to the Somerset Levels, the Gwent Levels and Crymlyn Bog, Glamorgan. A single specimen was collected in a pond net sample at LW01-AQ1 at Llanwern in 2025.

3.3.4. Great Silver Water Beetle *Hydrophilus piceus* (Linnaeus, 1758). **NT/NS.**

H. piceus is an unmistakable insect, as both an adult and well-grown larva on account of its very large size. Adults may reach nearly 50 mm, which makes them the largest British beetle. It is a rare species, which occurs on coastal grazing marshes in Kent, Sussex, Somerset and Gwent, and also in the Norfolk Broads. It was formerly more widely distributed in the Midlands, the London marshes and the Cambridgeshire fens, but appears to have disappeared from these areas. Larvae of *H. piceus* feed on water snails, leaving characteristic holes in the shells of their victims. They tend to be restricted to ditches with very dense mats of macrophytes, where their prey is most abundant, though

adults disperse by flight and can be found in a much wider range of still water habitats. At Llanwern, adults and larvae were found in sample stations LW03-AQ1 and AQ2. These are field ditches that have been recently cleared and, in the case of the latter, have had much overhanging scrub removed.

3.3.5. A marsh beetle *Scirtes orbicularis* (Panzer, 1793). NS.

There are two British species of *Scirtes*, both of which have a broad, rounded body form, long spurs on the hind tibiae and strongly swollen hind femora that enable them to hop. *S. orbicularis* can be distinguished from the commoner *S. hemisphaericus* by having rugose, confluent elytral puncturation and a more yellow-brown ground colour. Larvae are aquatic, occurring in fenland pools and grazing marsh ditches. It is a very scarce species, which is confined to a few areas of lowland fen and grazing marsh in southern England. In Wales, it has only ever been found on the Gwent Levels. Its British strongholds are here, on the Somerset Levels, Norfolk Broads and on the coastal grazing marshes of east Sussex and west Kent. It was formerly known from the marshes around the Thames estuary but has not been recorded from these sites recently. At Llanwern, it was recorded from sample station LW03-AQ3 this year.

3.3.6. A soldierfly *Odontomyia ornata* (Meigen, 1822). NS.

The adult of this soldierfly is a large, striking insect with variably-sized orange wedges on the abdomen. The larvae are large and very elongated, with a long last segment in which the anal slit is placed in the middle. This species shows a strong affinity with grazing marsh ditches, though there are a very few colonies at inland fen sites. Its main British strongholds are on the Somerset and Gwent Levels, though it also has sizeable populations on coastal grazing marshes in East Sussex, and a scatter of other colonies in southern England and East Anglia. At Llanwern, *O. ornata* was recorded in sample stations LW03-AQ2, AQ3 and LW04-AQ1.

3.2. BUMBLEBEES AT LLANWERN, 2025

The results of the 2025 bumblebee monitoring are presented in Tables 5 to 7 below. Table 4 summarises the results and gives the comparative total counts of the two important bumblebees in both this year and from the earlier 2017 and 2023 surveys. Table 3 shows the numbers of the two important carder bumblebees present in each of the three main survey blocks and also in the CBMA. Table 4 shows the number of visits to individual flower species by the two important bumblebees.

TABLE 5: Bumblebee counts, Llanwern 2025

Species	2017 count	2023 count	2025 count	Survey units recorded in 2025
<i>Bombus sylvarum</i>	81	50	63	LW01a,b,e,f,g,h; 02a,c,f,g; 03a,;04a,b,c,d; 05a,b,d; 06a,b,c,d,e,f
<i>Bombus humilis</i>	138	87	79	LW01a,c,e,f,g; 02a,b,c,f,g,h,j,k; 04a,b,c,d; 05a,d,e; 06a,b,c,e,f
<i>Bombus hortorum</i>	-	-	-	
<i>Bombus lapidarius</i>	-	-	-	LW01a,e; 02j,k; 04a,b,c,d; 06b
<i>Bombus lucorum/terrestris</i>	-	-	-	LW01a,f; 02j; 04a,b,d; 05a,c,d; 06a,c,e
<i>Bombus pascuorum</i>	-	-	-	LW01a,c; 02a,b,e,g,h,k; 04a,b,c,d; 05a,b,c,d; 06a,b,c,e,f
<i>Bombus pratorum</i>	-	-	-	
<i>Bombus terrestris</i>	-	-	-	LW06a
Notes on Table 5: The 2017 count in Table 1 excludes records from the original survey originating in areas that are now outside the the solar farm development. The overall counts for <i>B. sylvarum</i> and <i>B. humilis</i> given in column four only apply to the core survey area (LW01-03), where data has been collected over all three years				

TABLE 6: Important bumblebee counts by survey block, Llanwern 2025

	LW01	LW02	LW03	LW04	LW05	LW06
Species	2017/23/25					
<i>Bombus sylvarum</i>	75/28/28	1/13/12	5/7/23	3/-/31	14	47
<i>Bombus humilis</i>	77/74/28	6/4/15	55/9/36	5/-/70	28	21
Notes on Table 6: The LW04 control plot was counted during the 2017 baseline survey and again this year, but not in 2023.						

TABLE 7: Flowers visited by important bumblebees, Llanwern, 2025		
Species	No. <i>Bombus sylvarum</i>	No. <i>Bombus humilis</i>
<i>Centaurea nigra</i>	1	1
<i>Cirsium arvense</i>	31	13
<i>Cirsium palustre</i>	8	15
<i>Cirsium vulgare</i>	61	92
<i>Epilobium hirsutum</i>	2	2
<i>Lathyrus pratensis</i>	1	3
<i>Lotus corniculatus</i>	3	-
<i>Lotus pedunculatus</i>	4	3
<i>Lythrum salicaria</i>	5	4
<i>Trifolium repens</i>	31	50
<i>Vicia cracca</i>	2	13
In flight	6	2

Numbers of Shrill Carder Bumblebees recorded this year in LW01 and LW02 were similar to those in 2023. Numbers in LW03 showed a modest increase; from 7 to 23 individuals. This was mostly due to the good count in an uncut strip, disturbed strip where the castings from the ree to the north have been spread with frequent flowering SpearThistle. Brown-banded Carder Bumblebee numbers were similar to those in 2023, but they were significantly lower this year in LW03 than in 2023, down from 74 individuals to 28.

4. DISCUSSION

4.1. AQUATIC INVERTEBRATES AT LLANWERN, 2025

Overall, the results of the aquatic invertebrate survey suggest there has been little change from the previous survey. However, the condition of two of the reens sampled in LW03 (AQ1 and AQ2) has certainly improved as a result of management carried out in the intervening period. This has involved them being cleared out and the boundary hedges being cut back so that they are unshaded on their southern side. Despite the recent clearance, they were already recovering strongly, with well-developed submerged, floating and emergent vegetation and a diverse aquatic invertebrate assemblage that included a strong breeding population of the Great Silver Water Beetle. It is likely that these field ditches should develop a rich late-successional assemblage provide they continue to be management sympathetically.

Six key aquatic species have been recorded at Llanwern during the two earlier surveys and four of these were found at the site again this year. These are listed in Table 8 below. The Black Colonel soldierfly *Odontomyia tigrina*, which was recorded here during earlier surveys has now been found to be sufficiently widespread in Britain to necessitate removal of Nationally Scarce status and is therefore no longer regarded as a key species.

TABLE 8: KEY AQUATIC INVERTEBRATES RECORDED AT LLANWERN: 2015, 2022 AND 2025			
Species	Status	Sample station(s)	Record year(s)
A Haliplid water beetle <i>Peltodytes caesus</i>	NS	LW01-AQ1; LW02-AQ1; LW03-AQ1	2015, 22, 25
King Diving Beetle <i>Dytiscus dimidiatus</i>	NT	LW03-AQ1	2015
A diving beetle <i>Hydaticus transversalis</i>	NS	LW01-AQ1; LW02-AQ1; LW03-AQ2	2015, 22, 25
A Helophorid water beetle <i>Helophorus granularis</i>	NS	LW03-AQ1	2022
Great Silver Water Beetle <i>Hydrophilus piceus</i>	NT; NS	LW03-AQ1, AQ2	2022, 25
Ornate Brigardier soldierfly <i>Odontomyia ornata</i>	NS	LW01-AQ1; LW03-AQ2, AQ3; LW04-AQ1	2015, 22,

A rotational programme of field ditch clearance should be extended to other areas of Llanwern in which individual reens are de-silted/cast out every seven to ten years. This should allow for the development of a full range of successional stages, including the late-successional stages that have a particularly rich aquatic invertebrate fauna. Castings should be left close to the bank to allow aquatic invertebrates to re-colonise. Ditch clearance works should aim to create quite gently graded channel profiles with shallow marginal areas, as these are one of the most important micro-habitats for aquatic and wetland invertebrates of grazing marsh reens.

Young scrub and dense vegetation may require more frequent clearance, over a period of two to three years. Banks should be cut at least every other year to prevent dense growth from shading the ditch. The objective is to maintain open, sunny conditions on at least half of the water column such that it is possible to maintain abundant submerged and floating aquatic vegetation. It is particularly important to control the growth of young trees and

shrubs such that at least 50% of the water column is predominantly unshaded. Older trees, especially those with dead wood habitat features should be retained. In the case of old Crack Willows *Salix cracca*, this may be achieved by regular pollarding. If clearance of shading vegetation is undertaken on one side of the reed only, this should be prioritised towards the sunnier, more south-facing bank.

Further advice on management of grazing marsh field ditches can be found in recent publications by Buglife (2011) and the Royal Society for the Protection of Birds (RSPB). <https://cdn.buglife.org.uk/2019/07/DitchesmanagementleafletBuglife3.pdf>

4.2. BUMBLEBEES AT LLANWERN, 2025

Management of the solar farm within the inner security fence continues to be generally unfavourable for bumblebees. At LW01, sheep grazing pressure was intense and at LW02 and LW03, most of the areas had been cut right up to the inner fence prior to this survey, both of which were severely limiting the availability of flower resources (and potential nesting sites) for bumblebees. The exception was the uncut, disturbed strip where castings from the reed to the north had been spread along the northern boundary of LW03H. This had frequent flowering Spear Thistle (see report cover) and good numbers of both Shrill and Brown-banded Carder Bumblebees. This demonstrates how easily it would be possible to very substantially increase the abundance of Shrill Carder Bumblebee and other pollinators at Llanwern. Key management prescriptions for these areas are as follows:

- A substantial reduction in grazing intensity at LW01, that allows for the development of mixed height swards with abundant flowers;
- The retention of uncut, strips between spring and late-summer, where this will not interfere with the solar panels;
- No spraying of Spear and other thistles where these are not interfering with solar panels.

By contrast, the buffer strips between the inner and outer fences had generally not been cut or intensely grazed and as a consequence had taller grassland swards with well-developed flower resources. These areas appeared much more favourable for foraging bees and the mid-height swards also looked suitable for nesting carder bumblebees. Unfortunately, severe access restrictions left insufficient time to survey these areas. Management by moderate grazing and cutting in early-autumn, once carder bumblebees have finished nesting are the most important management prescriptions for these areas.

The 2025 survey also looked at Control (LW04), Lapwing Mitigation (LW05) and Shrill Carder Bumblebee Mitigation (LW06) areas. The two Mitigation plots both had extensive areas of moderately tall to rank flower-rich grassland, which was providing excellent foraging and potential nesting habitat for Shrill Carder Bumblebee and other pollinators. LW06 also included the field around the sub-station (LW06C). This was unmanaged and had rank grassland with tall ruderal vegetation, including abundant stands of Creeping Thistle, which had very good numbers of both Shrill and Brown-banded Carders. Given its importance for pollinators, it is suggested that this field should be managed as for the adjacent areas of mitigation habitat.

The control plot was grazed and/or cut and consequently had almost no flower resources and low bumblebee counts when it was last surveyed in 2017. However, in 2025, the grassland was growing back after cutting earlier in the year and had abundant dense patches of flowering White Clover and Tufted Vetch. These were being visited by very good numbers of both Shril and Brown-banded Carder Bumblebees. Fields such as this that are cut earlier in the spring-summer and then left to regenerate can be very important in stimulating later flowering of legumes and other important nectar sources for pollinators and especially for the Shril and Brown-banded Carder that have their main foraging period in late-summer.

5. ACKNOWLEDGMENTS

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APPENDIX 1. SAMPLE STATION RESULTS TABLES

The full results for the five sample stations re-surveyed in 2022 can be found in Tables A1 to A6 below. Aquatic invertebrates collected from the three sub-samples are listed in columns three to five of these tables. The abundance codes given for the sub-samples are defined as follows: D = 1-10, C = 11-100, B = 101-1000 and A = >1000.

TABLE A1: AQUATIC INVERTEBRATES AT SAMPLE STATION LW01-AQ1, LLANWERN, 2025						
Species	Common name	AQ1a	AQ1b	AQ1c	Marsh fidelity	Status score
<i>Ampullaceana balthica</i>	Wandering Pond Snail	C	C	C	-	1
<i>Anacaena globulus</i>	A water beetle		D		-	1
<i>Anacaena limbata</i>	A water beetle		D	D	-	1
<i>Anax imperator</i>	Emperor Dragonfly			D	-	1
<i>Anisus vortex</i>	Whirlpool Ram's-horn Snail	C	C	C	-	1
<i>Asellus aquaticus</i>	A water louse	C	C	C	-	1
<i>Bithynia tentaculata</i>	Common Bithynia		C		-	1
<i>Brachytron pratense</i>	Hairy Dragonfly	D		D	B	2
<i>Coccidula rufa</i>	A ladybird		D	D	n/a	n/a
<i>Coenagrion puella</i>	Azure Damselfly	D		D	-	1
<i>Corixa punctata</i>	A Water boatman		D		-	1
<i>Crangonyx pseudogracilis</i>	A freshwater shrimp	C	C	D	n/a	n/a
<i>Donacia semicuprea</i>	A reed beetle		C	D	n/a	n/a
<i>Enochrus coarctatus</i>	A water beetle		D		B	2
<i>Enochrus testaceus</i>	A water beetle			D	-	2
<i>Erpobdella octoculata</i>	A leech	D	D		-	1
<i>Graptodytes pictus</i>	A diving beetle	D	D		B	2
<i>Gyrinus substriatus</i>	A whirligig beetle		C		-	1
<i>Haliphus ruficollis</i>	A water beetle	D	D		-	1
<i>Haliphus lineatocollis</i>	A Haliplid water beetle			D	-	1
<i>Helophorus aequalis</i>	A water beetle			D	-	1
<i>Helophorus brevipalpis</i>	A water beetle	C	C	D	-	1
<i>Helophorus minutus</i>	A water beetle				-	1
<i>Hydaticus transversalis</i>	A diving beetle		D		A	3
<i>Hydraena riparia</i>	A water beetle	D		D	-	2
<i>Hydrometra stagnorum</i>	Common Water Measurer		D	D	-	1
<i>Hydroporus angustatus</i>	A diving beetle	D			-	1
<i>Hydroporus incognitus</i>	A diving beetle		D		-	1
<i>Hydroporus palustris</i>	A diving beetle	D	C	D	-	1
<i>Hygrotus inaequalis</i>	A diving beetle		D		-	1
<i>Hyphydrus ovatus</i>	A diving beetle			D	-	1
<i>Ilyocoris cimicoides</i>	Saucer Bug	C	D		-	1
<i>Ischnura elegans</i>	Common Blue-tailed Damselfly	D		D	-	1
<i>Laccobius bipunctatus</i>	A water beetle	D			-	1
<i>Lymnaea stagnalis</i>	Great Pond Snail	D		D	-	1
<i>Mesovelgia furcata</i>	A Mesoveliid water bug		D	D	-	2
<i>Noterus clavicornis</i>	A diving beetle	D		D	-	1
<i>Odacantha melanura</i>	A ground beetle		D		n/a	n/a
<i>Peltodytes caesus</i>	A Haliplid water beetle			D	A	3

<i>Physa fontinalis</i>	Common Bladder Snail	C	C	C	-	1
<i>Planorbarius corneus</i>	Great Ram's-horn Snail	C	C	D	-	1
<i>Planorbis planorbis</i>	Margined Ram's-horn Snail	C	D	D	-	1
<i>Plea minutissima</i>	A Pleid water boatman		D	D	-	1
<i>Scirtes hemisphaericus</i>	A marsh beetle	D	D		n/a	n/a
<i>Sigara dorsalis</i>	A lesser water boatman			D	-	1
<i>Stenus binotatus</i>	A camphor rove beetle	D		D	n/a	n/a
<i>Stenus latifrons</i>	A camphor rove beetle	D			n/a	n/a
<i>Theromyzon tessulatum</i>	Duck Leech			D	-	1
					SRS	41
					SQS	51
					SQI	1.24
					HQS	8.54

TABLE A2: AQUATIC INVERTEBRATES AT SAMPLE STATION LW02-AQ1, LLANWERN, 2025						
Species	Common name	AQ1a	AQ1b	AQ1c	Marsh fidelity	Status score
<i>Ampullaceana balthica</i>	Wandering Pond Snail	C	D	C	-	1
<i>Anacaena limbata</i>	A water beetle	D	D		-	1
<i>Anisus vortex</i>	Whirlpool Ram's-horn Snail	C	C	C	-	1
<i>Asellus aquaticus</i>	A water louse	C	C	C	-	1
<i>Bithynia tentaculata</i>	Common Bithynia	D	C	C	-	1
<i>Coccidula rufa</i>	A ladybird		D		n/a	n/a
<i>Coenagrion puella</i>	Azure Damselfly			D	-	1
<i>Corixa punctata</i>	A Water boatman	C	D		-	1
<i>Crangonyx pseudogracilis</i>	A freshwater shrimp	D	C	C	n/a	n/a
<i>Donacia semicuprea</i>	A reed beetle	D			n/a	n/a
<i>Erpobdella octoculata</i>	A leech	D		D	-	1
<i>Erpobdella testacea</i>	A leech	D			-	2
<i>Gerris lacustris</i>	A pond skater			D	-	1
<i>Haliphus ruficollis</i>	A water beetle	D	D	D	-	1
<i>Haliphus lineatocollis</i>	A Haliplid water beetle	C	D	D	-	1
<i>Haliphus sibiricus</i>	A water beetle				-	1
<i>Helophorus brevipalpis</i>	A water beetle	C	D	D	-	1
<i>Helophorus minutus</i>	A water beetle	D	D		-	1
<i>Hydroporus palustris</i>	A diving beetle	D			-	1
<i>Hygrotus inaequalis</i>	A diving beetle		D		-	1
<i>Hyphydrus ovatus</i>	A diving beetle			D	-	1
<i>Ilybius montanus</i>	A diving beetle	D			-	1
<i>Ilyocoris cimicoides</i>	Saucer Bug	D	D	D	-	1
<i>Liopterus haemorrhoidalis</i>	A diving beetle	D			-	2
<i>Lymnaea stagnalis</i>	Great Pond Snail	D	C	D	-	1
<i>Mesovelia furcata</i>	A Mesoveliid water bug	D			-	2
<i>Noterus clavicornis</i>	A diving beetle	D	D	D	-	1
<i>Notonecta glauca</i>	A backswimmer	D			-	1
<i>Physa fontinalis</i>	Common Bladder Snail	C	B	C	-	1
<i>Planorbarius corneus</i>	Great Ram's-horn Snail	D	D		-	1
<i>Planorbis planorbis</i>	Margined Ram's-horn Snail	C	C	C	-	1
<i>Plateumaris sericea</i>	A reed beetle		D		n/a	n/a
<i>Plea minutissima</i>	A Pleid water boatman	D	C	D	-	1
<i>Scirtes hemisphaericus</i>	A marsh beetle		D		n/a	n/a
					SRS	29
					SQS	32
					SQI	1.10
					HQS	0

TABLE A3: AQUATIC INVERTEBRATES AT SAMPLE STATION LW03-AQ1, LLANWERN, 2025						
Species	Common name	AQ1a	AQ1b	AQ1c	Marsh fidelity	Status score
<i>Agabus bipustulatus</i>	A diving beetle	D	D	D	-	1
<i>Agabus nebulosus</i>	A diving beetle	D			-	1
<i>Ampullaceana balthica</i>	Wandering Pond Snail	D	C		-	1
<i>Anacaena limbata</i>	A water beetle		D	D	-	1
<i>Anisus vortex</i>	Whirlpool Ram's-horn Snail	D	C	C	-	1
<i>Asellus aquaticus</i>	A water louse	C	C	C	-	1
<i>Asellus meridianus</i>	A water louse	D	C		-	1
<i>Bithynia tentaculata</i>	Common Bithynia		D		-	1
<i>Colymbetes fuscus</i>	A diving beetle	D			-	1
<i>Corixa punctata</i>	A water boatman	D	D		-	1
<i>Crangonyx pseudogracilis</i>	A freshwater shrimp	C	D	C	n/a	n/a
<i>Enochrus testaceus</i>	A water beetle	D	D		-	2
<i>Erpobdella octoculata</i>	A leech		D		-	1
<i>Gerris lacustris</i>	A pond skater	D		D	-	1
<i>Gyrinus caspius</i>	A whirligig beetle	D			B	2
<i>Gyrinus substriatus</i>	A whirligig beetle		C	D	-	1
<i>Haliphus ruficollis</i>	A water beetle	D	D	D	-	1
<i>Haliphus flavicollis</i>	A Haliplid water beetle			D	-	2
<i>Haliphus sibiricus</i>	A Haliplid water beetle		D		-	1
<i>Helophorus aequalis</i>	A water beetle		D		-	1
<i>Helophorus brevipalpis</i>	A water beetle		D		-	1
<i>Helophorus minutus</i>	A water beetle	D	D		-	1
<i>Hespercorixa sahlbergii</i>	A lesser water boatman			D	-	1
<i>Hippeutis complanatus</i>	Flat Ram's-horn Snail		D		-	2
<i>Hydrobius fuscipes</i>	A water beetle		D		-	1
<i>Hydrophilus piceus</i>	Great Silver Water Beetle	D		D	A	4
<i>Hydroporus angustatus</i>	A diving beetle			D	-	1
<i>Hydroporus planus</i>	A diving beetle		D	D	-	1
<i>Hydroporus tessellatus</i>	A diving beetle			D	-	1
<i>Hygrotus inaequalis</i>	A diving beetle			D	-	1
<i>Hyphydrus ovatus</i>	A diving beetle			D	-	1
<i>Ilybius guttiger</i>	A diving beetle			D	-	1
<i>Ilybius montanus</i>	A diving beetle			D	-	1
<i>Ilyocoris cimicoides</i>	Saucer Bug	D		D	-	1
<i>Lymnaea stagnalis</i>	Great Pond Snail		D		-	1
<i>Nepa cinerea</i>	Water Scorpion	D			-	1
<i>Noterus clavicornis</i>	A diving beetle				-	1
<i>Notonecta glauca</i>	A backswimmer	C	D	D	-	1
<i>Ochthebius minimus</i>	A water beetle		D		-	1
<i>Physa fontinalis</i>	Common Bladder Snail	C	C	C	-	1
<i>Planorbarius corneus</i>	Great Ram's-horn Snail	D	D		-	1
<i>Planorbis planorbis</i>	Margined Ram's-horn Snail	C	C	D	-	1
<i>Rhantus suturalis</i>	A diving beetle			D	B	2
<i>Silis ruficollis</i>	A soldier beetle	D			n/a	n/a
<i>Sphaerium corneum</i>	Horny Orb Mussel		D	D	-	1
					SRS	42
					SQS	50

					SQI	1.19
					HQS	4.76

TABLE A4: AQUATIC INVERTEBRATES AT SAMPLE STATION LW03-AQ2, LLANWERN, 2025

Species	Common name	AQ1a	AQ1b	AQ1c	Marsh fidelity	Status score
<i>Agabus bipustulatus</i>	A diving beetle	D	D		-	1
<i>Ampullaceana balthica</i>	Wandering Pond Snail	D	C	C	-	1
<i>Anacaena limbata</i>	A water beetle	D			-	1
<i>Anisus vortex</i>	Whirlpool Ram's-horn Snail	C	C	D	-	1
<i>Asellus aquaticus</i>	A water louse	C	C		-	1
<i>Asellus meridianus</i>	A water louse		D		-	1
<i>Bithynia tentaculata</i>	Common Bithynia		D		-	1
<i>Caenis robusta</i>	An angler's curse mayfly		D		B	2
<i>Coenagrion puella</i>	Azure Damselfly	D			-	1
<i>Corixa punctata</i>	A water boatman	C	D	D	-	1
<i>Crangonyx pseudogracilis</i>	A freshwater shrimp	C	C		n/a	n/a
<i>Donacia marginata</i>	A reed beetle		D		n/a	n/a
<i>Enochrus coarctatus</i>	A water beetle	D			B	2
<i>Erpobdella octoculata</i>	A leech	D			-	1
<i>Helochaeres lividus</i>	A water beetle			D	B	2
<i>Helophorus aequalis</i>	A water beetle	D		D	-	1
<i>Helophorus brevipalpis</i>	A water beetle	C	D		-	1
<i>Helophorus minutus</i>	A water beetle		D		-	1
<i>Hippeutis complanatus</i>	Flat Ram's-horn Snail		D		-	2
<i>Hydrophilus piceus</i>	Great Silver Water Beetle		D		A	4
<i>Hydroporus angustatus</i>	A diving beetle			D	-	1
<i>Hydroporus pubescens</i>	A diving beetle	D	D	C	-	1
<i>Ilybius montanus</i>	A diving beetle			D	-	1
<i>Ilybius quadriguttatus</i>	A diving beetle		D		B	2
<i>Ilyocoris cimicoides</i>	Saucer Bug			D	-	1
<i>Ischnura elegans</i>	Blue-tailed damselfly		D		-	1
<i>Lymnaea palustris</i>	Marsh Pond Snail			D	-	1
<i>Microvelia reticulata</i>	A Veliid water bug	D			-	1
<i>Noterus clavicornis</i>	A diving beetle		D		1	1
<i>Notonecta glauca</i>	A backswimmer		D		-	1
<i>Ochthebius minimus</i>	A water beetle			D	-	1
<i>Odontomyia ornata</i>	Ornate Brigadier soldierfly	D			A	5
<i>Odontomyia tigrina</i>	Black Colonel soldierfly			D	B	3
<i>Physa fontinalis</i>	Common Bladder Snail	C	C		-	1
<i>Planorbis planorbis</i>	Margined Ram's-horn Snail	C	C	D	-	1
<i>Rhantus suturalis</i>	A diving beetle	D			B	2
					SRS	34
					SQS	48
					SQI	1.41
					HQS	13.23

TABLE A5: AQUATIC INVERTEBRATES AT SAMPLE STATION LW03-AQ3, LLANWERN, 2025						
Species	Common name	AQ1a	AQ1b	AQ1c	Marsh fidelity	Status score
<i>Agabus bipustulatus</i>	A diving beetle			D	-	1
<i>Ampullaceana balthica</i>	Wandering Pond Snail		D		-	1
<i>Anacaena limbata</i>	A water beetle	D			-	1
<i>Anisus vortex</i>	Whirlpool Ram's-horn Snail	C	C	D	-	1
<i>Asellus aquaticus</i>	A water louse	C	C	C	-	1
<i>Bithynia tentaculata</i>	Common Bithynia	D	D	C	-	1
<i>Coenagrion puella</i>	Azure Damselfly		D		-	1
<i>Crangonyx pseudogracilis</i>	A freshwater shrimp	C	D	C	n/a	n/a
<i>Helophorus brevipalpis</i>	A water beetle	D		D	-	1
<i>Helophorus minutus</i>	A water beetle	D			-	1
<i>Hespercorixa linnaei</i>	A lesser water boatman		D		-	1
<i>Hydroporus palustris</i>	A diving beetle	D		D	-	1
<i>Hydroporus planus</i>	A diving beetle	D			-	1
<i>Hydroporus pubescens</i>	A diving beetle	C	D		-	1
<i>Hydroporus tessellatus</i>	A diving beetle	D			-	1
<i>Ilybius montanus</i>	A diving beetle		D		-	1
<i>Ilyocoris cimicoides</i>	Saucer Bug	D			-	1
<i>Lymnaea stagnalis</i>	Marsh Pond Snail			D	-	1
<i>Noterus clavicornis</i>	A diving beetle	C	D	D	-	1
<i>Notonecta glauca</i>	A backswimmer		D	D	-	1
<i>Ochthebius minimus</i>	A water beetle	D			-	1
<i>Odontomyia ornata</i>	Ornate Brigadier soldierfly			D	A	5
<i>Physa fontinalis</i>	Common Bladder Snail	C	C	C	-	1
<i>Planorbarius corneus</i>	Great Ram's-horn Snail			D	-	1
<i>Planorbis planorbis</i>	Margined Ram's-horn Snail	C	D		-	1
<i>Prasocuris junci</i>	A leaf beetle		D		n/a	n/a
<i>Scirtes orbicularis</i>	A marsh beetle		D		n/a	n/a
					SRS	24
					SQS	
					SQI	
					HQS	

TABLE A6: AQUATIC INVERTEBRATES AT SAMPLE STATION LW04-AQ1, LLANWERN, 2025						
Species	Group	AQ1a	AQ1b	AQ1c	Marsh fidelity	Status score
<i>Ampu llaceana balthica</i>	Wandering Pond Snail	C	C	C	-	1
<i>Anacaena globulus</i>	A water beetle			D	-	1
<i>Anacaena limbata</i>	A water beetle	D	C	D	-	1
<i>Anacaena lutescens</i>	A water beetle		D		-	1
<i>Anisus vortex</i>	Whirlpool Ram's-horn Snail	C	C	B	-	1
<i>Asellus aquaticus</i>	A water louse	C	C	C	-	1
<i>Asellus meridianus</i>	A water louse				-	1
<i>Bithynia tentaculata</i>	Common Bithynia			C	-	1
<i>Caenis robusta</i>	An angler's curse mayfly	D		D	B	2
<i>Coenagrion puella</i>	Azure Damselfly	D	D		-	1
<i>Corixa punctata</i>	A water boatman	D			-	1
<i>Crangonyx pseudogracilis</i>	A freshwater shrimp	C	C	C	-	n/a
<i>Donacia semicuprea</i>	A reed beetle			D	n/a	n/a
<i>Enochrus testaceus</i>	A water beetle	D		D	-	2
<i>Erpobdella octoculata</i>	A leech			D	-	1
<i>Haliplus ruficollis</i>	A water beetle	C	D	D	-	1
<i>Haliplus sibiricus</i>	A water beetle			C	-	1
<i>Helophorus aequalis</i>	A water beetle	D		D	-	1
<i>Helophorus brevipalpis</i>	A water beetle	C	C	C	-	1
<i>Helophorus minutus</i>	A water beetle	C		D	-	1
<i>Hydroporus palustris</i>	A diving beetle	C	C	D	-	1
<i>Hyphydrus ovatus</i>	A diving beetle	D		D	-	1
<i>Ilybius quadriguttatus</i>	A diving beetle		D		B	2
<i>Ilyocoris cimicoides</i>	Saucer Bug	D	D	C	-	1
<i>Lymnaea stagnalis</i>	Great Pond Snail	D		C	-	1
<i>Noterus clavicornis</i>	A diving beetle	C	C	C	-	1
<i>Notonecta glauca</i>	A backswimmer	D	D		-	1
<i>Musculium transversum</i>	Lake Orb Mussel	D			-	1
<i>Odontomyia ornata</i>	Ornate Brigadier soldierfly	D			A	5
<i>Physa fontinalis</i>	Common Bladder Snail	C	C	C	-	1
<i>Planorbarius corneus</i>	Great Ram's-horn Snail	D	C	D	-	1
<i>Planorbis planorbis</i>	Margined Ram's-horn Snail	C	C	B	-	1
<i>Sphaerium corneum</i>	Horny Orb Mussel	D		D	-	1
<i>Theromyzon tessulatum</i>	Duck Leech	D		D	-	1
<i>Xantholinus longiventris</i>	A rove beetle	D			n/a	n/a
					SRS	32
					SQS	39
					SQI	1.22
					HQS	6.25

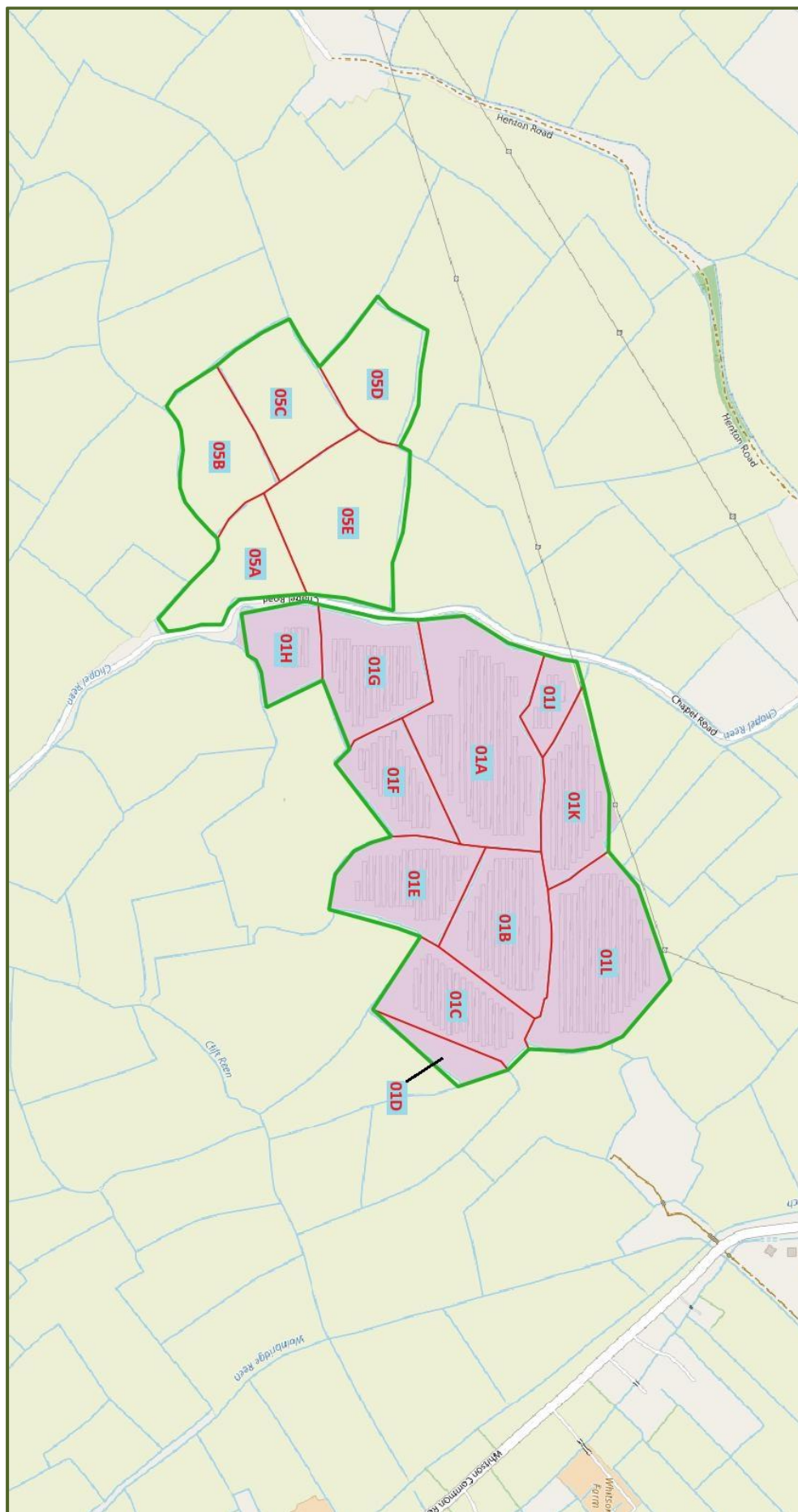


FIGURE A2.1. Bumblebee survey units, LW01 and LW05

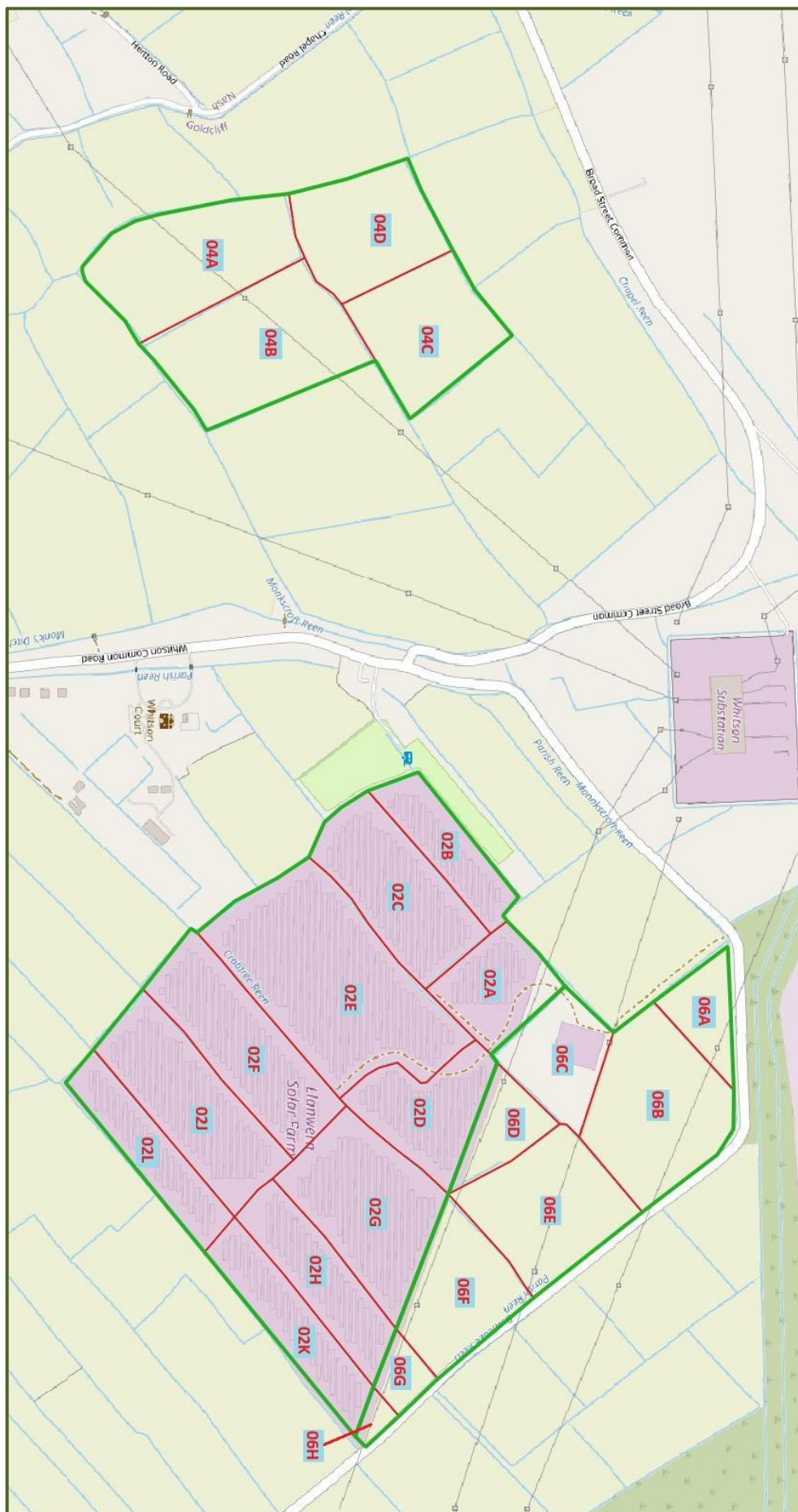
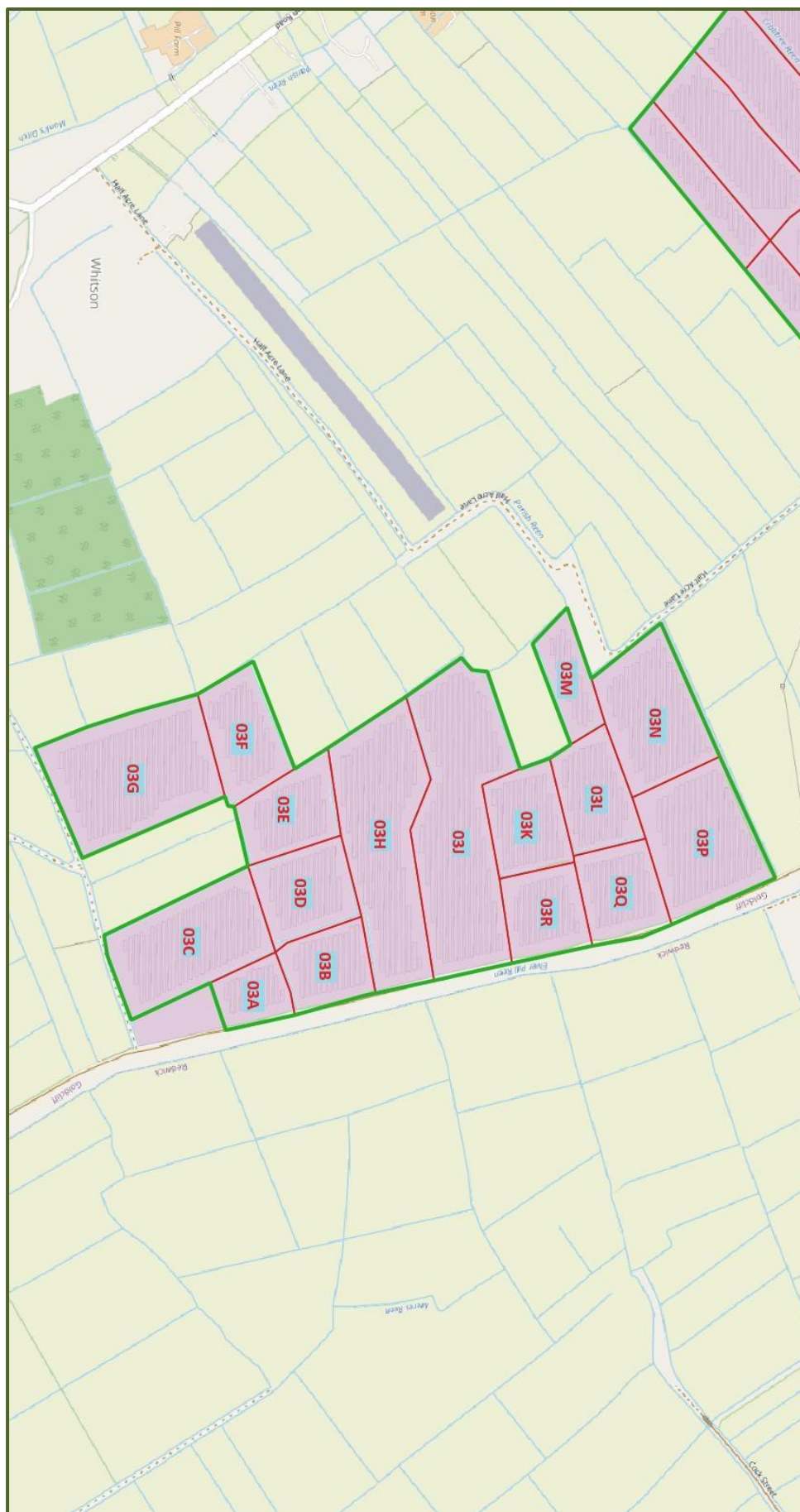


FIGURE A2.2. Bumblebee survey units, LW02, LW04 and LW06



Appendix 5 – Ditch Silt Reinstatement



Llanwern Solar Services Ltd

Complete

Score	2 / 2 (100%)	Flagged items	0	Actions	0
Site	Llanwern Solar Site				
Area	Areas 1, 2 & 3				
Prepared by	D Price				
Date	04.11.2025 16:45 GMT				
Reference Number	PO250344				
Work Description	Ditch, Reen Bank Clearance				
Start Date	15.09.2025 08:30 BST				
Completion Date	19.09.2025 17:00 BST				

Conditions		1 / 1 (100%)
Site Access		Good
Ground conditions		Dry, hard
Weather conditions		Dry >15°C
Site security fencing		N/A

Scope of work		1 / 1 (100%)
Was the scope of works completed	Yes	
If no, what work has not been completed		
Reason for work not completed		
Machinery used	Tractor and Mcconnel side arm flail	
Operator	A Price, D Price & D Johnson	
Any other observations/issues		

Photos

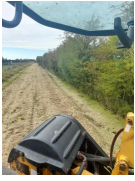


Photo 1



Photo 2



Photo 3



Photo 4



Photo 5



Photo 6



Photo 7



Photo 8

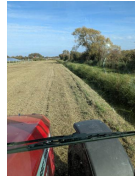


Photo 9



Photo 10



Photo 11



Photo 12



Photo 13



Photo 14



Photo 15



Photo 16



Photo 17



Photo 18



Photo 19



Photo 20

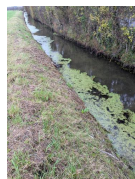


Photo 21

Media summary



Photo 1



Photo 2



Photo 3



Photo 4



Photo 5



Photo 6



Photo 7



Photo 8



Photo 9



Photo 10



Photo 11



Photo 12



Photo 13



Photo 14



Photo 15



Photo 16



Photo 17



Photo 18



Photo 19



Photo 20



Photo 21



Llanwern Solar Services Ltd

Complete

Score	2 / 2 (100%)	Flagged items	0	Actions	0
Site	Llanwern Solar Site				
Area	Area 1, 2 & 3				
Prepared by	D Price				
Date	03.11.2025 15:30 GMT				
Reference Number	PO250338				
Work Description	Cultivation of reen waste				
Start Date	07.09.2025 08:30 BST				
Completion Date	19.09.2025 17:00 BST				

Conditions		1 / 1 (100%)
Site Access		Good
Ground conditions		Dry
Weather conditions		Dry, >12°C
Site security fencing		N/A

Scope of work	1 / 1 (100%)
Was the scope of works completed	Yes
If no, what work has not been completed	
Reason for work not completed	
Machinery used	360 Excavator c/w rake, tractor, rotorvator, powerharrow and seeder
Operator	A Price & D Price
Any other observations/issues	None

Photos



Photo 1



Photo 2



Photo 3



Photo 4



Photo 5



Photo 6

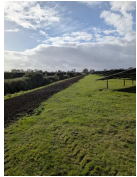


Photo 7



Photo 8



Photo 9



Photo 10



Photo 11



Photo 12



Photo 13

Media summary



Photo 1



Photo 2



Photo 3



Photo 4



Photo 5



Photo 6



Photo 7



Photo 8



Photo 9



Photo 10



Photo 11



Photo 12



Photo 13



Llanwern Solar Services Ltd

Complete

Score	2 / 2 (100%)	Flagged items	0	Actions	0
Site	Llanwern Solar Site				
Area	Area 1, 2 & 3				
Prepared by	D Price				
Date	18.12.2025 17:37 GMT				
Reference Number	PO250536				
Work Description	Ditch / Reen Renovation				
Start Date	01.12.2025 08:30 GMT				
Completion Date	12.12.2025 19:00 GMT				

Conditions		1 / 1 (100%)
Site Access		Fair
Ground conditions		Soft, standing water
Weather conditions		Rain, 6 - 8°C
Site security fencing		N/A

Scope of work		1 / 1 (100%)
Was the scope of works completed		Yes
If no, what work has not been completed		
Reason for work not completed		
Machinery used	13 and 8 ton excavator	
Operator	A Price, J Rowland	
Any other observations/issues	Tree stumps were removed from the ditch in area 3	

Photos



Photo 1



Photo 2



Photo 3



Photo 4



Photo 5



Photo 6



Photo 7



Photo 8



Photo 9



Photo 10



Photo 11



Photo 12



Photo 13



Photo 14



Photo 15



Photo 16



Photo 17



Photo 18



Photo 19



Photo 20



Photo 21



Photo 22



Photo 23



Photo 24



Photo 25



Photo 26



Photo 27



Photo 28



Photo 29



Photo 30



Photo 31

Media summary



Photo 1



Photo 2



Photo 3



Photo 4



Photo 5



Photo 6



Photo 7



Photo 8



Photo 9



Photo 10



Photo 11



Photo 12



Photo 13



Photo 14



Photo 15



Photo 16



Photo 17



Photo 18



Photo 19



Photo 20



Photo 21



Photo 22



Photo 23



Photo 24



Photo 25



Photo 26



Photo 27



Photo 28



Photo 29



Photo 30



Photo 31

Appendix 6 – Spot Herbicide Treatment



Llanwern Solar Services Ltd

Complete

Score	2 / 2 (100%)	Flagged items	0	Actions	0
Site	Llanwern Solar Site				
Area	1, 2 & 3				
Prepared by	D Price				
Date	20.10.2025 21:49 BST				
Reference Number	PO250409				
Work Description	Spot Herbicide Treatment				
Start Date	06.10.2025 08:30 BST				
Completion Date	17.10.2025 17:30 BST				

Conditions		1 / 1 (100%)
Site Access		Good
Ground conditions		Dry & Firm
Weather conditions		Dry, 14 - 17°C, light breeze <7mph
Site security fencing		N/A

Scope of work		1 / 1 (100%)
Was the scope of works completed	Yes	
If no, what work has not been completed		
Reason for work not completed		
Machinery used	Quad, RTV and Compact tractor C/W Lance Sprayer	
Operator	D Price, A Price & C Jones	
Any other observations/issues	Livestock tangled in weeds	

Photos



Photo 1



Photo 2



Photo 3



Photo 4



Photo 5



Photo 6



Photo 7



Photo 8



Photo 9



Photo 10



Photo 11



Photo 12



Photo 13



Photo 14



Photo 15



Photo 16



Photo 17



Photo 18



Photo 19



Photo 20



Photo 21



Photo 22



Photo 23



Photo 24



Photo 25



Photo 26



Photo 27



Photo 28



Photo 29



Photo 30

Media summary



Photo 1



Photo 2



Photo 3



Photo 4



Photo 5



Photo 6



Photo 7



Photo 8



Photo 9



Photo 10



Photo 11



Photo 12



Photo 13



Photo 14



Photo 15



Photo 16



Photo 17



Photo 18



Photo 19



Photo 20



Photo 21

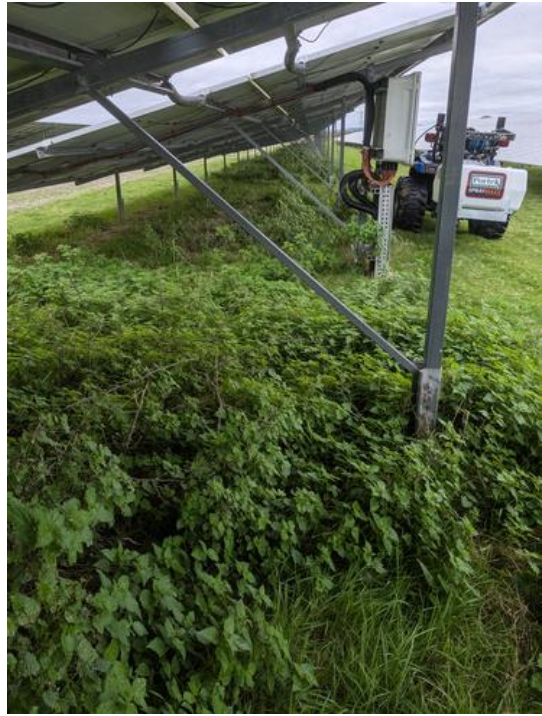


Photo 22



Photo 23



Photo 24



Photo 25



Photo 26

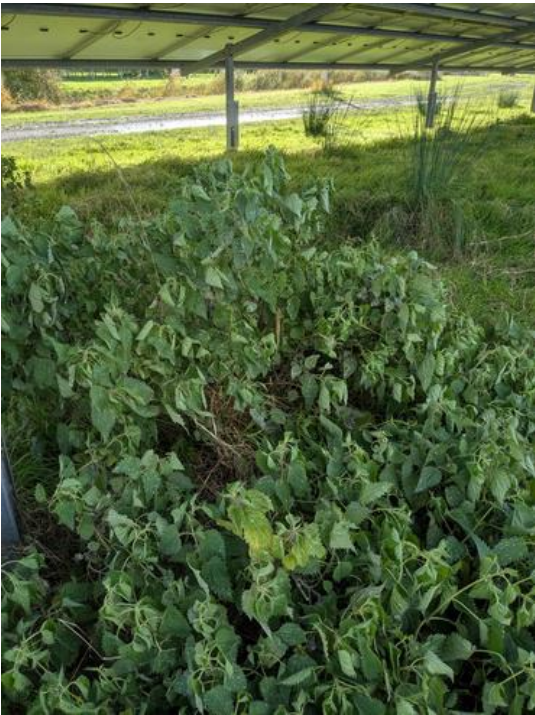


Photo 27



Photo 28



Photo 29



Photo 30

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Land Management

