

Habitat Management Plan

Proposed development of a solar PV array at
Williams Farm, Wrexham, Wales.

Prepared for: Solar Ventures Limited

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1.0 Instruction and limitations

The Magnificent Science Company Limited were instructed by Solar Ventures Limited to produce a habitat management plan in support of a planning application for the development of a solar PV array at Williams Farm, Wrexham, Wrexham County, Wales.

This plan is a response to a specific instruction for a specific end use, specific site layout with regard to habitat as present at the time of the site visit and proposed development. It is prepared for the sole use of Solar Ventures Limited and their planning consultant, XL Planning Limited.

For the avoidance of doubt, any duty of care to any other end users or third parties is specifically excluded. If a period of one year passes prior to commencing site operations, further survey work may be required to ensure compliance with the statutory legal responsibility of the developers. The plan will require a re-write in the case of any change of boundaries, plans, location of amenity areas or buildings, planting schemes, changes of use of the wider area or buildings and/or end use to ensure its fitness for purpose.

The plan submitted to us by the client that was used for the ecological assessment and management plan was entitled 'SITE LAYOUT Installation of a 5.5 MW solar farm for Solar Ventures Ltd @ Williams Farm, Wrexham, LL13 9XS' [file name 'SITE LAYOUT (1-1250 on A0)'].

Assignment of this plan without the written consent of The Magnificent Science Company Limited is forbidden. An assignment can be easily arranged but will require a re-write in the case of any change of boundaries, plans, location of amenity areas or buildings, changes of use of the wider area or buildings and/or end use to ensure its fitness for purpose, for which a small fee is levied. Please contact The Magnificent Science Company Limited for assignments at projectmanager@magnificentscience.com.

This plan is available in alternative formats on request including electronic PDF formatted for screen readers, large print and audio MP3.

2.0 Introduction and site description

The site at Williams Farm, Wrexham, North Wales is approximately 4.75km to the south-east of the centre of the town of Wrexham, and 2.65km from the outskirts of the urban boundary, at national grid reference SJ 38041 48342. It is situated within an industrial estate area, to the south of the main Wrexham Industrial Estate. Industrial units flank an approximate 180 degree circumference of the site from the north-north-east to the west-south-west; with a smaller industrial unit to the south of the site. The surrounding landscape is low-lying/flat grazed grassland of improved and semi-improved

character, with some arable fields and woodlands.

The development site itself is approximately 12.3 hectares in area and comprises predominately sheep-grazed semi-improved neutral grasslands, with a small patch of semi-natural broadleaved woodland and large standard trees. The River Clywedog runs west to east through the north-western area of the wider landholding and is a tributary of the River Dee. The boundaries of the site comprise post-and-wire fencing, with some intact native species-rich hedgerows along the north-eastern perimeter, as well as a section of the southern boundary and species-poor hedgerows on the remaining boundaries; both hedgerow types contain large trees. Within the site the hedgerows are defunct and species-poor.

The topography of the site slopes down to the River Clywedog with the lower fields acting as a floodplain. There is good connectivity from the site to patches of local ancient semi-natural broadleaved woodland, as well as a conifer plantation. Connectivity to the wider landscape is mainly via the river, fringed with mature broadleaved woodland along sections of its bank, running west to east on site. The river on the site follows a natural meandering course only channelled through a small section under a bridge at the far eastern end of site. The site has large standard trees in the fields, as well as in the hedgerows and boundaries which connect to the adjacent land (including woodland and scrub).

The original Phase 1 habitat survey map with boundaries is presented in Figure 1.

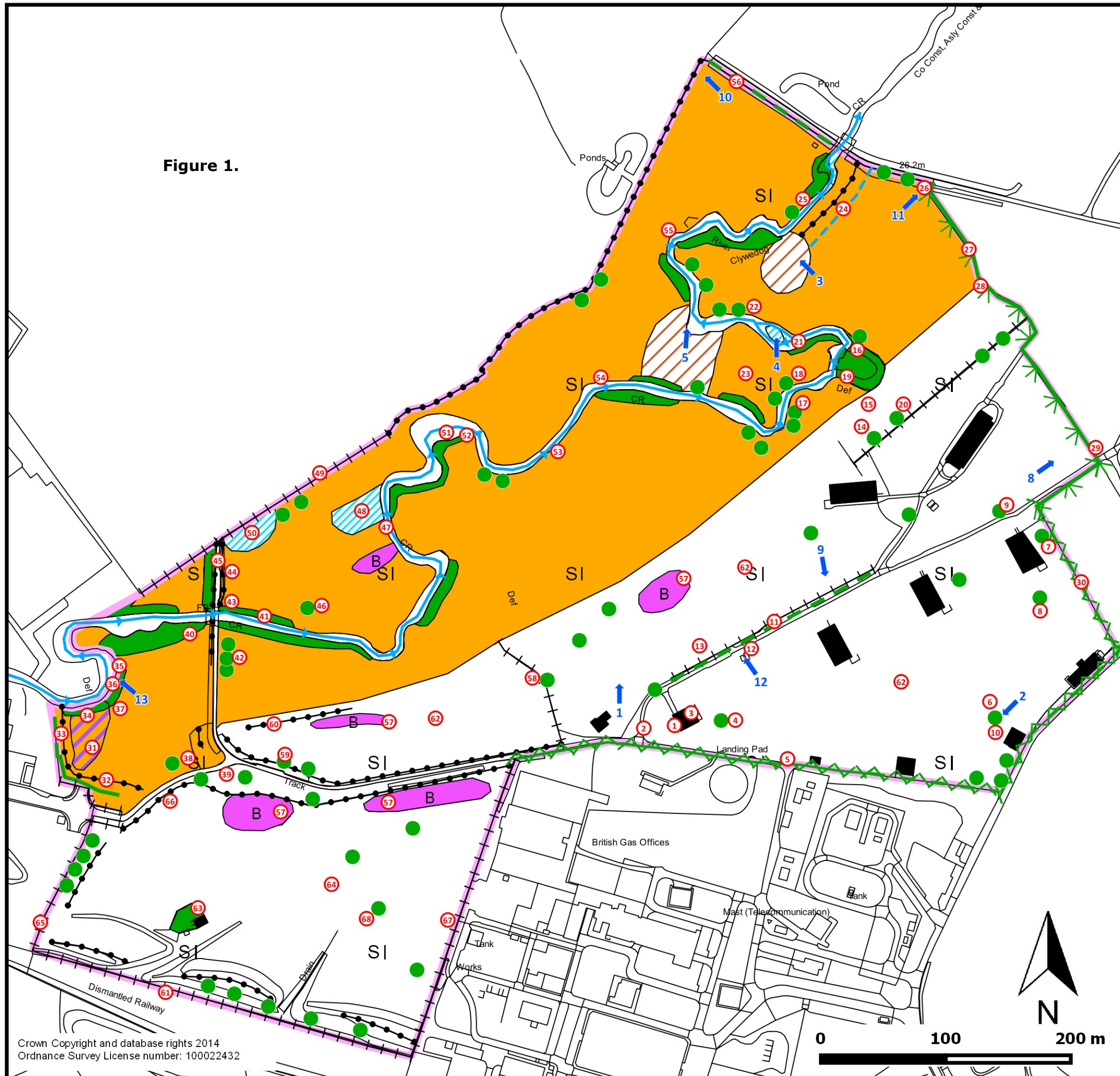
3.0 Habitat management prescriptions

This habitat management plan includes the management of existing habitats within the development site boundary, as well as those located within the wider landholding. The floodplain area along the River Clywedog and the area to the north-east of the solar PV array have been allocated as a 'GCN Mitigation Area'. This plan also covers the management of habitats created during the groundworks/enabling works and construction phases.

The management of both the existing and newly created habitats will be undertaken throughout the 25 year lifespan of the operational phase of the solar PV array. Monitoring will also be undertaken throughout the operational lifespan of the development (covered in section 4.0); this monitoring will inform and influence the ongoing management of the habitats.

Figure 2 presents the site layout map with the habitat management prescriptions.

Figure 1.



Key

- | | |
|---|---|
|  | Semi-natural broad-leaved woodland |
|  | Semi-improved neutral grassland |
|  | Poor semi-improved grassland |
|  | Marshy grassland |
|  | Basic flush |
|  | Tall ruderal |
|  | Inundation vegetation |
|  | Marginal vegetation |
|  | Buildings |
|  | Native species-rich hedgerow |
|  | Native species-rich hedgerow and trees |
|  | Species-poor hedgerow |
|  | Defunct hedgerow, native species-rich |
|  | Defunct hedgerow, species-poor |
|  | Running water |
|  | Dry ditch |
|  | Earth bank |
|  | Fence |
|  | Standard trees (Parkland and scattered trees) |
|  | Target notes |
|  | Photograph number & direction |
|  | Site boundary |

Williams Farm Solar Farm Phase 1 Habitat Map

Client: Solar Ventures Limited

Location: SJ 38153 48382

Mapped by: KD GIS mapping: FFM

Issued: 07.11.2014

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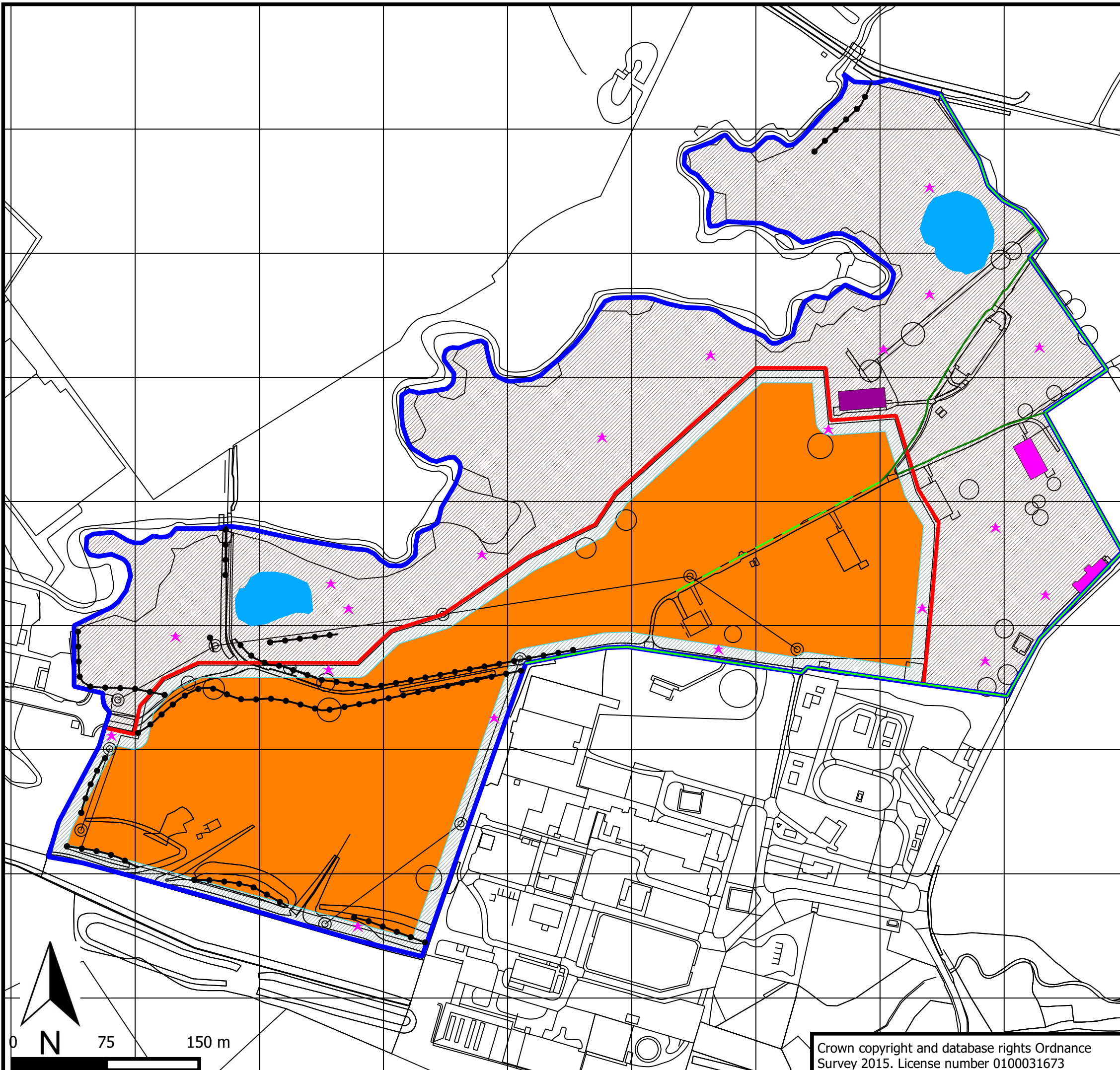
Key

- Development site boundary
- Ownership boundary
- Pond to be created
(exact location to be determined)
- Building to contain bat roost
- Building to contain Barn Owl "nest" box
- Restored semi-improved grassland - with
retained stone/wood piles and earth banks
- Ecological corridor
- GCN Mitigation Area
- Hedge to be created
- Defunct hedge to be reinstated
- Existing hedgerow
- Earth bank
- Refugia for GCN
(exact locations to be determined)

**William's Farm Solar PV Array
Habitat Management Map**
Client: Solar Ventures Limited
Location: SJ 37993 48290
Mapped by: SB
GIS mapping: DJH
Issued: 15.10.2015

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3.1 Management of existing habitats within the development site

3.1.1 Semi-improved grassland under solar panels

The semi-improved grassland throughout the development site is currently grazed by sheep. This habitat will be seriously disturbed during the construction phase. Once construction has been completed and all materials, machinery and equipment have left site, the area will be left to recolonise with plant species (seed should remain in the topsoil). As this grassland was poor semi-improved grassland it will be aided in recolonisation, and in an attempt to improve the quality of the habitat, a native, locally-sourced species-rich seed mix will be sown or green hay laid between the panels. This seed/hay will be collected from a traditionally managed grassland site close to the site itself.

If this fails, a commercial seed mix will need to be purchased. This will be a mix suitable for loamy and clayey soil (as indicated for the area on the Soilscales website). A suitable seed mix would therefore be 'EM5 – Meadow Mixture for Loamy Soils' from Emorsgate Seed (www.wildseed.co.uk), with species composition as follows:

- Common Bent (*Agrostis capillaris*): 10%
- Sweet Vernal-grass (*Anthoxanthum odoratum*): 1%
- Quaking-grass (*Briza media*): 3%
- Crested Dog's-tail (*Cynosurus cristatus*): 32%
- Sheep's Fescue (*Festuca ovina*): 32%
- Red Fescue (*F. rubra*): 20%
- Smaller Cat's-tail (*Phleum bertolonii*): 4%
- Yarrow (*Achillea millefolium*): 0.5%
- Common Knapweed (*Centaurea nigra*): 2.5%
- Lady's Bedstraw (*Galium verum*): 1.5%
- Meadow Crane's-bill (*Geranium pratense*): 0.4%
- Field Scabious (*Knautia arvensis*): 1%
- Rough Hawkbit (*Leontodon hispidus*): 0.5%
- Oxeye Daisy (*Leucanthemum vulgare*): 1%
- Common Bird's-foot Trefoil (*Lotus corniculatus*): 1.5%
- Musk Mallow (*Malva moschata*): 0.5%
- Ribwort Plantain (*Plantago lanceolata*): 1%
- Hoary Plantain (*P. media*): 0.5%

Cowslip (*Primula veris*): 0.5%

Selfheal (*Prunella vulgaris*): 2%

Meadow Buttercup (*Ranunculus acris*): 2.5%

Yellow Rattle (*Rhinanthus minor*): 1.5%

Common Sorrel (*Rumex acetosa*): 1%

Bladder Campion (*Silene vulgaris*): 1.6%

Seed would be surface sown in the autumn or spring and firmed in using a roller.

The grassland would be left to develop over the first growing season, with one cut mid-summer, with the ensuing cut vegetation removed. In subsequent years the grassland will be managed by sheep grazing; no grazing will take place from spring until late July/August to allow flowering to occur.

The sheep will graze different sections of the site at different times, creating areas of different length grass across the site and thereby producing a mosaic of different habitats within the site, thus benefiting invertebrates, birds and small mammals.

No artificial inputs, such as artificial pesticides and fertilisers, should be applied on site, particularly on the floodplain grassland within the riparian zone. This helps to maintain and improve the floristic diversity.

3.1.2 Management of ecological corridor

A 12 metre ecological corridor around the perimeter of the development will be in place (this forms CEZs during the groundworks/enabling works and construction phases of the development). The grassland in this corridor will be allowed to grow longer and develop a more tussocky nature. It will be managed by topping at a height of at least 13 cm in a three-year rotation. This will benefit many species including invertebrates, amphibians and reptiles, small mammals and therefore hopefully the Barn Owl (*Tyto alba* subsp. *alba*).

No artificial inputs, such as artificial pesticides and fertilisers, should be applied on site, particularly on the floodplain grassland within the riparian zone. This helps to maintain and improve the floristic diversity.

3.1.3 Management of existing hedgerows

Gaps in the existing boundary hedgerows will be in-filled with a mix of Hawthorn (*Crataegus monogyna*), Blackthorn (*Prunus spinosa*), Hazel (*Corylus avellana*), Field Maple (*Acer campestre*), Elder (*Sambucus nigra*), Pedunculate Oak (*Quercus robur*), Dog-rose (*Rosa canina* agg.) and Holly (*Ilex aquifolium*) – reflecting the diversity of species in the local hedgerows. Planting will take place during the winter months and 'whips' (bare-rooted stock) will be utilised.

The native species-poor defunct hedgerow on site that follows a track running south-west – north-east across the site, will be planted up with the above mentioned species to form an intact hedgerow (at present this hedge comprises only Hawthorn). This hedge will be extended eastwards to link up with the existing hedgerow network (see section 3.2.3 below).

The existing native hedges will not be trimmed more frequently than once every three years and will be kept at least 1.2 metres high. The management will aim to create a tapered 'A-shaped' hedgerow, encouraging denser growth, and cutting will take place during the winter months, thus avoiding the bird breeding season (which extends from March to September, inclusive). The hedges will be trimmed in rotation over a four year period, thus ensuring that the hedges are at different stages of growth etc. at any one time.

Dead wood will not be removed as this is beneficial for many species groups, particularly amphibians (including Great Crested Newts) and reptiles, invertebrates and fungi. The dead wood will be used to create wood piles for refugia (see section 3.1.4 below).

3.1.4 Maintain existing stone/wood piles and earth banks on site as refugia

The brick/stone and wood piles should be retained on site as these provide refugia and hibernacula for reptiles and amphibians. These exist adjacent to a number of the buildings on site. Any wood will be replaced as it rots down; cuttings from the hedgerow management will be used.

Earth banks are found around the edge of the southern-most area of semi-improved grassland (see target note 60 on the original Phase 1 habitat map (Figure 1)). These earth banks will be left untouched and will be managed as per the grassland management surrounding them.

3.2 Management of existing habitats within the wider landholding ('GCN Mitigation Area')

3.2.1 Grassland areas

The river and associated riparian habitats, including the semi-improved neutral grassland within the floodplain, are diverse and collectively form the richest area for biodiversity on site, including marshy grassland, tall ruderal and broadleaved woodland. Together with the semi-improved neutral grassland to the north-east of the development site, this riparian zone forms the 'GCN (Great Crested Newt) Mitigation Area'.

The aim of the grassland management will be provide a floristically-rich habitat with varied structure. A 'traditional' hay cut during hot dry weather in mid-summer (June or July) will be carried out annually, with the cuttings being removed, in combination with autumn and spring grazing by sheep. When cut,

the 'hay' will be left to dry and shed seed for one to seven days then it will be removed from the site. Different sections of the site will be grazed by sheep at different times. This would create areas of different length grass across the site and thereby producing a mosaic of different habitats within the site, thus benefiting invertebrates, birds and small mammals, as well as the Great Crested Newts and other amphibians.

No artificial inputs, such as artificial pesticides and fertilisers, should be applied on site, particularly on the floodplain grassland within the riparian zone. This helps to maintain and improve the floristic diversity.

This area of longer vegetation provides foraging opportunities for reptiles and amphibians during their terrestrial stage.

3.2.2 Hedgerows

Gaps in the existing boundary hedgerows will be in-filled with a mix of Hawthorn (*Crataegus monogyna*), Blackthorn (*Prunus spinosa*), Hazel (*Corylus avellana*), Field Maple (*Acer campestre*), Elder (*Sambucus nigra*), Pedunculate Oak (*Quercus robur*), Dog-rose (*Rosa canina* agg.) and Holly (*Ilex aquifolium*) – reflecting the diversity of species in the local hedgerows. Planting will take place during the winter months and 'whips' (bare-rooted stock) will be utilised.

The existing native hedges will not be trimmed more frequently than once every three years and will be kept at least 1.2 metres high. The management will aim to create a tapered 'A-shaped' hedgerow, encouraging denser growth, and cutting will take place during the winter months, thus avoiding the bird breeding season (which extends from March to September, inclusive). The hedges will be trimmed in rotation over a four year period, thus ensuring that the hedges are at different stages of growth etc. at any one time.

Dead wood will not be removed as this is beneficial for many species groups, particularly amphibians (including Great Crested Newts) and reptiles, invertebrates and fungi. The dead wood will be used to create wood piles for refugia (see section 3.3.2 below).

3.3 Creation of new habitats

The new habitats will be created during both the groundworks/enabling works and construction phases.

3.3.1 Pond creation

Two new ponds will be created in the GCN Mitigation Area once the GCN derogation licence has been granted. These will be in place before any Great Crested Newts are translocated to this area from the development site.

Both ponds will have surface areas between 150 and 250 metre squared; with

varying depths and sloping sides. They will be left to self colonise, with a mix of marginal, submerged and floating vegetation, with some areas of open water. Woody species, including Hawthorn (*Crataegus monogyna*), Willow species (*Salix* spp.) and Alder (*Alnus glutinosa*) will be planted on the north, east and/or west sides, where necessary, to provide a degree of shading and cover for the Great Crested Newts and other amphibians, adjacent to the ponds.

The spoil arising from digging of the two ponds will be left on site as uncompacted banks, and some will be mixed with stones, rubble etc. to form the new refugia (see section 3.3.2).

3.3.2 Creation of refugia for Great Crested Newts

Refugia and hibernacula for Great Crested Newts, other amphibians and reptiles will be created within the GCN Mitigation Area and the 12 metre ecological corridor within the development site. A minimum of ten refugia will be created from rubble, rocks, logs and earth and will be located in the shelter of the hedgerows and mature trees (the exact sitings will be determined by ecologists on site). The spoil arising from digging of the two ponds will be mixed with stones, rubble etc. to form some of the new refugia.

The specifications for the refugia will follow the guidance in the Great Crested Newts Mitigation Guidelines (English Nature, 2001) and the Great Crested Newt Conservation Handbook (Langton *et al*, 2001). The dimensions will not be less than two metres length by one metre width and one metre height.

3.3.3 Extension of existing hedge

Two new sections of hedgerow will be planted, linking the existing native species-poor defunct hedgerow (which will be gapped up (see section 3.1.3 above)) with the hedgerow running north-south to the east of the development site. One new section will run north-eastwards along a track from the existing defunct hedge and the other will continue eastwards from said hedge, again along a track. A mix of Hawthorn (*Crataegus monogyna*), Blackthorn (*Prunus spinosa*), Hazel (*Corylus avellana*), Field Maple (*Acer campestre*), Elder (*Sambucus nigra*), Pedunculate Oak (*Quercus robur*), Dog-rose (*Rosa canina* agg.) and Holly (*Ilex aquifolium*) will be planted, reflecting the diversity of species in the local hedgerows. Planting will take place during the winter months and 'whips' (bare-rooted stock) will be utilised. Any whips that die will be replaced at the end of the first and second growing seasons.

These hedges will be allowed to grow to at least 1.2 metres high, with the management aiming to create a tapered 'A-shaped' hedgerow, encouraging denser growth.

Once established, these hedges will be trimmed in rotation over a four year

period, thus ensuring that the hedges are at different stages of growth etc. at any one time. Cutting will take place during the winter months, thus avoiding the bird breeding season (which extends from March to September, inclusive).

Dead wood will not be removed as this is beneficial for many species groups, particularly amphibians (including Great Crested Newts) and reptiles, invertebrates and fungi. The dead wood will be used to create wood piles for refugia (see section 3.3.2 above).

3.3.4 Creation of bat roosts

Some of the buildings on site have bat roosting potential, providing a dark, cool, damp environment with a constant temperature suitable for hibernating bats. Two of the buildings are closed with small entrance holes and have roosting opportunities inside where brickwork has deteriorated and lost its mortar, thus providing suitable cavities.

Two buildings within the GCN Mitigation Area will be improved to provide ideal conditions for hibernating bats. The two buildings selected (see Figure 2) are located close to existing hedgerows and mature trees. These buildings will be partly boarded-up, allowing access to just bats (and nesting birds); this would create a more secure and stable environment. Bat Conservation Trust guidance will be followed.

Bat boxes, such as the Kent Bat Box or the Schwegler Bat Box, will also be installed on trees without roosting potential to encourage bat roosting on the site. A minimum of ten boxes will be erected on site. Bat Conservation Trust guidance will be followed.

3.3.5 Barn Owl nest box

One of the buildings within the GCN Mitigation Area (the most north-western one (see Figure 2 above)) will be adapted for use by the Barn Owl (*Tyto alba* subsp. *alba*) by incorporating a nest box within it. The Barn Owl Trust recommend that construction of nest boxes for Barn Owl should be the priority conservation action in this area (please refer to the map on the Barn Owl Trust website www.barnowltrust.org.uk). The entrance for the Barn Owl will face the open areas to the north and east of the site. Barn Owl Trust guidance will be followed regarding the construction and placement of the nest box within the building.

3.4 Management of invasive non-native plant species

Himalayan Balsam (*Impatiens glandulifera*) was found along both banks of the River Clywedog throughout its course within the wider landholding (the 'GCN Mitigation Area'). As this plant species is listed on Schedule 9 of the Wildlife and Countryside Act 1981 (as amended), all plants of this species will be removed so as to control its spread. The seedbank lasts for approximately 18

months, so two years control should eradicate the plant if there is no further infestation from upstream.

See target notes 17 and 50 on the original Phase 1 habitat map (Figure 1).

4.0 Monitoring

Monitoring will be undertaken throughout the operational lifespan of the development (25 years). This monitoring will inform and influence the ongoing management of the habitats. It will also inform the decommissioning phase at the end of the operational phase.

Table 1 presents the monitoring required for this development, including the monitoring of protective measures and habitat creation during the groundworks/enabling and construction phases, as well as botanical and Great Crested Newt surveys during the operational phase. The bat roosts, bat boxes and Barn Owl nest box will also be checked for the use by the relevant species.

Sarah Board BSc (Hons) MSc MCIEEM

Ecologist

pp.



Peter McCann-Downes BSc (Hons) ACSM

Director

For The Magnificent Science Company Limited, October 02015

Table 1. Monitoring requirements.

Protective / enhancement measure	Monitoring requirement		
	Groundworks/enabling works (spring 2016)	Construction phase (late spring / summer 2016)	Operational phase (late summer 2016 onwards)
1. Grassland management under solar panels.	N/a	1. ECoW ¹ to oversee recolonisation of grassland, seeding if required.	1. Ecologist/ECoW ¹ to check implementation of management regime annually for the first six years then every three years. 2. Botanical survey of new grassland areas undertaken by suitably qualified ecologist(s) annually in June for the first five years then every five years.
2. Management of ecological corridor.	1. Creation of ecological corridor (CEZs) overseen by ECoW ¹ . 2. Creation of refugia for herptofauna overseen by ECoW ¹ .	1. ECoW ¹ to check on the maintenance of the ecological corridor (CEZs).	1. Ecologist/ECoW ¹ to check implementation of management regime (topping) annually for the first six years then every three years. 2. Botanical survey of new grassland areas undertaken by suitably qualified ecologist(s) annually in June for the first six years then every three years.
3. Management of existing hedgerows.	N/a	1. ECoW ¹ to oversee in-filling of gaps in all existing hedges.	1. Ecologist/ECoW ¹ to check implementation of management regime annually for the first six

Key:

¹ ECoW – Ecological Clerk of Works

Table 1. Monitoring requirements.

			years then every three years.
4. Maintenance of existing stone/wood piles.	1. ECoW ¹ to check on the maintenance of the existing stone/wood piles.	1. ECoW ¹ to check on the maintenance of the existing stone/wood piles.	1. Ecologist/ECoW ¹ to check on the maintenance of the existing stone/wood piles.
5. Management of 'GCN Mitigation Area'.	1. ECoW ¹ to oversee pond creation. 2. Creation of refugia for herptofauna overseen by ECoW ¹ . 3. ECoW ¹ to check implementation of management regime annually for the first six years then every three years.	1. ECoW ¹ to check implementation of management regime.	1. Ecologist/ECoW ¹ to check implementation of management regime annually for the first six years then every three years. 2. Botanical and GCN surveys of ponds undertaken by suitably qualified ecologist(s) annually for the first six years then every three years.
6. Extension of existing hedge.	N/a	1. ECoW ¹ to oversee extension of existing hedge eastwards.	1. Ecologist/ECoW ¹ to check growth of new hedge at end of first and second growing seasons. 2. Ecologist/ECoW ¹ to check implementation of management regime annually for the first six years then every three years.
7. Creation of bat roosts/erection of bat boxes.	N/a	1. ECoW ¹ to oversee the creation of bat roosts and the erection of bat boxes.	1. Bat surveys undertaken by suitably qualified ecologist(s) every three years.

Key:

¹ ECoW – Ecological Clerk of Works

Table 1. Monitoring requirements.

8. Erection of Barn Owl nest box.	N/a	1. ECoW ¹ to oversee the erection of a Barn Owl nest box.	1. Nest box checked by suitably qualified ecologist(s) every three years.
9. Removal of Himalayan Balsam plants.	1. ECoW ¹ to oversee the removal of all Himalayan Balsam plants.	1. ECoW ¹ to oversee the removal of all Himalayan Balsam plants.	1. Ecologist/ECoW ¹ to monitor the presence of Himalayan Balsam plants every three years.

Key:

¹ ECoW – Ecological Clerk of Works

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