



Appendix 20 Ecological Update

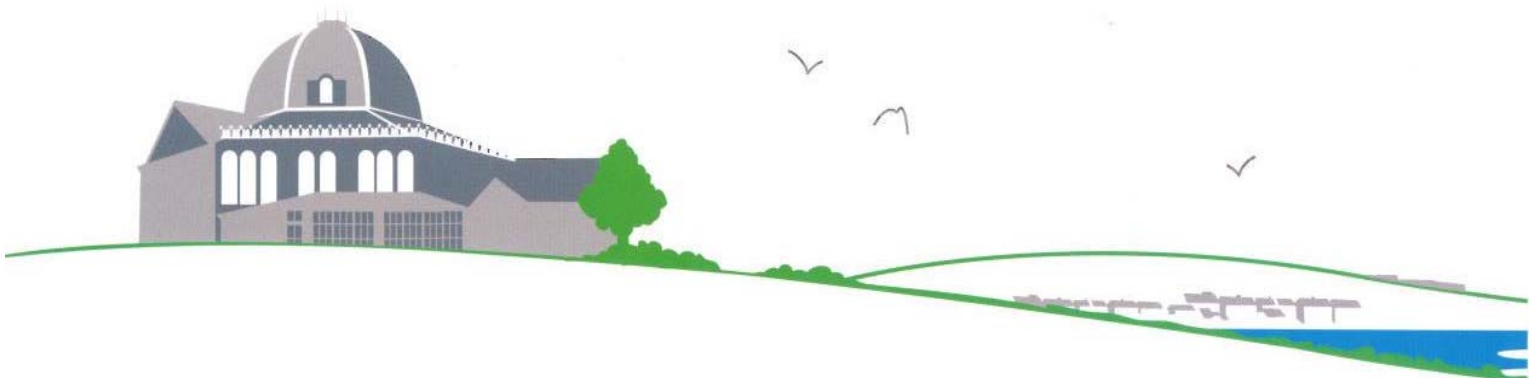
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MDG DESIGN

HOME FARM, LLAY

GREAT CRESTED NEWT
ASSESSMENT AND MITIGATION



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This project has been undertaken in accordance with PAA policies and procedures on quality assurance.

Signed: _____



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- 1 Summary of the Legislation Relating to Great Crested Newts
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1. INTRODUCTION

- 1.1 Penny Anderson Associates Ltd (PAA) was commissioned in June 2016 by MDG Architects to carry out a great crested newt (GCN) assessment at a site referred to as Home Farm in Llay, near Wrexham where there is a proposal for residential development (hereafter referred to as the 'site').
- 1.2 Great crested newts are a European protected species and a material consideration in the planning process. Developments and building works have the potential to harm GCN e.g. through the loss and fragmentation of habitat, loss of waterbodies used for breeding, pollution, increasing shade and siltation of waterbodies. To avoid harm to GCN and an infringement of wildlife law, suitable mitigation should be provided (further details of legislation that protects GCN is presented in Appendix 1).
- 1.3 The status of any GCN population present should be established to enable an assessment of the potential impact of the development on GCN and supporting habitat and to inform appropriate mitigation to maintain the favourable status for the species. Natural Resources Wales (NRW) issues licenses under regulation 53 of the Habitats regulations to permit works within the law (Natural resources Wales 2016).
- 1.4 Numbers of GCN are declining in the UK despite full European and domestic-level protection (Langton *et al.* 2001). However, studies in using GIS output models from a number of earlier reports indicate the main hotspots for great crested newt occurrence in Wales include north Denbighshire, Flintshire and northern Wrexham (French *et al.* 2014).
- 1.5 An ecological assessment (TEP 2014) identified a number of waterbodies within the proposed development site and in the immediate vicinity and a recommendation was made that the waterbodies should be surveyed for the presence of great crested newts (*Triturus cristatus*). (Please note that for consistency and to facilitate comparison, the pond numbering used in this report is the same as that adopted in the TEP (2014) report (see Appendix E: *HSI Results and Pond Locations* drawing 4358.01.001).
- 1.6 However, in order to estimate the population size class i.e. whether a small, medium or large population, to meet best practice guidance, surveys need to be carried out between mid-March and mid-June with at least three visits in the peak season (usually mid-April to mid-May). The opportunity was missed this year and the survey used environmental DNA to establish presence or absence.
- 1.7 This report presents the results of a Habitat Suitability Index (HSI) survey of the waterbodies within the proposed development site and a 250m area around the site, and the results of a presence/absence survey of the waterbodies using Environmental DNA (eDNA). Furthermore it outlines a GCN mitigation strategy based on the results of the eDNA survey and a site walkover habitat assessment carried out in September of this year.

Site Description

- 1.8 The site is approximately 12ha (central grid reference SJ 33707 56243) and bounded by Straight Mile to the north, Gegin Lane to the south-east, Gresford Road (B5373) to the south-west and open pasture to the east (see Figures 1 and 2). To the west of the B5373 lies a residential and industrial area. The site itself is comprised largely of improved grassland, small areas of scrub and mature trees with some hardstanding. Field boundaries consist uniformly of species-poor hedgerows.

2. METHODS

Desk Study

- 2.1 A desk study was carried out as part of the ecological assessment of the site (TEP 2014) and historic records for protected species and designated wildlife sites were gathered from a number of sources including MAGIC Map¹ and CAFNOD, which is the Local Environmental Records Centre for North Wales.

Field Surveys

- 2.2 The HSI assessment and eDNA water sampling were carried out by Principal Ecologist Paul Fisher (Natural Resources Wales Licence registration No. 71854:OTH:SA:2016 and NE class licence registration No. 2016-20125-CLS-CLS) assisted by Ecologist Hazel Robson (NE class registration No. 2016-20265-CLS-CLS), on 13th June 2016. This is within the newt breeding season and the advised optimum period for sample collection, which is mid-April to the end of June.
- 2.3 The HSI assessment and eDNA analysis was carried out on waterbodies within the site and those up to 250m from the site boundary. Newts disperse over land to forage and the distances covered vary widely depending on the quality of habitat and accessibility. Barriers to movement include roads, rivers, built-up areas and large expanses of bare ground or sparse vegetation. Guidelines suggest that terrestrial habitat should be considered within approximately 250m of any areas likely to be affected by development, as the majority of adult newts are likely to stay within 250m of the breeding pond. Nevertheless, newts may move further if there are areas of high quality foraging habitat and suitable refugia available (Langton 2001, ARG UK 2010).

HSI Assessment

- 2.4 The ponds were assessed for potential to support GCN using the Habitat Suitability Index (HSI) method (Oldham 2000, ARG UK 2010). The HSI is a measure of habitat suitability and is calculated by allocating scores to a range of factors that reflect the potential suitability of a waterbody to support GCN. These include the geographical location of the waterbody, the number of waterbodies within 1km, surface area and permanence, biological water quality, shading, presence of fish and birds, coverage of macrophytes and the suitability of surrounding terrestrial habitat. The resulting HSI score cannot be used to confirm the presence of GCN, and it should not be used as a substitute for a full survey where one is needed. However, the score ranges from 0 (completely unsuitable) to 1 (highly suitable) and represents a useful tool when considering the potential of a site to support GCN, and the need for further more detailed investigation. Brady (2006) provides a system for using HSI scores to define pond suitability for GCN on a categorical scale where:

- < 0.5 = poor

¹ The MAGIC website provides geographic information about the natural environment. It is presented in an interactive map which can be explored using a number of mapping tools <http://www.magic.gov.uk/magicmap.aspx>

- 0.5-0.59 = below average
- 0.6-0.69 = average
- 0.7-0.79 = good
- >0.8 = excellent

- 2.5 The ecology assessment (TEP 2014) concluded that GCN dispersal to the site from the south-west was highly unlikely as the industrial and residential land use and the B5373 road represent significant barriers to movement. The report also indicated that there are no significant obstructions elsewhere to amphibian migration and the intervening habitat of grassland, scrub and hedgerows provide suitable terrestrial habitat for GCN.

Environmental DNA GCN Survey

- 2.6 The use of eDNA is a fairly recent technique developed for detecting the presence or absence of GCN. Sources of eDNA include GCN mucous, shed skin and faeces in the waterbody. It has a number of potential advantages over traditional detection methods that require at least four surveys deploying bottle traps, egg searching, torching and netting. GCN are a relatively cryptic species and traditional techniques may not always be effective in detecting presence or establishing absence. Recent research has shown that the DNA can be detected in water samples at very low concentrations using qPCR (quantitative Polymerase Chain Reaction) methods (Biggs *et al.* 2014a). An evaluation of the use of eDNA in detecting the presence of GCN in ponds found that the technique was successful in identifying GCN 99.3% of the time where it was known that newts were present (Biggs *et al.* 2014b). Nevertheless, negative results may be because eDNA is present but at levels below the detection limits of the methods. Similarly, positive results may be due to contamination of the samples.
- 2.7 The survey method followed technical advice and field protocols for staff collecting water samples (Biggs *et al.* 2014a, Natural Resources Wales 2016). Sampling kits were obtained from The United Kingdom Accreditation Service (UKAS) accredited SureScreen Scientifics laboratory, collected samples were stored at room temperature and analysed within four days of delivery.

Field Sampling Protocol

- 2.8 The field kits include sampling tubes with preservative, sterile gloves, sampling ladle, transfer pipette and self-supporting bag (Whirl-Pak bag). Care was taken during the sampling to ensure there was no cross-contamination of water from one pond to another. Surveyors did not enter the water to prevent disturbance of the pond sediment. The sampling protocol followed the steps outlined below:
- 20 samples were taken from each pond and pond cluster, taking sub-samples at evenly spaced intervals, targeting areas where there was vegetation that may be used for egg laying and, where possible, more open water where newts might display;
 - the water column was mixed gently and samples taken close to the bottom of the pond;

- 20 samples of 30mL of pond water were taken from around the ponds using the ladle and emptied into the Whirl-Pak bag, which was shaken for 10 seconds to mix any DNA across the whole sample;
- wearing sterile gloves to avoid contamination, the transfer pipette was used to take about 15mL of water from the Whirl-Pak bag and transferred to a sterile tube containing 35mL of ethanol to preserve the eDNA sample;
- the tube was capped and shaken for 10 seconds to mix the sample and the preservative;
- the procedure was repeated for the six conical tubes in the kit; and
- samples were refrigerated overnight and dispatched by courier to the laboratory the following day.

2.9 Please refer to Figures 1 and 2. Ponds 4, 5, 6, 7, 8, 9, and 10 form a cluster of waterbodies connected by narrow channels (Pond 4, which is part of the cluster, could not be accessed). Ponds 5, 6 and 7 effectively formed a single waterbody and were sampled together. Ponds 8, 9 and 10 were also sampled as a single waterbody. Ponds 2 and 11 were isolated and sampled separately. Pond 3, which is a drainage ditch, was found to be dry. Pond 1 that features on the map was found to be a depression in the field and not a waterbody, although the land owner reported that it will hold water following very heavy rain but this is infrequent and very short-lived. This was confirmed during the site walkover with no evidence of aquatic or marshy species (Plate 1). Access to pond 12 and the pond referred to as 'Pond at The Courtyard' west of the site was not available. A total of four sampling kits were used.

Site Walkover Habitat Assessment

2.10 The walkover survey was carried out by Principal Ecologist Paul Fisher (MCIEEM)² and Principal Environmental Scientist Gerard Hawley (MCIEEM) on 13th September 2016. The specific purpose was to assess terrestrial habitat suitability for GCN around the ponds and review the land between the ponds and the proposed development footprint to assess habitat functionality with regard to GCN foraging, dispersal and hibernation. Furthermore, features were appraised for their potential to assist or obstruct GCN movement.

Limitations

2.11 The HSI assessment can be undertaken throughout the year. The eDNA sampling took place within the optimum period, which is mid-April to the end of June. Steep banks and dense bankside vegetation made safe access to some of the pond edges impractical. However, there was sufficient access available to all the ponds, with the exception of Ponds 4 and 12, so that representative samples could be taken. It rained during the latter half of sampling but it was not persistent or heavy enough to disturb sediment or hamper access. Collection protocols were strictly followed and the results of the surveys are considered to be valid. Access to the whole of the site was available during the site walkover survey, which was carried out in mild and dry weather, within the growing season when plant

² Member of the Chartered Institute of Ecology and Environmental Management.

identification was not significantly hampered. It is considered that there were no significant limitations.

3. RESULTS

Desk Study

- 3.1 Four records for GCN were returned dated 2003 (two records) and 2007 (seven records) at three locations. In all cases the records are for waterbodies to the west of the site at 1.2km, 1.4km and 1.6km.

HSI Assessment

- 3.2 The full results of the HSI surveys are provided in Appendix 2 and are collated in Table 1 below.

Table 1 Home Farm HSI Results

Pond ref	P2	P4	P5	P6	P7
SI1 - Location	1	1	1	1	1
SI2 - Pond area	0.4	0.4	0.4	0.4	0.9
SI3 - Pond drying	0.5	1	1	1	1
SI4 - Water quality	0.67	0.67	0.67	0.67	0.67
SI4 - Shade	0.6	0.6	0.6	0.6	0.6
SI6 - Fowl	0.67	0.67	0.67	0.67	0.67
SI7 - Fish	1	0.67	0.67	0.67	0.67
SI8 - Ponds	1	1	1	1	1
SI9 - Terrestrial habitat	1	1	1	1	1
SI10 - Macrophytes	0.9	0.4	0.4	0.4	0.4
HSI	0.74	0.70	0.70	0.70	0.76
Pond ref	P8	P9	P10	P11	
SI1 - Location	1	1	1	1	
SI2 - Pond area	0.5	0.6	0.9	0.4	
SI3 - Pond drying	1	1	1	0.5	
SI4 - Water quality	0.67	0.67	0.67	0.67	
SI4 - Shade	0.6	0.6	0.6	0.6	
SI6 - Fowl	0.67	0.67	0.67	1	
SI7 - Fish	0.67	0.67	0.67	1	
SI8 - Ponds	1	1	1	1	
SI9 - Terrestrial habitat	1	1	1	1	
SI10 - Macrophytes	0.6	0.5	0.5	0.9	
HSI	0.75	0.75	0.78	0.77	

- 3.3 As the table above shows the ponds recorded similar scores ranging from 0.7 to 0.78. This indicates 'good' pond suitability.

Environmental DNA GCN Survey

- 3.4 The laboratory report is presented as Appendix 3. It describes the laboratory testing methodology and the results, which are summarised in the table below.

Table 2 Home Farm eDNA Analysis Results

Ponds/pond Clusters	OS Co-ordinates	Inhibition Check	Sample Integrity	Result
2	SJ 34142 56445	Acceptable	Acceptable	Negative
5, 6 and 7	SJ 33929 56611	Acceptable	Acceptable	Positive
8, 9 and 10	SJ 33929 56610	Acceptable	Acceptable	Negative
11	SJ 34150 56002	Acceptable	Acceptable	Negative

- 3.5 The sample integrity was satisfactory and the laboratory inhibitor and sample integrity checks were assessed as acceptable. The cluster that includes ponds 5, 6 and 7 had a positive result. Provided the water samples are taken correctly to avoid cross-contamination eDNA analysis is extremely accurate.

Site Walkover Habitat Assessment

- 3.6 The site predominantly consists of improved grassland dominated by perennial rye-grass (*Lolium perenne*) much of which is grazed by cattle and managed (Plates 2 and 3). Field boundaries consist of predominantly species-poor, largely intact hedgerows dominated by hawthorn (*Crataegus monogyna*) (Plates 2 and 3). The single waterbody within the development footprint is the ephemeral ditch (P3) located along the boundary of the site with Gresford Road (B5373) and this was dry at the time of survey (Plate 4).
- 3.7 The conclusion of the habitat assessment was that the managed grassland does not provide high value terrestrial GCN habitat and the hedgerows are more likely to provide foraging opportunities and migration corridors for GCN.

4. DISCUSSION AND RECOMMENDATIONS

Discussion

- 4.1 The HSI results for the waterbodies indicated 'good' suitability for all of the ponds assessed and the site at Home Farm is in an area of the UK that has a high density of small waterbodies and a relatively high population of GCN (Wilkinson *et al.* 2011, French *et al.* 2014).
- 4.2 Ponds P2 and P8 to P11 had a negative result for GCN presence
- 4.3 However, the pond cluster 5, 6, and 7, which is within 250m of the site, returned a positive result for GCN presence. These ponds are approximately 170m to the north east of the site. The intervening terrestrial habitat between the ponds and the site is marginally suitable for GCN. However, the B5102 is a relatively busy road, which runs east-west along the northern boundary of the proposed development site, and is situated between the site and ponds 5, 6 and 7 (Plates 5 and 6).
- 4.4 It is difficult to assess with any degree of certainty the extent to which the B5102 represents an impediment to GCN migration, although it would seem reasonable to assume that it does to at least some extent. The terrestrial habitat immediately surrounding ponds 5, 6 and 7 evaluated as an element of the HSI assessment scored 'good' for each of the ponds (Table 1) and this would provide suitable terrestrial habitat and the potential for occupation by GCN in their terrestrial phase is high.
- 4.5 A number of studies (Langton 2002, Fahrig *et al.* 1995, Hels and Buchwald 2001) have established that roads are a major impediment to amphibian dispersal and survival. Some studies have found that even low traffic volumes may be sufficient to cause high levels of amphibian mortality. On a road in the Netherlands near a breeding pond for common toads (*Bufo bufo*), a flow of 10 vehicles per hour resulted in 30% mortality of migrating females and the author projected that a flow of 60 vehicles per hour would incur 90% mortality (van Gelder 1973).
- 4.6 Due to a high level of variation among species for mortality rates in response to traffic levels, mortality rates of some species can increase, decrease, or remain constant depending on the species. Mazerolle (2004) was able to detect interspecific variation in mortality rates at traffic flows as low as 5-26 vehicles per hour. Whilst traffic flow data were not available for this stretch of the B5102 it is anticipated, based on observations during the walkover survey, that vehicle traffic would significantly exceed the quoted figures.
- 4.7 Extrapolating from the study of toads, it might be appropriate to consider a higher mortality level for GCN as they would require greater time to traverse the road. Nevertheless it is possible that GCN may cross from the ponds into the site.
- 4.8 A General GCN Mitigation Strategy was submitted with the outline planning application and it is reported that the strategy had been developed following discussions with the Wrexham County Ecologist on 20th and 23rd February 2015. It recommends that in order to assess the potential impact of the proposed development on GCN, surveys are required to establish the status of the GCN population, should they be present. This could be through the 'traditional' approach that requires a minimum of four survey visits using bottle trapping, torching egg searching and/or netting with an additional two visits if GCN are found.

Alternatively, eDNA surveys can be used to establish presence/absence although traditional surveys methods would be needed to determine the population class size.

- 4.9 It is only once the waterbody surveys have been completed (see recommendations below) that estimates of the GCN population can be made. Even then it may be difficult to determine the extent of the area acting as functional GCN terrestrial habitat. The walkover survey showed that the site consists predominantly of managed grassland of relatively low ecological value with very little is given over to scrub. The improved grasslands are grazed and the land owners have reported that 8ha of the 12ha are cut twice a year for silage. If GCN are using the site this level of disturbance suggests that the hedgerows would provide more suitable foraging habitat than the open fields.
- 4.10 The eDNA survey carried out in June 2016 has established that at the time of survey there was no evidence of GCN within the development footprint and indeed, the waterbody P1 was dry and there was no evidence of it holding water for any significant length of time.
- 4.11 There is evidence of GCN presence for the pond cluster 5, 6, and 7, which is 170m away from the nearest point of the site. Straight Mile lies between the site and the waterbodies and, although it is difficult to be precise as to the extent, it does represent a barrier to movement.

Recommendations

- 4.12 In keeping with the recommendations given in the General GCN Mitigation Strategy, it is recommended that pond cluster 1 (P5, P6, P7, P8, P9 and P10) is surveyed using standard survey techniques (e.g. bottle traps, torching, egg search, netting) to determine the population size class for the purposes of obtaining a Natural Resource Wales licence to disturb GCN, if required, and to inform an appropriate mitigation strategy.
- 4.13 Ponds P2, P11, and the pond referred to as 'Pond at the Courtyard' (see Figures 1 and 2), should be subject to eDNA survey and, if GCN are detected, should be surveyed using traditional methods to estimate population size. If the results of the eDNA survey is negative, no further survey effort is required for ponds P2, P11 and the pond referred to as the 'Pond at the Courtyard.'
- 4.14 The waterbodies P1 and the ditch P3 should be included in the scope of the surveys. These have been found to be ephemeral but with wetter weather conditions they may fill and have the potential to support GCN.
- 4.15 Irrespective of the size of the GCN population, it is judged that the intervening habitats and road is not a barrier to GCN and that it is possible that GCN will cross from the cluster of ponds to the site.
- 4.16 Habitats within the site are generally of low quality for GCN, comprising grazed, improved grassland with few opportunities for feeding or shelter for GCN. Any GCN using the site are most likely to occur within the boundary hedgerows. These provide shelter for foraging, dispersal and hibernation.
- 4.17 There is no published guidance on the extent of a particular habitat that is likely to be used by GCN, or the number of GCN likely to use it. However, widely adopted best practice (English Nature 2001) is that any mitigation scheme should aim to provide replacement terrestrial habitat (i.e. habitats other than ponds, used by GCN) for mitigate for the loss of habitat within a development site.

- 4.18 No guidance is provided on the extent of replacement habitat that should be provided, except that new habitats should aim to replicate those lost in terms of quality and extent, with the objective of maintaining the overall status of the GCN population. It is usual practice for mitigation strategies for GCN to be developed on a case-by-case basis by the ecologist taking account of factors such as distance of the GCN population from the site, the number of GCN likely to be found within the site and the quality of habitats to be lost.
- 4.19 In this case, the majority of the proposed development site comprises low quality GCN habitat (grazed, improved grassland) that is unlikely to be used by GCN. It is therefore not appropriate or proportionate to attempt to replicate the loss of this habitat. Rather, the mitigation strategy should aim to retain those parts of the site that are most likely to be used by GCN (i.e. the boundary hedgerows and ditch) and provide small areas of new connecting habitat to provide a functioning habitat for GCN.
- 4.20 Additionally, these retained and new habitats should seek to incorporate enhancements for GCN so that although the overall extent of habitat may be reduced, the quality of habitat is improved.
- 4.21 The precise balance between extent and quality of habitat is a matter of professional judgement and is informed by the knowledge and experience of the ecologist.
- 4.22 An appropriate and proportionate mitigation strategy would be to retain as many of the boundary hedgerows as possible and incorporate new areas of suitably managed grassland/wetland features to provide a functioning habitat for GCN. The extent of new habitats can be relatively small, but the quality should be high. This is the approach that is presented in the proposed Masterplan (Dwg no 14.543-08 Ver 03).
- 4.23 In addition to providing suitable terrestrial habitat, the mitigation strategy must also avoid harm to individual GCN during site clearance and construction. Since the GCN population is 170m from the site and it is known that most GCN tend to with captured within 50m of their breeding ponds (English Nature 2004) the number of GCN likely to be present within the site is low. The mitigation strategy should therefore include measures to search for and remove GCN prior to site clearance. This can be done through a 'reasonable avoidance' approach e.g. searching for GCN by hand where the risk of finding individuals is very low, or through a programme of fencing and trapping GCN. The final approach will be dependent upon the results of a detailed population size class survey which will indicate the number of GCN that are likely to be present within the site.
- 4.24 In summary, mitigation may require some or all of the following:
- Installation of Temporary Amphibian Fencing (TAF) - around the perimeter to enclose the site and exclude GCN and to compartmentalise it with internal drift fencing to identify any patterns of use of the site by GCN. This may inform mitigation design for example.
 - Trapping (using pitfall traps at c.10m intervals and artificial refugia at c.10m intervals) to clear the site and translocate newts.
 - The provision of a suitable receptor site for the translocation of animals through trapping should be anticipated. This can be in the on site habitats that are to be retained in mitigation. A suitable candidate is the ditch P3, which was found to hold water in September 2016 although it was dry in June 2016. The landscape strategy identifies the southward extension of the tree/scrub line immediately to the north of P3. This would incorporate the pond into a lightly planted woodland strip, enhancing the functionality of

the immediate terrestrial habitat. It is recommended that P3 and its immediate terrestrial habitat is subject to restoration and enhancement works. A further more detailed site investigation is required but works could include:

- Removal of some of the existing aquatic and marginal vegetation to create more areas of open water;
- Thinning and removal of adjacent shrubs and young trees to decrease the shading levels and reduce infilling from leaf fall.
- Extension, widening, re-profiling and deepening of the channel to increase water volume and surface area and inhibit seasonal drying.
- The provision of an area around P3 of suitable terrestrial habitat for GCN that includes constructed hibernacula.
- In the event of trapping being required P3 and the surrounding terrestrial habitat should provide cover and dispersal function and act as a suitable area for the translocation of GCN and other amphibians.

4.25 In mitigating for the loss of terrestrial habitat it is advised that opportunities exist within the landscape design to improve habitat quality for GCN and other species (the landscape proposals are provided in the landscape and visual appraisal (BCA Landscape 2015) and Landscape and Visual (Landscape Strategy Section 6.5) given as proof of evidence as part of an appeal by Mrs M Crewe (PINS Ref: APP/H6955/A/16/3147116; LPA Ref: P/2014/0905)).

4.26 Figure 2 shows an aerial of the site showing existing hedgerows and tree lines and Figure 3 presents the indicative Masterplan for the site. The landscape strategy incorporates many features that would increase the functionality of the site for GCN so that off-site mitigation is unnecessary. Landscaping proposals include:

- Retention and safeguarding of existing trees;
- The retention of all perimeter hedgerows;
- Use of native species in green infrastructure planting;
- Specification of planting stock propagated from local provenance;
- Diversity of species where appropriate; and
- Proposals accompanied by landscape management with objectives to maintain and enhance ecological value.

4.27 The above measures would benefit wildlife and increase biodiversity. The landscape strategy (Figure 3) also includes the provision of areas of open greenspace in the centre of the site and around the site margins including a pond in the southern section. In addition, it is recommended that consideration should be given to further measures:

- Installation of hibernacula at, for example, 50m intervals at strategic points throughout the hedgerow system to improve functionality for GCN.

- Addition of a continuous 2m buffer along all perimeter hedgerows to provide a greater area of suitable GCN habitat - enhanced forage and cover to include unmanaged/lightly managed grassland and planting of small scalloped areas with scrub/trees to extend the hedgerow system and create replacement GCN terrestrial habitat with enhanced functionality.

4.28 The landscape strategy brings broader benefits to wildlife in general. The agricultural grassland is of low ecological value. This will be replaced by planned greenspace and formally designed amenity areas and a significant proportion of the site will consist of domestic gardens. A number of studies have shown that gardens and urban greenspace make a significant contribution to increasing biodiversity and the provision and access to such spaces are key contributors to social and ecological function in urban environments. Gardens can offer a variety of plant species, trees, shrubs and ponds that support invertebrates and provide food for birds, bats and amphibians such as GCN (e.g. Gaston *et al.* 2005, Barbosa *et al.* 2007, Cameron *et al.* 2012).

4.29 The detail of the mitigation strategy would be finalised following a full GCN population size class survey but the overall approach would be as set out above, irrespective of the survey results, and could be secured through a suitably worded planning condition.

Executive Summary

4.30 An eDNA survey for GCN in 2016 has confirmed the presence of GCN in a cluster of ponds located 170m north east of the site and with some connectivity to the site. A full population size class survey would be required in due course to confirm the numbers of GCN likely to be present within the proposed development site.

4.31 The majority of the development site comprises habitat of low value for GCN (improved grassland) although the boundary hedgerows provide some habitat for GCN feeding, shelter and hibernation.

4.32 A mitigation strategy is recommended which takes account of the low habitat quality on site and the distance of the GCN ponds from the site (irrespective of the population size).

4.33 The overall aim of mitigation is to replicate the extent and quality of habitat lost. However, there is no published guidance on the extent of habitat that must be provided. Rather, an appropriate and proportionate mitigation strategy will be developed in a qualitative way, informed by the knowledge and experience of the ecologist, on a case-by-case basis.

4.34 In this case it is judged that the overall quality of habitat to be lost is low (improved grassland) and it would not be appropriate or necessary to replicate this habitat. Instead, the recommended mitigation strategy is to retain as many of the boundary hedgerows as possible since these are the features that are most likely to be used by GCN, and to provide small areas of new habitat within the development site e.g. grassland and wetland to link the hedgerows and provide a functioning GCN habitat. This approach is shown in Masterplan Dwg No. 14.543-08 Ver 03..

4.35 In addition, mitigation measures will be required to avoid harm to individual GCN during site clearance and construction e.g. 'reasonable avoidance' measures such as hand searching where there is a low risk of encountering GCN or a programme of fencing and trapping. The distance of the GCN ponds from the site (i.e. 170m) indicates that the number of GCN likely to be found within the site is relatively low. However, the precise nature of the mitigation

measures would be informed by a detailed population size class survey that will indicate the numbers of GCN likely to be found.

- 4.36 The final GCN mitigation strategy can be secured through a suitably worded planning condition following completion of the detailed population size class survey, though the overall approach would be as set out above.

5. REFERENCES

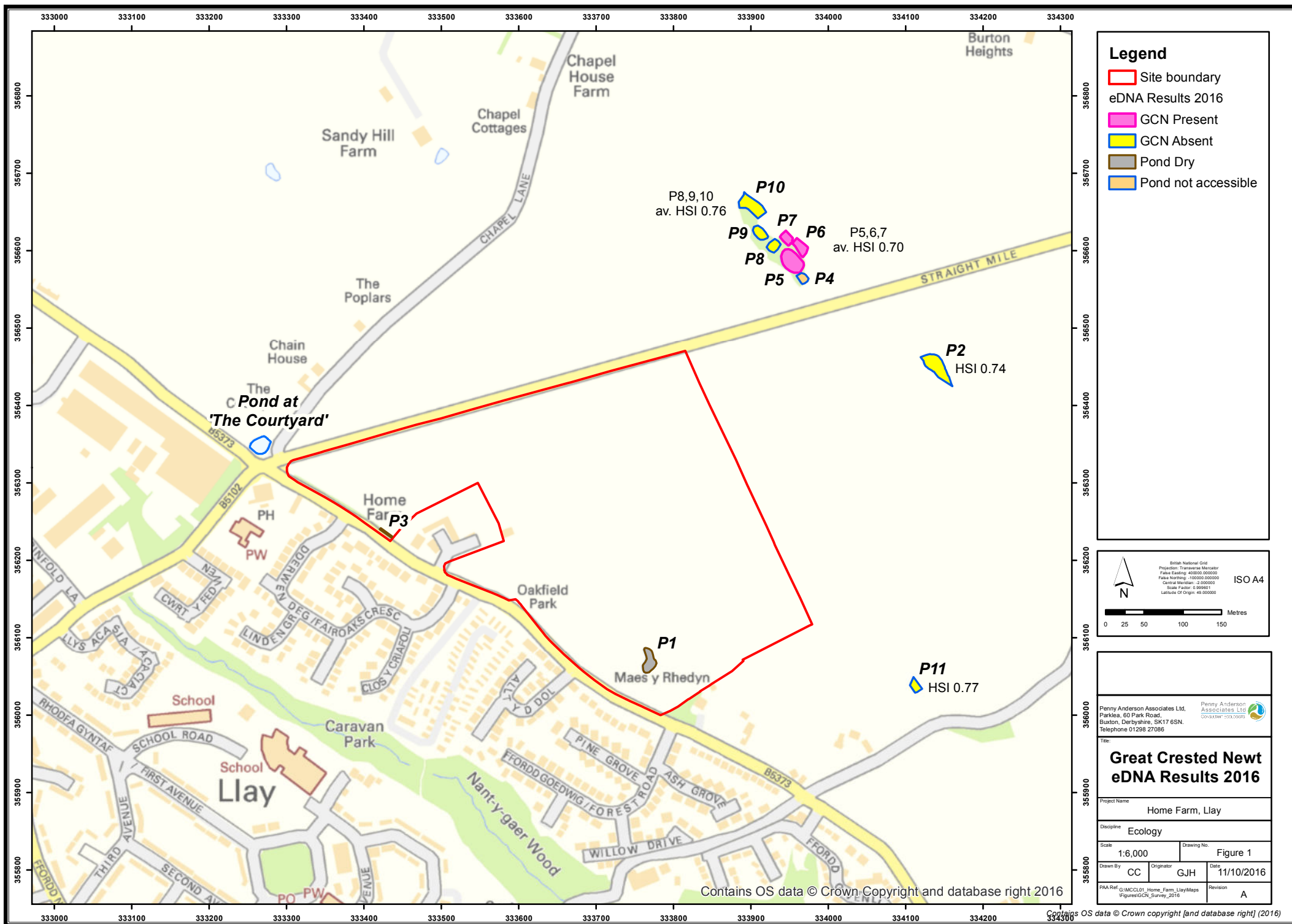
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6. ABBREVIATIONS

BAP	Biodiversity Action Plan	NERC	Natural Environment and Rural Communities
CRoW	Countryside and Rights of Way	NPPF	National Planning Policy Framework
EU	European Union	PAA	Penny Anderson Associates Ltd
eDNA	Environmental DNA	qPCR	quantative Polymerase Chain Reaction
GCN	Great Crested Newt	SBI	Site of Biological Importance
HSI	Habitat Suitability Index	SSSI	Sites of Special Scientific Interest
JNCC	Joint Nature Conservation Committee	UKAS	United Kingdom Accreditation Service
MAGIC	Multi-Agency Geographic Information for the Countryside	WCA	Wildlife and Countryside Act

FIGURES



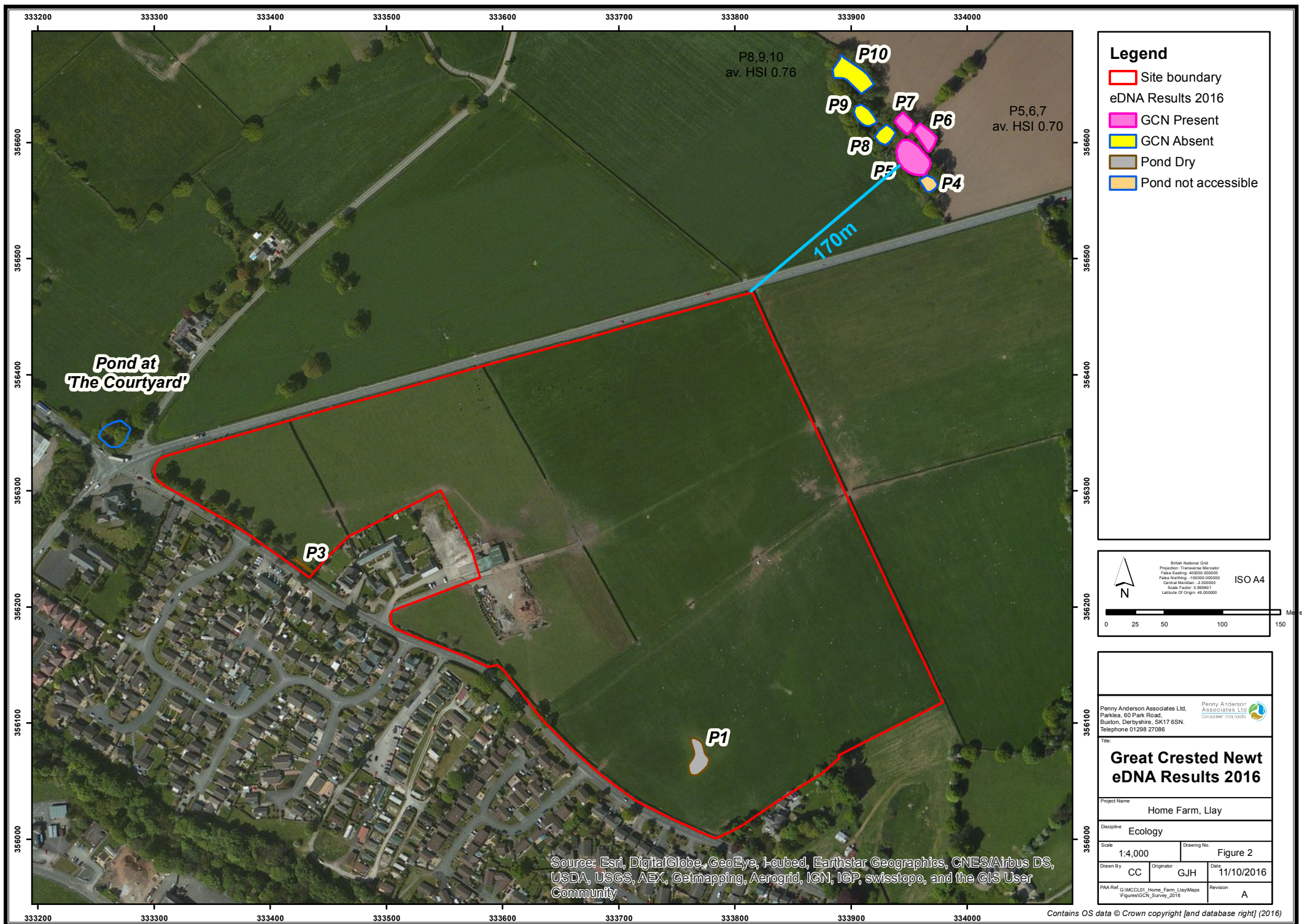




Figure 3. Landscaping Strategy

PLATES



Plate 1 Depression in field referred to as pond 1 in Figures 1 and 2.



Plate 2 View south-east showing species-poor hedgerow and rye-grass dominated managed grassland.



Plate 3 View north-west.



Plate 4 Ephemeral ditch (P3) along site boundary with Gresford Road (B5373).



Plate 5 View east along Straight Mile (B5102) from the traffic lights and junction with Cresford Road. Application area visible in background.



Plate 6 View east along Straight Mile adjacent to pond cluster to the left.

APPENDICES

APPENDIX 1

Summary of the Legislation Relating to Great Crested Newts

SUMMARY OF THE LEGISLATION RELATING TO GREAT CRESTED NEWTS (GCN)

Great crested (or warty) newts (*Triturus cristatus*) (GCN) are protected under the Wildlife and Countryside Act (WCA) 1981, which has been also amended by various legislation including the Countryside and Rights of Way (CROW) Act 2000 and the Conservation of Habitats and Species Regulations 2010, and this legislation is applicable to England and Wales. Great crested newts are listed on Schedule 5 of the WCA and are therefore subject to some the provisions of Section 9 which, with the amendments, make it an offence to:

- Intentionally or recklessly disturb a GCN while it is occupying a structure or place which it uses for shelter or protection (S9:4b).
- Intentionally or recklessly obstruct access to any structure or place used for shelter or protection by a GCN (S9:4c).

There are additional offences in relation to buying and selling (S9:5) any live or dead animal of this species or anything derived from them.

Great crested newts are also listed under Annexes IIa and IVa of EC Directive on the Conservation of Natural Habitats and of Wild Fauna and Flora, also known as the 'Habitats Directive'. Inclusion on Annex IVa means they are consequently identified as European Protected Species (EPS) and protected under the Conservation of Habitats and Species Regulations 2010¹. The Conservation of Habitats and Species Regulations 2010 state that a person commits an offence if they:

- (a) deliberately capture, injure or kill any wild animal of a European protected species,
- (b) deliberately disturb wild animals of any such species, in such a way as –
 - (i) to impair their ability to survive, to breed or reproduce, or to rear their young, or
 - (ii) in the case of animals of a hibernating or migratory species, to hibernate or migrate, or
 - (iii) to affect significantly the local distribution or abundance of the species to which they belong;
- (c) deliberately take or destroy the eggs of such an animal, or
- (d) damage or destroy a breeding site or resting place of such an animal.

Under these Regulations it is an offence to damage or destroy a breeding site or resting place, whether the animal is in occupation or not, and protection extends to all life stages of the animal in question. There are additional offences relating to possession, control and sale of a live or dead GCN or part of such an animal.

Environment (Wales) Act 2016 Section 7 lists GCN as a species of Principal Importance for the purpose of maintaining and enhancing biodiversity in relation to Wales. More broadly, the Environment Act (Wales) Part 1 sets out Wales' approach to planning and managing natural resources at a national and local level with a general purpose linked to statutory 'principles of sustainable management of natural resources' defined within the Act. Section 6 of the Act places a duty on public authorities to 'seek to maintain and enhance biodiversity' so far as it is consistent with the proper exercise of those functions. In so doing, public authorities must also seek to 'promote the resilience of ecosystems'. The duty replaces the section 40 duty in the Natural Environment and Rural Communities Act 2006 (NERC Act 2006), in relation to Wales, and applies to those authorities that fell within the previous duty. Section 7 replaces the duty in section 42 of the NERC Act 2006. The Welsh Ministers will publish, review and revise lists of living organisms and types of habitat in Wales, which they consider are of key significance to sustain and improve biodiversity in relation to Wales.

The Nature Recovery Plan for Wales aims to address the underlying causes of biodiversity loss by:

¹ These regulations have been slightly amended by The Conservation of Habitats and Species Regulations 2012

- putting nature at the heart of our decision-making
- increasing the resilience of our natural environment
- taking specific action for habitats and species.

It sets out how Wales will deliver the commitments of the UN Convention on Biological Diversity and the EU Biodiversity Strategy to halt the decline in biodiversity by 2020 and then reverse that decline.

Please note: the above text provides a brief summary of the legislation in relation to GCN for England and Wales and the original Acts, Regulations and any amendments should be referred to for the precise wording.

APPENDIX 2

Habitat Suitability Index (HSI) Survey Forms

Habitat Suitability Index (H S I) for GCN surveys.		Date: June 13th 2016	Surveyor(s):
Site Name: Home Farm		Job No.MCCL01	PF & HR
Pond name/number: 2		Single or part of cluster: Single	
Distance to nearest pond: 90m		Number of ponds in cluster: 0	

H S I ASSESSMENT:

Parameters:	Descr.	Field meas:	HSI Score
SI-1 Geographic location	Geographical area A, B or C	DESK-BASED (SEE MAP)	1
SI-2 Pond area	m ²		0.4
SI-3 Pond permanence	Drought years per decade		0.5
SI-4 Water quality	Invert assemblage, amphibs or fish presence		0.67
SI-5 Pond shading	% of perimeter affected to 1m out		0.6
SI-6 Nos. Wildfowl	No. per pond (inc species)		0.67
SI-7 Fish occurrence	P / A + Possible impacts		1
SI-8 Pond density	No. ponds within 1km	DESK-BASED/REMOTE	1
SI-9 Newt-friendly habitat	Terrestrial habitat quality to 1km (Field and desk based - use OS map)		1
SI-10 Macrophyte content	% plants reaching water surface		0.9

Drawing/Photo



HSI range 0.0 (unsuitable habitat) - 1.0 (optimum habitat)

Pond HSI

0.74

Pond suitability

GOOD

Habitat Suitability Index (H S I) for GCN surveys.		Date: June 13th 2016	Surveyor(s):
Site Name: Home Farm		Job No.MCCL01	PF & HR
Pond name/number: 4		Single or part of cluster: Part of a cluster	
Distance to nearest pond: 7 ponds all connected by ditches		Number of ponds in cluster: 7	

H S I ASSESSMENT:

Parameters:	Descr.	Field meas:	HSI Score
SI-1 Geographic location	Geographical area A, B or C	DESK-BASED (SEE MAP)	1
SI-2 Pond area	m ²		0.4
SI-3 Pond permanence	Drought years per decade		1
SI-4 Water quality	Invert assemblage, amphibs or fish presence		0.67
SI-5 Pond shading	% of perimeter affected to 1m out		0.6
SI-6 Nos. Wildfowl	No. per pond (inc species)		0.67
SI-7 Fish occurrence	P / A + Possible impacts		0.67
SI-8 Pond density	No. ponds within 1km	DESK-BASED/REMOTE	1
SI-9 Newt-friendly habitat	Terrestrial habitat quality to 1km (Field and desk based - use OS map)		1
SI-10 Macrophyte content	% plants reaching water surface		0.4

Drawing/Photo



HSI range 0.0 (unsuitable habitat) - 1.0 (optimum habitat)

Pond HSI

0.7

Pond suitability

GOOD

Habitat Suitability Index (H S I) for GCN surveys.		Date: June 13th 2016	Surveyor(s):
Site Name: Home Farm		Job No.MCCL01	PF & HR
Pond name/number: 5		Single or part of cluster: Part of a cluster	
Distance to nearest pond: 7 ponds all connected by ditches		Number of ponds in cluster: 7	

H S I ASSESSMENT:

Parameters:	Descr.	Field meas:	HSI Score
SI-1 Geographic location	Geographical area A, B or C	DESK-BASED (SEE MAP)	1
SI-2 Pond area	m ²		0.4
SI-3 Pond permanence	Drought years per decade		1
SI-4 Water quality	Invert assemblage, amphibs or fish presence		0.67
SI-5 Pond shading	% of perimeter affected to 1m out		0.6
SI-6 Nos. Wildfowl	No. per pond (inc species)		0.67
SI-7 Fish occurrence	P / A + Possible impacts		0.67
SI-8 Pond density	No. ponds within 1km	DESK-BASED/REMOTE	1
SI-9 Newt-friendly habitat	Terrestrial habitat quality to 1km (Field and desk based - use OS map)		1
SI-10 Macrophyte content	% plants reaching water surface		0.4

Drawing/Photo



HSI range 0.0 (unsuitable habitat) - 1.0 (optimum habitat)

Pond HSI

0.7

Pond suitability

GOOD

Habitat Suitability Index (H S I) for GCN surveys.		Date: June 13th 2016	Surveyor(s):
Site Name: Home Farm		Job No.MCCL01	PF & HR
Pond name/number: 6		Single or part of cluster: Part of a cluster	
Distance to nearest pond: 7 ponds all connected by ditches		Number of ponds in cluster: 7	

H S I ASSESSMENT:

Parameters:	Descr.	Field meas:	HSI Score
SI-1 Geographic location	Geographical area A, B or C	DESK-BASED (SEE MAP)	1
SI-2 Pond area	m ²		0.4
SI-3 Pond permanence	Drought years per decade		1
SI-4 Water quality	Invert assemblage, amphibs or fish presence		0.67
SI-5 Pond shading	% of perimeter affected to 1m out		0.6
SI-6 Nos. Wildfowl	No. per pond (inc species)		0.67
SI-7 Fish occurrence	P / A + Possible impacts		0.67
SI-8 Pond density	No. ponds within 1km	DESK-BASED/REMOTE	1
SI-9 Newt-friendly habitat	Terrestrial habitat quality to 1km (Field and desk based - use OS map)		1
SI-10 Macrophyte content	% plants reaching water surface		0.4

Drawing/Photo



HSI range 0.0 (unsuitable habitat) - 1.0 (optimum habitat)

Pond HSI

0.7

Pond suitability

GOOD

Habitat Suitability Index (H S I) for GCN surveys.		Date: June 13th 2016	Surveyor(s):
Site Name: Home Farm		Job No.MCCL01	PF & HR
Pond name/number: 7		Single or part of cluster: Part of a cluster	
Distance to nearest pond: 7 ponds all connected by ditches		Number of ponds in cluster: 7	

H S I ASSESSMENT:

Parameters:	Descr.	Field meas:	HSI Score
SI-1 Geographic location	Geographical area A, B or C	DESK-BASED (SEE MAP)	1
SI-2 Pond area	m ²		0.9
SI-3 Pond permanence	Drought years per decade		1
SI-4 Water quality	Invert assemblage, amphibs or fish presence		0.67
SI-5 Pond shading	% of perimeter affected to 1m out		0.6
SI-6 Nos. Wildfowl	No. per pond (inc species)		0.67
SI-7 Fish occurrence	P / A + Possible impacts		0.67
SI-8 Pond density	No. ponds within 1km	DESK-BASED/REMOTE	1
SI-9 Newt-friendly habitat	Terrestrial habitat quality to 1km (Field and desk based - use OS map)		1
SI-10 Macrophyte content	% plants reaching water surface		0.4

Drawing/Photo



HSI range 0.0 (unsuitable habitat) - 1.0 (optimum habitat)

Pond HSI

0.76

Pond suitability

GOOD

Habitat Suitability Index (H S I) for GCN surveys.		Date: June 13th 2016	Surveyor(s):
Site Name: Home Farm		Job No.MCCL01	PF & HR
Pond name/number: 8		Single or part of cluster: Part of a cluster	
Distance to nearest pond: 7 ponds all connected by ditches		Number of ponds in cluster: 7	

H S I ASSESSMENT:

Parameters:	Descr.	Field meas:	HSI Score
SI-1 Geographic location	Geographical area A, B or C	DESK-BASED (SEE MAP)	1
SI-2 Pond area	m ²		0.6
SI-3 Pond permanence	Drought years per decade		1
SI-4 Water quality	Invert assemblage, amphibs or fish presence		0.67
SI-5 Pond shading	% of perimeter affected to 1m out		0.6
SI-6 Nos. Wildfowl	No. per pond (inc species)		0.67
SI-7 Fish occurrence	P / A + Possible impacts		0.67
SI-8 Pond density	No. ponds within 1km	DESK-BASED/REMOTE	1
SI-9 Newt-friendly habitat	Terrestrial habitat quality to 1km (Field and desk based - use OS map)		1
SI-10 Macrophyte content	% plants reaching water surface		0.5

Drawing/Photo



HSI range 0.0 (unsuitable habitat) - 1.0 (optimum habitat)

Pond HSI

0.75

Pond suitability

GOOD

Habitat Suitability Index (H S I) for GCN surveys.		Date: June 13th 2016	Surveyor(s):
Site Name: Home Farm		Job No.MCCL01	PF & HR
Pond name/number: 9		Single or part of cluster: Part of a cluster	
Distance to nearest pond: 7 ponds all connected by ditches		Number of ponds in cluster: 7	

H S I ASSESSMENT:

Parameters:	Descr.	Field meas:	HSI Score
SI-1 Geographic location	Geographical area A, B or C	DESK-BASED (SEE MAP)	1
SI-2 Pond area	m ²		0.6
SI-3 Pond permanence	Drought years per decade		1
SI-4 Water quality	Invert assemblage, amphibs or fish presence		0.67
SI-5 Pond shading	% of perimeter affected to 1m out		0.6
SI-6 Nos. Wildfowl	No. per pond (inc species)		0.67
SI-7 Fish occurrence	P / A + Possible impacts		0.67
SI-8 Pond density	No. ponds within 1km	DESK-BASED/REMOTE	1
SI-9 Newt-friendly habitat	Terrestrial habitat quality to 1km (Field and desk based - use OS map)		1
SI-10 Macrophyte content	% plants reaching water surface		0.5

Drawing/Photo



HSI range 0.0 (unsuitable habitat) - 1.0 (optimum habitat)

Pond HSI

0.75

Pond suitability

GOOD

Habitat Suitability Index (H S I) for GCN surveys.		Date: June 13th 2016	Surveyor(s):
Site Name: Home Farm		Job No.MCCL01	PF & HR
Pond name/number: 10		Single or part of cluster: Part of a cluster	
Distance to nearest pond: 7 ponds all connected by ditches		Number of ponds in cluster: 7	

H S I ASSESSMENT:

Parameters:	Descr.	Field meas:	HSI Score
SI-1 Geographic location	Geographical area A, B or C	DESK-BASED (SEE MAP)	1
SI-2 Pond area	m ²		0.9
SI-3 Pond permanence	Drought years per decade		1
SI-4 Water quality	Invert assemblage, amphibs or fish presence		0.67
SI-5 Pond shading	% of perimeter affected to 1m out		0.6
SI-6 Nos. Wildfowl	No. per pond (inc species)		0.67
SI-7 Fish occurrence	P / A + Possible impacts		0.67
SI-8 Pond density	No. ponds within 1km	DESK-BASED/REMOTE	1
SI-9 Newt-friendly habitat	Terrestrial habitat quality to 1km (Field and desk based - use OS map)		1
SI-10 Macrophyte content	% plants reaching water surface		0.5

Drawing/Photo



HSI range 0.0 (unsuitable habitat) - 1.0 (optimum habitat)

Pond HSI

0.78

Pond suitability

GOOD

Habitat Suitability Index (H S I) for GCN surveys.		Date: June 13th 2016	Surveyor(s):
Site Name: Home Farm		Job No.MCCL01	PF & HR
Pond name/number: 11		Single or part of cluster: Single	
Distance to nearest pond: 350m		Number of ponds in cluster: 0	

H S I ASSESSMENT:

Parameters:	Descr.	Field meas:	HSI Score
SI-1 Geographic location	Geographical area A, B or C	DESK-BASED (SEE MAP)	1
SI-2 Pond area	m ²		0.4
SI-3 Pond permanence	Drought years per decade		0.5
SI-4 Water quality	Invert assemblage, amphibs or fish presence		0.67
SI-5 Pond shading	% of perimeter affected to 1m out		0.6
SI-6 Nos. Wildfowl	No. per pond (inc species)		1
SI-7 Fish occurrence	P / A + Possible impacts		1
SI-8 Pond density	No. ponds within 1km	DESK-BASED/REMOTE	1
SI-9 Newt-friendly habitat	Terrestrial habitat quality to 1km (Field and desk based - use OS map)		1
SI-10 Macrophyte content	% plants reaching water surface		0.9

Drawing/Photo



HSI range 0.0 (unsuitable habitat) - 1.0 (optimum habitat)

Pond HSI

0.77

Pond suitability

GOOD

APPENDIX 3

eDNA Results from SureScreen Scientifics

Technical Report
Confidential

Folio No D1914
Report No: 1
Client: Penny Anderson Associates Ltd
Order No: 135
Attn: Hazel Robson
Date: 30th June 2016

TECHNICAL REPORT

EXAMINATION OF ENVIRONMENTAL DNA **IN POND WATER FOR THE DETECTION OF** **GREAT CRESTED NEWTS**

D.Hickman



Forensic Scientists and Consultant Engineers
SureScreen Scientifics Division Ltd, Morley Retreat, Church Lane, Morley, Derbyshire, DE7 6DE, UK
Tel: +44 (0)1332 292003 Email: scientifics@suresscreen.com
Company Registration No. 2733607

Methodology

When Great Crested Newts (GCN) inhabit a pond, they deposit traces of their DNA in the water as evidence of their presence. By sampling the water we can analyse these small environmental traces to detect GCN inhabitation.

The laboratory testing is conducted in two phases. The sample first goes through an extraction process where all 6 tubes are pooled together to acquire as much eDNA as possible. The pooled sample is then tested via real time PCR (or q-PCR). This process amplifies select part of DNA allowing it to be detected and measured.

qPCR combines PCR amplification and detection into a single step. This eliminates the need to detect products using gel electrophoresis. With qPCR, fluorescent dyes specific to the target sequence are used to label PCR products during thermal cycling. The accumulation of fluorescent signal during the exponential phase of the reaction is measured for fast and objective data analysis.

The primers used in this process are specific to a part of mitochondrial DNA only found in GCN ensuring no other DNA is amplified.

Samples are tested in a clean room and the different phases of testing are kept separate to reduce any risk of cross contamination.

Each pooled sample is replicated 12 times to ensure results are accurate. If one of the twelve replicates tests positive the sample is declared positive. The sample is only declared negative if no replicates show amplification.

Inhibition and degradation checks are also carried out on each sample using a known DNA marker. Results of these quality control tests are recorded with each sample.

Results

Lab Ref	Sample	Co-Ordinates	Inhibition Check	Sample integrity	Result
22734	Pond 2	SJ 34142 56445	Acceptable	Acceptable	Negative
22736	Pond 5	SJ 33929 56611	Acceptable	Acceptable	Positive 12/12
22737	Pond 10	SJ 33929 56610	Acceptable	Acceptable	Negative
22738	Pond 11	SJ 34150 56002	Acceptable	Acceptable	Negative

Advice

Negative results may not indicate the absence of GCN just the presence of eDNA below the detection limits of the method. However this method is extremely sensitive. It is still advised to survey a pond using traditional methods within 2km of a positive result or a known habitat for GCN.

Positive results may be true positives but also may be due to contamination of samples from another pond or improper sampling technique. Please ensure traditional surveys are performed on positive ponds and care is taken to avoid spreading GCN DNA.

Samples undergo integrity scores to check for degradation post sampling. Samples which are not acceptable should be re-sampled. Sample integrity scores are based on the amount of degradation of an artificial DNA marker placed in the kits and analysed by qPCR.

PCR inhibitors can cause false results. Every effort is made to clean the sample pre-analysis however some inhibitors cannot be extracted. An unacceptable inhibition check will cause an indeterminate sample and must be sampled again.

Analysed and reported By: **Derry Hickman**



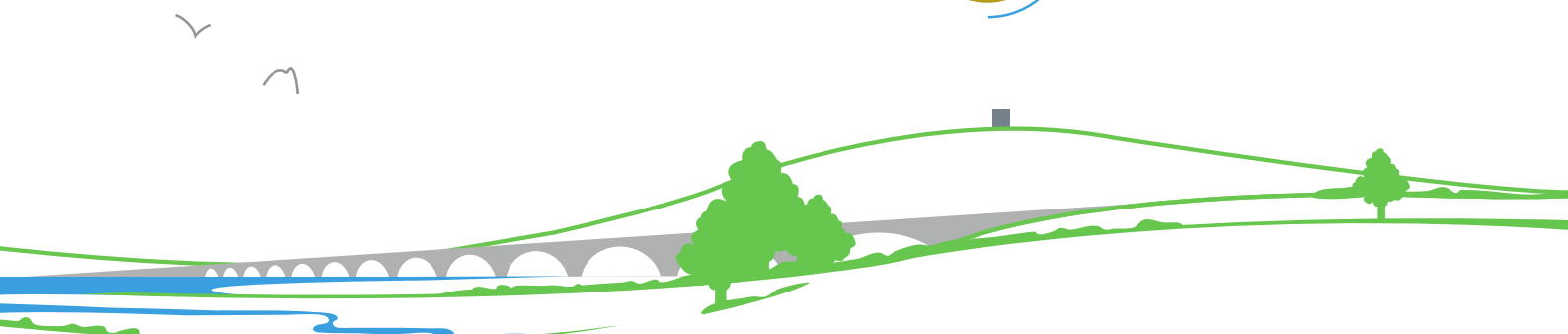
Checked and approved: **Andrew Penny**



A. P. Perry



Penny Anderson
Associates Ltd
CONSULTANT ECOLOGISTS



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