HITHER GREEN GOLF COURSE, HITHER GREEN LANE, REDDITCH

GREAT CRESTED NEWT HABITAT SUITABILITY INDEX ASSESSMENT AND eDNA SURVEY

A Report to: Barratt David Wilson Homes Mercia

Report No: RT-MME-153160-03

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REPORT VERIFICATION AND DECLARATION OF COMPLIANCE

This study has been undertaken in accordance with British Standard 42020:2013 “Biodiversity, Code of practice for planning and development”.

Report Version	Date	Completed by:	Checked and approved by:
Final	17/09/2021	Helen Griffin ACIEEM (Senior Ecological Consultant) and Carol Flaxman BSc (Hons) ACIEEM (Senior Ecological Consultant)	Tom Docker CEcol MCIEEM (Managing Director)

The information which we have prepared is true, and has been prepared and provided in accordance with the Chartered Institute of Ecology and Environmental Management’s Code of Professional Conduct. We confirm that the opinions expressed are our true and professional bona fide opinions.

DISCLAIMER

The contents of this report are the responsibility of Middlemarch Environmental Ltd. It should be noted that, whilst every effort is made to meet the client’s brief, no site investigation can ensure complete assessment or prediction of the natural environment.

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VALIDITY OF DATA

The findings of this study are valid for a period of two to four years, depending upon the nature of works proposed and the potential for these works to impact upon great crested newts. If works have not commenced within two years of this study, it may be necessary to undertake an updated survey to allow any changes in the status of great crested newts onsite to be assessed, and to inform a review of the conclusions and recommendations made.

NON-TECHNICAL SUMMARY

Barratt David Wilson Homes Mercia commissioned Middlemarch Environmental Ltd to undertake a Habitat Suitability Index Assessment and eDNA Survey for great crested newts *Triturus cristatus* at the site of a proposed development at Hither Green Lane in Redditch. This assessment is required to inform a planning application associated with the proposed construction of residential dwellings with associated hard and soft landscaping.

As part of the Preliminary Ecological Appraisal (Report RT-MME-152753-03 Rev A) completed by Middlemarch Environmental Ltd, a desk study for records of protected species was completed. The desk study did not return any records of great crested newts from within a 1 km search area.

Reference to Ordnance Survey mapped data indicated the potential presence of up to 21 ponds within a 500 m radius of the site, five of which were located within the site boundary. Of the 21 ponds identified it was not possible to survey two ponds, namely P13 and P14, due to access constraints. Ponds P10 no longer existed and P5, P12, P16 and P17 were dry at the time of survey. The remaining ponds therefore were the focus of this assessment.

The HSI Assessment and Environmental DNA (eDNA) survey were undertaken on 28th June 2021 by Evangeline Bevans (Ecological Project Officer) and Liam Kelly (Ecological Project Officer). eDNA testing was carried out at all suitable and accessible water bodies within a 250 m radius of the site, a total of nine ponds. The result of all ponds was negative indicating an absence of great crested newt DNA within the ponds at the time of the survey.

Due to the number of ponds on site and in close proximity to the site, common amphibians are likely to be present on site and a low number of common toad *Bufo bufo* were recorded during the reptile surveys completed on site (Report RT-MME-153160-05). The unmanaged grassland habitats, woodland, hedgerows and scrub habitat to be removed are suitable for foraging and sheltering amphibians. Four of the on site ponds are also proposed to be removed to facilitate development of the site. It is anticipated that these populations can be preserved on site post development, however, they may be at risk from construction activities and becoming road casualties.

The following recommendations have been made to protect common amphibians during site clearance and construction activities and for the long-term protection of amphibians at the site:

R1 **Great Crested Newt:** The assessment revealed that no great crested newt DNA was recorded within any of the surveyed ponds and therefore great crested newts are not a notable consideration in relation to the proposed development. The survey data obtained for the site is valid for two years from the survey date. In the unlikely event that a great crested newt is found during development works, all works must immediately cease and a suitably qualified ecologist should be contacted.

R2 **Common Amphibians:** The existing management of the grassland habitats should continue up until the commencement of works to ensure these habitats do not become tussocky and more favourable for common amphibians. The Reasonable Avoidance Method Statement provided in the Reptile Survey Report (RT-MME-153160-05) should be adhered to during site clearance and the construction phase for the protection of common amphibians.

R3 **Pond Removal:** The removal of the ponds should also be completed in the amphibian active season avoiding the breeding season (March to June, inclusive). The ponds should be drained prior to removal and a mesh screen should be used if a pump is required. Pond decommissioning works should be supervised by an Ecological Clerk of Works.

R4 **Amphibian Safeguarding:** Kerb and gully pot design should follow best practice design to allow amphibian movements across the site and prevent capture in gully pots.

R5 **Habitat Enhancement:** If possible, the proposed SUDs feature should be designed to support some permanent water and provide opportunities for breeding amphibians. The creation of new wildlife ponds or enhancement of retained ponds within wider golf course should be also considered. Amphibian hibernaculum and log piles could also be created within the areas of open space on site to provide additional opportunities for sheltering amphibians as well as small mammals and invertebrates.

CONTENTS

1. INTRODUCTION

1.1 PROJECT BACKGROUND

In 2021, Barratt David Wilson Homes Mercia commissioned Middlemarch Environmental Ltd to undertake a Habitat Suitability Index Assessment and eDNA Survey for great crested newts *Triturus cristatus* at the site of a proposed development at Hither Green Lane in Redditch. This assessment is required to inform a planning application associated with the proposed construction of residential dwellings with associated hard and soft landscaping.

Middlemarch Environmental Ltd has previously carried out the following surveys for Barratt Homes at this site:

- Preliminary Arboricultural Assessment (Report RT-MME-152753-01);
- Arboricultural Impact Assessment (Report RT-MME-152753-02); and,
- Preliminary Ecological Appraisal (Report RT-MME-152753-03 Rev A).

In addition, Middlemarch Environmental Ltd has been commissioned to undertake the following assessments:

- Preliminary Bat Roost Assessment (Report RT-MME-153160-01);
- Badger Survey (Report RT-MME-153160-02);
- Breeding Bird Survey (Report RT-MME-153160-04); and,
- Reptile Survey (Report RT-MME-153160-05).

Great crested newts are a legally protected species and are capable of being a material consideration in the planning process. A summary of the legislation protecting great crested newts is included within Appendix 1. This section also provides some brief information on the ecology of great crested newts.

1.2 DEVELOPMENT SITE DESCRIPTION AND CONTEXT

The site under consideration is an irregularly shaped parcel of land that measures approximately 10 ha in size and is located at Hither Green Golf Course in Redditch, Worcestershire. The site is centred at National Grid Reference SP 0437 6937.

At the time of the survey, the eastern half of the site comprised part of a golf course with areas of plantation woodland. The western section of the site mainly consisted of open unmanaged grassland with hedges, scattered trees and scrub. A large pond was situated towards the northern site boundary and there were four smaller ponds which formed part of the golf course.

The site is bordered to the north by Dagnell End Road and to the west by Hither Green Lane. Residential houses and a continuation of the golf course border the site to the east and fields of grassland, residential dwellings and a public house are present to the north and west. The River Arrow corridor is present to the south of the site with fields of grassland, a cemetery and residential dwellings beyond. The wider landscape to the north, east and west is dominated by agricultural fields and small residential areas. Redditch town centre dominates the landscape to the south.

1.3 SURVEY AREA AND JUSTIFICATION

Reference to Ordnance Survey mapped data indicated the potential presence of up to 21 ponds within a 500 m radius of the site, five of which were located within the site boundary.

Of the 21 ponds identified it was not possible to survey two ponds, namely P13 and P14, due to access constraints. Ponds P10 no longer existed and P5, P12, P16 and P17 were dry at the time of survey. The remaining ponds therefore were the focus of this assessment.

The distances of all ponds within the survey area from the development boundary are provided in Table 1.1, along with the justification for inclusion or exclusion from the survey effort. The locations of these ponds in relation to the proposed development site are shown on Middlemarch Environmental Ltd Drawing C153160-03-01 in Chapter 7.

Pond Reference	Distance from Development Boundary	Subject to Survey?	Justification
P1	On site	Yes	The pond is situated within the proposed development boundary.
P2	On site	Yes	As above
P3	On site	Yes	As above
P4	On site	Yes	As above
P5	On site	No	Dry at the time of survey.
P6	80 m east	Yes	The pond is situated within 250 m of the site boundary and although a small road was present between the site and pond, this is not considered a significant barrier.
P7	100 m east	Yes	As above
P8	90 m east	Yes	As above
P9	60 m east	Yes	As above
P10	80 m east	No	No longer exists.
P11	170 m east	Yes	The pond is situated within 250 m of the site boundary and although a small road was present between the site and pond, this is not considered a significant barrier.
P12	210 m east	No	Dry at the time of survey.
P13	150 m north	No	No access.
P14	200 m north	No	No access.
P15	250 m west	HSI only	P15 is separated from the site by the River Arrow and the A441 which constitute significant barriers to migration.
P16	200 m south	No	Dry at the time of survey.
P17	410 m south east	No	Dry at the time of survey.
P18	430 m south east	HSI only	P18 is located over 250 m from the site and is separated from the site by the River Arrow which constitutes a significant barrier to migration.
P19	460 m east	HSI only	Located nearly 500 m from the site and ponds in closer proximity to the site and on site were subject to eDNA surveys to inform this assessment.
P20	290 m north	HSI only	No formal access was provided to allow for the completion of eDNA surveys (this pond was viewed from a public footpath), however, the pond is located over 250 m from the site.
P21	430 m north	HSI only	No formal access was provided to allow for the completion of eDNA surveys (this pond was viewed from a public footpath), however, the pond is located over 250 m from the site.

Table 1.1: Distance of Ponds from the Development Boundary

1.4 DOCUMENTATION PROVIDED

The conclusions and recommendations made in this report are based on information provided by the client regarding the scope of the project. Documentation made available by the client is listed in Table 1.2.

Document Name / Drawing Number	Author
Land off Hither Green Lane Redditch, Proposed Site Layout Rev Q	Urban Design

Table 1.2: Documentation Provided by Client

2. METHODOLOGY

2.1 DESK STUDY

As part of the Preliminary Ecological Appraisal (Report RT-MME-152753-03 Rev A) an ecological desk study was undertaken within a 1 km radius of the site. The consultee for the desk study was Worcestershire Biological Records Centre.

Middlemarch Environmental Ltd then assimilated and reviewed the desk study data provided by this organisation. Relevant amphibian data are discussed in Chapter 3. In compliance with the terms and conditions relating to its commercial use, the full desk study data are not provided within this report.

2.2 HABITAT SUITABILITY INDEX ASSESSMENT

All surveyed ponds were visually assessed for their suitability to support great crested newts by a suitably qualified ecologist. Ponds were assessed utilising the great crested newt Habitat Suitability Index (HSI) developed by Oldham *et al* in 2000 and revised by ARG UK in 2010. The HSI is a numerical index between 0 and 1, wherein a score of 1 represents optimal habitat for great crested newts. The HSI score is used to define the suitability of the pond on a categorical scale (Table 2.1). It should be noted, however, that the system is not precise enough to allow the conclusion that a pond with a high score will definitely support great crested newts whilst those with a low score will not.

HSI Score	Pond Suitability to Support Breeding Great Crested Newts
< 0.5	Poor
0.5 – 0.59	Below average
0.6 – 0.69	Average
0.7 – 0.79	Good
> 0.8	Excellent

Table 2.1: Great Crested Newt HSI Scoring

The HSI is given by assigning a quantitative figure to each of 10 variables, including pond area, water quality and level of shading, which are all factors thought to affect great crested newts. The tenth root of the product of these variables is then calculated, giving a figure for habitat suitability.

2.3 SITE SUITABILITY AND CONNECTIVITY ASSESSMENT

As part of the Preliminary Ecological Appraisal (Report RT-MME-152753-03 Rev A) a Phase 1 Habitat Survey was undertaken of the proposed development site. Middlemarch Environmental Ltd used this habitat survey data to undertake an assessment of the suitability of the proposed development site to support great crested newts. An assessment was also made of the habitat connectivity between ponds and the site, based on a review of habitat survey data (if available), aerial imagery and mapped sources.

2.4 EDNA SURVEY

When great crested newts inhabit a pond, they deposit traces of their DNA in the water as evidence of their presence. By sampling the water present within the ponds using a specific protocol, it is possible to analyse these small environmental traces in order to detect great crested newt presence.

The protocol involves collecting 20 x 30ml samples of water from a surveyed pond using strict protocols to prevent cross-contamination. These 20 samples are then combined and separated into 6 tubes, containing a preservative liquid that prevents the sample degrading in transit. Laboratory analysis is then carried out and involves pooling of the six samples to extract as much eDNA as possible and testing the pooled sample. A full description of the methodology can be found in the eDNA report from SureScreen Scientifics in Appendix 1.

3. DESK STUDY RESULTS

3.1 BIOLOGICAL RECORDS

As part of the Preliminary Ecological Appraisal (Report RT-MME-152753-03 Rev A) completed by Middlemarch Environmental Ltd in July 2020, a desk study for records of protected species was completed.

The desk study did not return any records of great crested newts from within a 1 km search area. Common amphibians were recorded in the wider area at least 240 m from the site, namely common toad *Bufo bufo* and common frog *Rana temporaria*.

4. RESULTS

4.1 INTRODUCTION

The HSI Assessment and eDNA Survey were undertaken on 28th June 2021 by Evangeline Bevans BSc (Hons) (Ecological Project Officer) and Liam Kelly MSc BSc (Hons) (Ecological Project Officer). Table 4.1 details the weather conditions at the time of the site visit.

Parameter	Condition
Temperature (ºC)	15
Cloud (%)	100
Wind (Beaufort)	F0-1
Precipitation	Nil

Table 4.1: Weather Conditions During Field Assessment

The findings of the HSI Assessment and eDNA Survey are provided within Sections 4.3, 4.4 and 4.5.

4.2 SURVEY CONSTRAINTS

Access was not permitted to survey ponds P13 and P14 at the time of the survey. These ponds are located at least 150 m from the site and ponds on site and in closer proximity to the site were surveyed to inform this assessment. The restricted access to these ponds is not considered to be a significant survey limitation.

No significant constraints were identified at the time of survey.

4.3 HABITAT SUITABILITY INDEX ASSESSMENT

Table 4.2 provides a brief description of each of the surveyed ponds and assesses the presence or absence of habitat features favoured by great crested newts. Pond locations are shown on Middlemarch Environmental Ltd Drawing C153160-03-01 in the Chapter 7. Photographs of surveyed ponds are provided in Chapter 8.

Attribute	Description
Pond P1	
Description	P1 comprised a small, lined pond set within the amenity grassland of the golf course. The banks were shallow and lacking in marginal vegetation. The pond contained thick duckweed species *Lemna* sp. covering approximately 100% of the water surface.
Grid Reference	SP 0448 6937
Pond Area	150m^2
Distance from Development Boundary	On site
Permanence	Never dries
Water Quality	Poor
Shade	0%
Macrophytes	5% water lily species *Nymphaea* sp. (not including duckweed)
Egg Laying Habitat	No suitable egg laying habitat observed.
Open Courtship Area	Yes
Wildfowl	No evidence of wildfowl was observed during the survey.
Fish	No fish were observed, however given local conditions it is possible that fish could be present.
Surrounding Terrestrial Habitat	Poor - the pond is set within tightly managed amenity grassland within the golf course providing very limited terrestrial opportunities.
Photo Reference (see Chapter 8)	Plate 8.1

Table 4.2: Pond Description and Assessment of Habitat Features for Great Crested Newts (continues)

Attribute	Description
Pond P2	
Description	P2 was very similar to P1, comprising a lined, ornamental pond situated within the golf course. The banks were shallow and set within grassland. The pond contained small, localised patches of macrophytes, and the water was green suggesting presence of algae. Additionally, the pond was situated within the margins of the gold course with tall ruderal vegetation to the north and a band of linear woodland to the east.
Grid Reference	SP 0450 6939
Pond Area	110 m^2
Distance from Development Boundary	On site
Permanence	Never dries.
Water Quality	Poor
Shade	20%
Macrophytes	5% waterlily. 10% cover of duckweed was also noted.
Egg Laying Habitat	No suitable egg laying habitat observed.
Open Courtship Area	Yes
Wildfowl	No evidence of wildfowl was observed during the survey.
Fish	Low number of coarse fish were observed within the pond during the survey.
Surrounding Terrestrial Habitat	Moderate
Photo Reference (see Chapter 8)	Plate 8.2
Pond P3	
Description	P3 was a large pond set within a mosaic of grassland and scrub at the northern boundary of the golf course. The banks possessed shallow to moderate slope and contained scattered to dense pockets of hawthorn *Crataegus monogyna*, willow *Salix* sp., dog rose *Rosa canina* and bramble *Rubus fruticosus* agg. A pocket of linear woodland was present to the south. The pond contained New Zealand pigmyweed *Crassula helmsii*.
Grid Reference	SP 0454 6949
Pond Area	1,770 m^2
Distance from Development Boundary	On site
Permanence	Never dries.
Water Quality	Moderate
Shade	40%
Macrophytes	50% including water lily, reedmace *Typha latifolia*, yellow iris *Iris pseudacorus*, soft rush *Juncus effusus* and hard rush *Juncus inflexus.*
Egg Laying Habitat	Yes – reedmace and yellow iris provide some suitability but not favourable for egg laying
Open Courtship Area	Yes
Wildfowl	Wildfowl were present within the pond, but no major damage was observed.
Fish	The pond was stocked with carp.
Surrounding Terrestrial Habitat	Moderate
Photo Reference (see Chapter 8)	Plate 8.3

Table 4.2: Pond Description and Assessment of Habitat Features for Great Crested Newts (continues)

Attribute	Description
Pond P4	
Description	P4 comprised a shallow pond situated along the margins of the golf course. Dense soft rush was present throughout.
Grid Reference	SP 0436 6935
Pond Area	80 m^2
Distance from Development Boundary	On site
Permanence	Rarely dries
Water Quality	Moderate
Shade	30%
Macrophytes	80% including soft rush, water milfoil *Myriophyllum* sp. and spike rush *Eleocharis palustris.* Duckweed and algae were also present.
Egg Laying Habitat	Yes, although no favourable egg laying species were noted
Open Courtship Area	Yes
Wildfowl	No evidence of wildfowl was observed during the survey.
Fish	No evidence of fish was observed during the survey.
Surrounding Terrestrial Habitat	Moderate
Photo Reference (see Chapter 8)	Plate 8.4
Pond P6	
Description	P6 comprised a pond set within ornamental planting. The banks were densely vegetated with shrubs and dense stands of yellow flag iris were present at the margins.
Grid Reference	SP 0471 6940
Pond Area	200 m^2
Distance from Development Boundary	80 m east
Permanence	Never dries
Water Quality	Moderate
Shade	50%
Macrophytes	70% including yellow flag iris at the margins and water lily and greater spearwort *Ranunculus lingua* also present
Egg Laying Habitat	Yes, although no favourable egg laying species were noted
Open Courtship Area	No
Wildfowl	No evidence of wildfowl was observed during the survey.
Fish	No fish were observed, however given local conditions it is possible that fish could be present.
Surrounding Terrestrial Habitat	Poor
Photo Reference (see Chapter 8)	Plate 8.5

Table 4.2: Pond Description and Assessment of Habitat Features for Great Crested Newts (continues)

Attribute	Description
Pond P7	
Description	P7 comprised a small overflow pond connected to P8. It was set within dense vegetation dominated great willowherb *Epilobium hirsutum* and a range of ornamental shrubs and scattered willow. Marginal vegetation included stands of yellow flag iris.
Grid Reference	SP 0474 6941
Pond Area	50 m^2
Distance from Development Boundary	100 m east
Permanence	Rarely dries
Water Quality	Poor
Shade	100%
Macrophytes	20% including yellow flag iris and willowherb species
Egg Laying Habitat	Yes – willowherb is favourable for egg laying
Open Courtship Area	No
Wildfowl	No evidence of wildfowl was observed during the survey.
Fish	No evidence of fish was observed during the survey.
Surrounding Terrestrial Habitat	Poor
Photo Reference (see Chapter 8)	Plate 8.6
Pond P8	
Description	P8 comprised a narrow ornamental pond set within the hotel grounds and surrounded by dense ornamental planting including scattered cypress and willow trees. A small branch from a nearby willow had broken and fallen into the water. Scattered marginal vegetation included yellow flag iris.
Grid Reference	SP 0474 6943
Pond Area	70 m^2
Distance from Development Boundary	90 m east
Permanence	Never dries
Water Quality	Poor
Shade	60%
Macrophytes	10% namely yellow flag iris at the margins
Egg Laying Habitat	Yes, although no favourable egg laying species were noted
Open Courtship Area	Yes although the margins were vegetated / shaded
Wildfowl	No evidence of wildfowl was observed during the survey.
Fish	No fish were observed, however given local conditions it is possible that fish could be present.
Surrounding Terrestrial Habitat	Poor
Photo Reference (see Chapter 8)	Plate 8.7

Table 4.2: Pond Description and Assessment of Habitat Features for Great Crested Newts (continues)

Attribute	Description
Pond P9	
Description	P9 was situated in the same location as P7 and P8, and comprised a narrow ornamental pond set within the hotel grounds and surrounded by dense ornamental planting. Scattered marginal vegetation included yellow flag iris.
Grid Reference	SP 0472 6944
Pond Area	150 m^2
Distance from Development Boundary	60 m east
Permanence	Never dries
Water Quality	Poor
Shade	90%
Macrophytes	30% including water lily and yellow flag iris
Egg Laying Habitat	Yes, although no favourable egg laying species were noted
Open Courtship Area	Yes although the margins were vegetated / shaded
Wildfowl	No evidence of wildfowl was observed during the survey.
Fish	No evidence of fish was observed during the survey.
Surrounding Terrestrial Habitat	Poor
Photo Reference (see Chapter 8)	Plate 8.8
Pond P11	
Description	P11 comprised an ornamental pond set within the golf course to the east. Dense scrub delineated the pond margins to the north including hawthorn, English oak *Quercus robur* and alder *Alnus glutinosa*. Marginal vegetation included yellow flag iris.
Grid Reference	SP 0436 6935
Pond Area	200 m^2
Distance from Development Boundary	170 m east
Permanence	Sometimes dries
Water Quality	Moderate
Shade	100%
Macrophytes	100% including yellow flag iris, reedmace, water lily and brooklime *Veronica beccabunga*
Egg Laying Habitat	Yes
Open Courtship Area	No
Wildfowl	No evidence of wildfowl was observed during the survey.
Fish	No evidence of fish was observed during the survey.
Surrounding Terrestrial Habitat	Poor

Table 4.2: Pond Description and Assessment of Habitat Features for Great Crested Newts (continues)

Attribute	Description
Pond P15	
Description	P15 was situated within amenity grassland to the west of the site. Reference to historical aerial imagery indicated this pond was created between 2016 and 2017 in association with a nearby housing development. No marginal or emergent vegetation was noted.
Grid Reference	SP 0390 6930
Pond Area	1,950 m^2
Distance from Development Boundary	250 m west
Permanence	Never dries
Water Quality	Moderate
Shade	0%
Macrophytes	0%
Egg Laying Habitat	No suitable egg laying habitat observed.
Open Courtship Area	Yes
Wildfowl	No evidence of wildfowl was observed during the survey.
Fish	No fish were observed, however given local conditions it is possible that fish could be present.
Surrounding Terrestrial Habitat	Poor
Photo Reference (see Chapter 8)	8.9
Pond P18	
Description	P18 comprised a large, irregularly shaped linear pond situated to the south-east. The banks were vegetated with hawthorn, alder and willow which was dense in places.
Grid Reference	SP 0474 6882
Pond Area	>2,000 m^2
Distance from Development Boundary	430 m south east
Permanence	Never dries
Water Quality	Moderate
Shade	50%
Macrophytes	90% including reedmace, soft rush and hard rush
Egg Laying Habitat	Yes, although no favourable egg laying species were noted
Open Courtship Area	Yes
Wildfowl	No evidence of wildfowl was observed during the survey.
Fish	A small number of fish were observed within this pond.
Surrounding Terrestrial Habitat	Moderate
Photo Reference (see Chapter 8)	8.10

Table 4.2: Pond Description and Assessment of Habitat Features for Great Crested Newts (continues)

Attribute	Description
Pond P19	
Description	P19 was set within mown amenity grassland within the wider golf course. A band of woodland was present to the west and the pond was set among scattered scrub, willow and alder trees. The banks were of moderate to steep slope. Stands of yellow flag iris and reedmace were present at the margins, and water lily was noted within.
Grid Reference	SP 0514 6935
Pond Area	800 m^2
Distance from Development Boundary	460 m east
Permanence	Never dries
Water Quality	Moderate
Shade	50%
Macrophytes	50% including yellow flag iris, reedmace and water lily
Egg Laying Habitat	Yes, although no favourable egg laying species were noted
Open Courtship Area	Yes
Wildfowl	No evidence of wildfowl was observed during the survey.
Fish	No fish were observed, however given local conditions it is possible that fish could be present.
Surrounding Terrestrial Habitat	Poor
Photo Reference (see Chapter 8)	8.11
Pond P20	
Description	P20 was set within farmland to the north. At the time of survey, the water was noted as being very turbid. The banks were gently sloping and predominantly lacking in vegetation apart from a large overhanging English oak and band of dense scrub on the northern bank.
Grid Reference	SP 0464 6985
Pond Area	800 m^2
Distance from Development Boundary	290 m north
Permanence	Never dries
Water Quality	Poor
Shade	40%
Macrophytes	0%
Egg Laying Habitat	No
Open Courtship Area	Yes
Wildfowl	No evidence of wildfowl was observed during the survey.
Fish	No evidence of fish was observed during the survey.
Surrounding Terrestrial Habitat	Poor
Photo Reference (see Chapter 8)	8.12

Table 4.2: Pond Description and Assessment of Habitat Features for Great Crested Newts (continues)

Attribute	Description
Pond P21	
Description	P21 was set within farmland to the north. As with P20, the banks were gently sloping, and the water was very turbid. The pond was set among scattered willow, hawthorn and English oak.
Grid Reference	SP 0481 6997
Pond Area	400 m^2
Distance from Development Boundary	430 m north
Permanence	Never dries
Water Quality	Poor
Shade	50%
Macrophytes	0%
Egg Laying Habitat	No
Open Courtship Area	Yes
Wildfowl	No evidence of wildfowl was observed during the survey.
Fish	No evidence of fish was observed during the survey.
Surrounding Terrestrial Habitat	Poor

Table 4.2: (Cont.) Pond Description and Assessment of Habitat Features for Great Crested Newts

The HSI score for each of the ponds assessed is detailed in Table 4.3.

Pond Ref.	HSI Category										HSI Score
	SI 1	SI 2	SI 3	SI 4	SI 5	SI 6	SI 7	SI 8	SI 9	SI 10	
P1	1	0.2	0.9	0.33	1	1	0.67	1	0.33	0.35	**0.58 (Below average)**
P2	1	0.2	0.9	0.33	1	1	0.33	1	0.67	0.35	**0.58 (Below average)**
P3	1	0.85	0.9	0.67	1	0.67	0.01	1	0.67	0.8	**0.53 (Below average)**
P4	1	0.1	1	0.67	1	1	1	1	0.67	1	**0.73 (Good)**
P6	1	0.4	0.9	0.67	1	1	0.67	1	0.33	1	**0.75 (Good)**
P7	1	0.05	1	0.33	0.2	1	1	1	0.33	0.5	**0.47 (Poor)**
P8	1	0.1	0.9	0.33	1	1	0.67	1	0.33	0.35	**0.54 (Below average)**
P9	1	0.1	0.9	0.33	0.4	1	1	1	0.33	0.6	**0.55 (Below average)**
P11	1	0.4	0.5	0.67	0.2	1	1	1	0.33	0.8	**0.61 (Average)**
P15	1	0.5	0.9	0.67	1	1	0.67	0.4	0.33	0.3	**0.62 (Average)**
P18	1	-	0.9	0.67	1	1	0.33	1	0.67	0.9	**0.79 (Good)**
P19	1	0.95	0.9	0.67	1	1	0.67	1	0.33	0.8	**0.80 (Excellent)**
P20	1	0.95	0.9	0.33	1	1	1	1	0.33	0.3	**0.70 (Good)**
P21	1	0.8	0.9	0.33	1	1	1	1	0.33	0.3	**0.69 (Average)**

Key:
SI 1 – Location
SI 2 – Pond Area
SI 3 – Pond Drying
SI 4 – Water Quality
SI 5 – Shade
SI 6 – Waterfowl
SI 7 – Fish
SI 8 – Ponds Within 1km
SI 9 – Terrestrial Habitat
SI 10 – Macrophytes

Table 4.3: Habitat Suitability Index of Ponds Within 500 m of Study Area

4.4 SITE SUITABILITY AND CONNECTIVITY ASSESSMENT

The proposed development was situated within a golf course which was well connected to a range of suitable terrestrial and aquatic habitats within the wider landscape. The golf course was dominated by intensively managed amenity grassland; however, rough grassland, tall ruderal, scrub and woodland pockets were present particularly at the margins. Larger areas of rough semi-improved grassland were present in the north and west of the site and log piles and other debris were noted within the grassland in the north. Such habitats provide suitable foraging, refuge and hibernation opportunities for great crested newt and other amphibians although these are restricted in extent. Five ponds were noted on site (one of which was dry), and a further seven were present within the wider grounds of the hotel and golf course within 500 m of the site (one of which was dry and one no longer exists). Connectivity between the on-site and off-site aquatic and terrestrial habitats was considered good, and although scattered residential dwellings and intersecting lanes were present, these were not considered significant barriers to dispersal.

Ponds P15, P16, P17 and P18 were situated to the south of the River Arrow. During assessment, it was confirmed that at this location the River Arrow forms a significant connectivity barrier to amphibian dispersal between these ponds and the site. Additionally, P15 is also situated across the A441, which also constitutes a major barrier.

Ponds P20 and P21 were situated within farmland to the north. The grassland here was intensively managed, providing sub-optimal opportunities for refuge and dispersal. An intersecting lane was also present, though alone this would not be considered a significant barrier. The combination of the exposed farmland, lane and intervening distances (> 250 m) was considered sufficient to limit the potential for connectivity between these ponds and the site.

4.5 EDNA SURVEY

A summary of the eDNA analysis results provided by SureScreen Scientifics is given in Table 4.4.

Pond Ref.	SIC	DC	IC	Result
P1	Pass	Pass	Pass	Negative
P2	Pass	Pass	Pass	Negative
P3	Pass	Pass	Pass	Negative
P4	Pass	Pass	Pass	Negative
P6	Pass	Pass	Pass	Negative
P7	Pass	Pass	Pass	Negative
P8	Pass	Pass	Pass	Negative
P9	Pass	Pass	Pass	Negative
P11	Pass	Pass	Pass	Negative

Key:
SIC- Sample Integrity Check. Refers to quality of packaging, absence of tube leakage, suitability of sample (not too much mud or weed etc.) and absence of any factors that could potentially lead to results errors. Inspection upon receipt of sample at the laboratory. To check if the sample is of adequate integrity when received. Pass or Fail.

DC- Degradation Check. Analysis of the spiked DNA marker to see if there has been degradation of the kit since made in the laboratory to sampling to analysis. Pass or Fail.

IC- Inhibition Check- PCR inhibitors can cause false results. Inhibitors are analysed to check the quality of the result. 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.

Result- NEGATIVE means that GCN eDNA was not detected or is below the threshold detection level and the test result should be considered as no evidence of GCN presence. POSITIVE means that GCN eDNA was found at or above the threshold level and the presence of GCN at this location at the time of sampling or in the recent past is confirmed. Positive or Negative.

Table 4.4: eDNA Analysis Results

5. DISCUSSION AND CONCLUSIONS

5.1 SUMMARY OF SITE PROPOSALS

The proposals for the site involve the construction of residential dwellings with associated hard and soft landscaping. Pond P3 will be retained in accordance with the proposals and ponds P1, P2, P4 and P5 will be removed to facilitate the development. A new Sustainable Urban Drainage system (SUDs) will be created in the south of the site.

5.2 STATUS OF GREAT CRESTED NEWTS WITHIN THE SURVEY AREA

The desk study did not return any records of great crested newt within a 1 km search radius.

The results of the HSI index assessment for all ponds surveyed are summarised in Table 5.1.

HSI Score	Pond Suitability for Great Crested Newt	Pond Reference
< 0.5	Poor	P7
0.5 – 0.59	Below average	P1, P2, P3, P8, P9
0.6 – 0.69	Average	P11, P15, P21
0.7 – 0.79	Good	P4, P6, P18, P20
> 0.8	Excellent	P19

Table 5.1: Summary of HSI Results

Pond P7 was found to have 'poor' suitability for great crested newt due to its small size, high percentage of margins shaded (100% shading), poor surrounding terrestrial habitat and limited cover of macrophytes.

Ponds P1 and P2 on site were small in size, had poor water quality and a limited cover of macrophytes and P1 was additionally known to support fish. These factors reduce their suitability for use by great crested newt and the ponds are considered to be of 'below average' suitability. Pond P3 on site is also of 'below average' suitability which is largely influenced by the large population of coarse fish present. Ponds P8 and P9 also have 'below average' suitability for use by great crested newt due to their small size, poor water quality and surrounding terrestrial habitats. Pond P8 also had a low macrophyte cover and P9 had a high percentage of the margins shaded.

Pond P11 was found to be of 'average' suitability for use by great crested newt. Although the pond supported a high macrophyte cover including suitable egg-laying vegetation and no evidence of fish or fowl was noted, the pond was small in size, considered to sometimes dry and a high percentage of the margins were shaded (100% shading). Ponds P15 and P21 were also of 'below average' suitability for amphibians. The score of these ponds was influenced by the poor surrounding terrestrial habitat and an absence of macrophytes within the pond. Pond P21 was also considered to have poor water quality.

Pond P4 located on site had no evidence of fish or fowl within the pond and supported a diversity of macrophytes, however the pond was small in size and was assessed as having 'good' suitability for use by great crested newt. Pond P6 and P18 both had no evidence of waterfowl and supported a high percentage cover of macrophytes, however a small number of fish were noted within P18 and poor terrestrial habitats surrounded P6, namely sort mown amenity grassland. Therefore, P6 and P18 were assessed a having 'good' suitability in the HSI assessment. Pond P20 was also assessed as having 'good' suitability due to no evidence of fish or fowl recorded and the pond is considered to permanently support water. However, the pond had poor water quality, poor surrounding terrestrial habitats (improved grassland) and an absence of macrophytes which will adversely affect the suitability score.

Pond P19 was the only pond assessed as having 'excellent' suitability for use by great crested newt. This pond would permanently support water, an absence of fowl was recorded and macrophytes were noted within the pond. However, fish may be present within the pond and the pond is surrounded by amenity grassland which provides poor quality terrestrial habitat.

The golf course habitats are intensively managed reducing the suitability of the terrestrial habitat associated with the golf course ponds in the wider area. However, the plantation woodland belts across the golf course provide habitat connectivity between the proposed development site and ponds in the wider area.

eDNA testing was carried out at all suitable and accessible water bodies within a 250 m radius of the site, a total of nine ponds. The result of all ponds was negative indicating an absence of great crested newt DNA within the ponds at the time of the survey.

5.3 CONCLUSIONS AND SUMMARY OF POTENTIAL IMPACTS

The presence of great crested newt within the site is reasonably discounted and it is therefore considered that the proposed development of the site will not affect the favrouable conservation status of this species.

Due to the number of ponds on site and in close proximity to the site, common amphibians are likely to be present on site and a low number of common toad were recorded during the reptile surveys completed on site (Report RT-MME-153160-05). The unmanaged grassland habitats, woodland, hedgerows and scrub habitat to be removed are suitable for foraging and sheltering amphibians. Whilst these species have no statutory protection, common toad is listed a Species of Principal Importance for Nature Conservation in England which means they are a material consideration in the planning process. Therefore, recommendations to protect common amphibian species during site clearance and construction are provided in Section 6.

Four ponds on site, namely P1, P2, P4 and P5, will be removed to facilitate the proposals. Care should be taken during the draining and removal of the ponds to ensure breeding amphibians are not harmed. A recommendation to ensure the protection of common amphibians during removal of the ponds is provided in Section 6.

Favourable foraging and sheltering habitats for common amphibians will be removed as a result of the works. However, grassland and woodland habitats will be retained along the eastern site boundary providing connectivity between the site and the off-site golf course ponds in the wider area to the east as well as the terrestrial habitats in the wider area. Areas of open space and landscape planting will be incorporated into the proposed site layout including trees and scrub planting and wildflower grassland. The creation of these habitats will enhance the site for terrestrial amphibians and as such it is anticipated that sufficient foraging habitat will be maintained on site post-development to support common amphibian populations.

A SUDs feature will also be created in the south of the site which may increase the breeding habitats available to amphibians and compensate for the loss of the four ponds, although it may not be of high quality for breeding amphibians depending on its design and permanence to support water. Further recommendations to enhance the site for amphibians in the long-term should also be considered and have been recommended in Section 6.

Amphibians, and particularly toads due to their annual migrations to and from their breeding ponds, can be vulnerable to road casualty impacts and becoming trapped in gully pots. As roads will be necessary within the proposed development care should be taken to design kerbs and if required, gully pots in a manner that reduces risk to amphibians.

6. RECOMMENDATIONS

All recommendations provided in this section are based on Middlemarch Environmental Ltd's current understanding of the site proposals correct at the time the report was compiled. Should the proposals alter, the conclusions and recommendations made in the report should be reviewed to ensure that they remain appropriate.

R1 **Great Crested Newt:** The assessment revealed that no great crested newt DNA was recorded within any of the surveyed ponds and therefore great crested newts are not a notable consideration in relation to the proposed development. The survey data obtained for the site is valid for two years from the survey date. If development works have not commenced within this timeframe it will be essential to update the survey effort to establish if the status of the ponds has changed in the interim. In the unlikely event that a great crested newt is found during development works, all works must immediately cease and a suitably qualified ecologist should be contacted.

R2 **Common Amphibians:** The existing management of the grassland habitats should continue up until the commencement of works to ensure these habitats do not become tussocky and more favourable for common amphibians. The Reasonable Avoidance Method Statement provided in the Reptile Survey Report (RT-MME-153160-05) should be adhered to during site clearance and the construction phase for the protection of common amphibians.

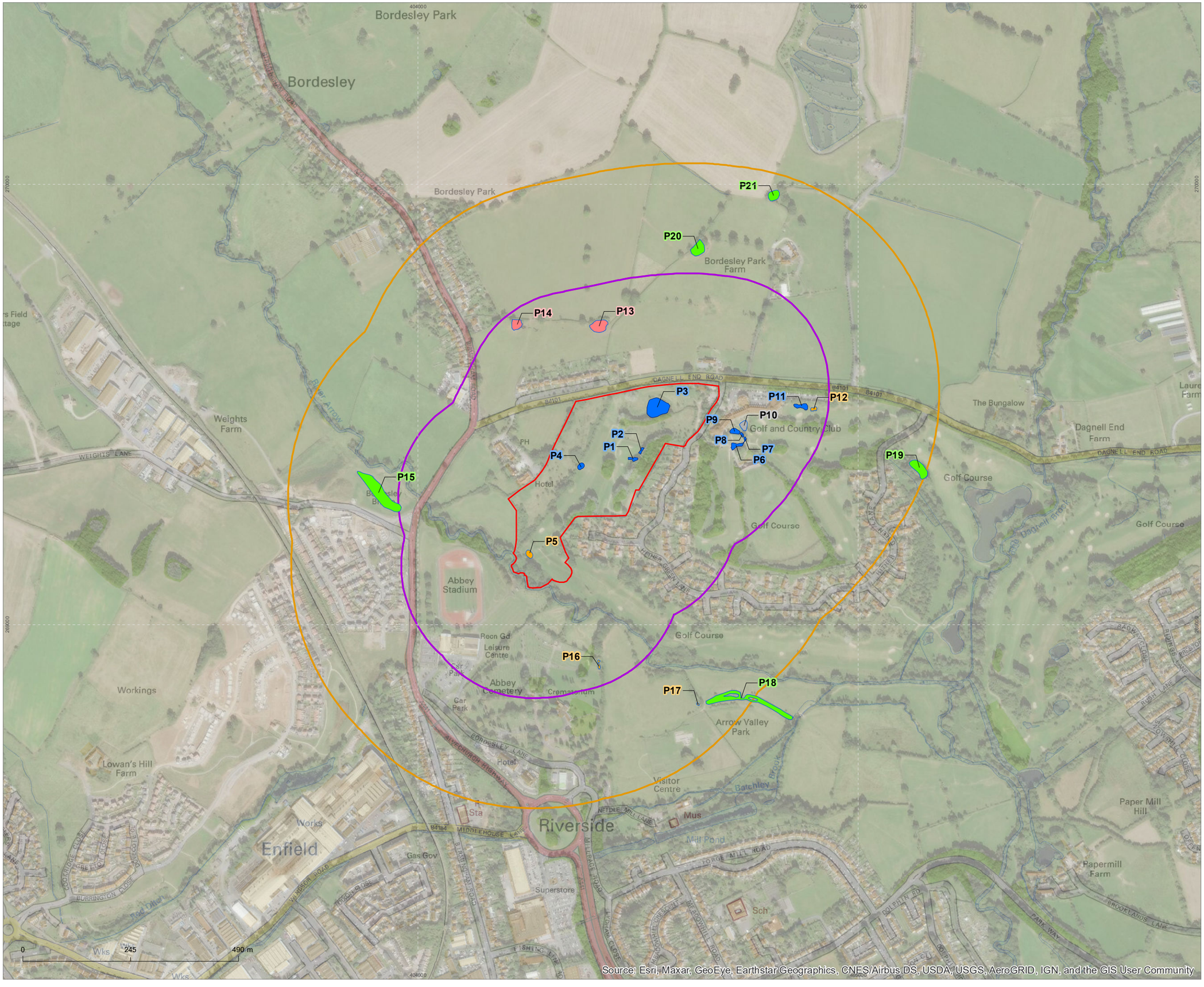
R3 **Pond Removal:** The removal of the ponds should also be completed in the amphibian active season avoiding the breeding season (March to June, inclusive). The ponds should be drained prior to removal and a mesh screen should be used if a pump is required. Pond decommissioning works should be supervised by an Ecological Clerk of Works.

R4 **Amphibian Safeguarding:** Kerb and gully pot design should follow best practice design to allow amphibian movements across the site and prevent capture in gully pots.

R5 **Habitat Enhancement:** If possible, the proposed SUDs feature should be designed to support some permanent water and provide opportunities for breeding amphibians. The creation of new wildlife ponds or enhancement of retained ponds within wider golf course, such as via plug planting suitable aquatic species for use by common newt species for egg laying including water mint *Mentha aquatica* and great willowherb *Epilobium hirsutum*, should be also considered. Amphibian hibernaculum and log piles could also be created within the areas of open space on site, which can be created from the removed trees, to provide additional opportunities for sheltering amphibians as well as small mammals and invertebrates.

7. DRAWINGS

Drawing C153160-03-01 – Pond Location Plan



C153160-03-01

Legend

- Application boundary
- 250 m radius from application boundary
- 500 m radius from application boundary
- Pond surveyed: HSI and eDNA
- Pond surveyed: HSI only
- Dry pond
- No access to pond
- Pond not present

N

Project	Hither Green Golf Course, Redditch, Worcestershire
Drawing	GCN HSI and eDNA Survey
Client	Baratt David Wilson Homes Mercia
Drawing Number: C153160-03-01	Revision: 00
Scale @ A3: 1:8,000	Date: September 2021
Approved By: HG	Drawn By: VO

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8. PHOTOGRAPHS

Plate 8.1: Pond P1 (on site)

Plate 8.2: Pond P2 (on site)

Plate 8.3: Pond P3 (on site)

Plate 8.4: Pond P4 (on site)

Plate 8.5: Pond P6

Plate 8.6: Pond P7

Plate 8.7: Pond P8

Plate 8.8: Pond P9

Plate 8.9: Pond P15

Plate 8.10: Pond P18

Plate 8.11: Pond P19

Plate 8.12: Pond P20

REFERENCES AND BIBLIOGRAPHY

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APPENDIX 1

eDNA Survey Report - SureScreen Scientifics

SureScreen Scientifics

Folio No: E11468
Report No: 1
Purchase Order: JUN 2197
Client: MIDDLEMARCH ENVIRONMENTAL
Contact: Evangeline Bevans

TECHNICAL REPORT

ANALYSIS OF ENVIRONMENTAL DNA IN POND WATER FOR THE DETECTION OF GREAT CRESTED NEWTS (TRITURUS CRISTATUS)

SUMMARY

When great crested newts (GCN), *Triturus cristatus*, inhabit a pond, they continuously release small amounts of their DNA into the environment. By collecting and analysing water samples, we can detect these small traces of environmental DNA (eDNA) to confirm GCN habitation or establish GCN absence.

RESULTS

Date sample received at Laboratory: 02/07/2021
Date Reported: 13/07/2021
Matters Affecting Results: None

Lab Sample No.	Site Name	O/S Reference	SIC	DC	IC	Result	Positive Replicates
6938	POND 1	SP 04490 69378	Pass	Pass	Pass	Negative	0

If you have any questions regarding results, please contact us: ForensicEcology@surescreen.com

Reported by: Chris Troth **Approved by:** Chris Troth

METHODOLOGY

The samples detailed above have been analysed for the presence of GCN eDNA following the protocol stated in DEFRA WC1067 'Analytical and methodological development for improved surveillance of the Great Crested Newt, Appendix 5.' (Biggs et al. 2014). Each of the 6 sub-sample tubes are first centrifuged and pooled together into a single sample which then undergoes DNA extraction. The extracted sample is then analysed using real time PCR (qPCR), which uses species-specific molecular markers to amplify GCN DNA within a sample. These markers are unique to GCN DNA, meaning that there should be no detection of closely related species.

If GCN DNA is present, the DNA is amplified up to a detectable level, resulting in positive species detection. If GCN DNA is not present then amplification does not occur, and a negative result is recorded.

Analysis of eDNA requires scrupulous attention to detail to prevent risk of contamination. True positive controls, negative controls and spiked synthetic DNA are included in every analysis and these have to be correct before any result is declared and reported. Stages of the DNA analysis are also conducted in different buildings at our premises for added security.

SureScreen Scientifics Ltd is ISO9001 accredited and participate in Natural England's proficiency testing scheme for GCN eDNA testing. We also carry out regular inter-laboratory checks on accuracy of results as part of our quality control procedures.

INTERPRETATION OF RESULTS

SIC: **Sample Integrity Check** [Pass/Fail]
When samples are received in the laboratory, they are inspected for any tube leakage, suitability of sample (not too much mud or weed etc.) and absence of any factors that could potentially lead to inconclusive results.

DC: **Degradation Check** [Pass/Fail]
Analysis of the spiked DNA marker to see if there has been degradation of the kit or sample between the date it was made to the date of analysis. Degradation of the spiked DNA marker may lead indicate a risk of false negative results.

IC: **Inhibition Check** [Pass/Fail]
The presence of inhibitors within a sample are assessed using a DNA marker. If inhibition is detected, samples are purified and re-analysed. Inhibitors cannot always be removed, if the inhibition check fails, the sample should be re-collected.

Result: **Presence of GCN eDNA** [Positive/Negative/Inconclusive]
Positive: GCN DNA was identified within the sample, indicative of GCN presence within the sampling location at the time the sample was taken or within the recent past at the sampling location.
Positive Replicates: Number of positive qPCR replicates out of a series of 12. If one or more of these are found to be positive the pond is declared positive for GCN presence. It may be assumed that small fractions of positive analyses suggest low level presence, but this cannot currently be used for population studies. In accordance with Natural England protocol, even a score of 1/12 is declared positive. 0/12 indicates negative GCN presence.
Negative: GCN eDNA was not detected or is below the threshold detection level and the test result should be considered as evidence of GCN absence, however, does not exclude the potential for GCN presence below the limit of detection.

SureScreen Scientifics

Folio No: E11453
Report No: 1
Purchase Order: JUN2197
Client: MIDDLEMARCH ENVIRONMENTAL
Contact: Evangeline Bevans

TECHNICAL REPORT

ANALYSIS OF ENVIRONMENTAL DNA IN POND WATER FOR THE DETECTION OF GREAT CRESTED NEWTS (TRITURUS CRISTATUS)

SUMMARY

When great crested newts (GCN), *Triturus cristatus*, inhabit a pond, they continuously release small amounts of their DNA into the environment. By collecting and analysing water samples, we can detect these small traces of environmental DNA (eDNA) to confirm GCN habitation or establish GCN absence.

RESULTS

Date sample received at Laboratory: 01/07/2021
Date Reported: 13/07/2021
Matters Affecting Results: None

Lab Sample No.	Site Name	O/S Reference	SIC	DC	IC	Result	Positive Replicates
6937	Pond 4	SP0436769364	Pass	Pass	Pass	Negative	0
6935	Hither Green, Pond 2	SP0450869396	Pass	Pass	Pass	Negative	0

If you have any questions regarding results, please contact us: ForensicEcology@surescreen.com

Reported by: Chris Troth **Approved by:** Chris Troth

METHODOLOGY

The samples detailed above have been analysed for the presence of GCN eDNA following the protocol stated in DEFRA WC1067 'Analytical and methodological development for improved surveillance of the Great Crested Newt, Appendix 5.' (Biggs et al. 2014). Each of the 6 sub-sample tubes are first centrifuged and pooled together into a single sample which then undergoes DNA extraction. The extracted sample is then analysed using real time PCR (qPCR), which uses species-specific molecular markers to amplify GCN DNA within a sample. These markers are unique to GCN DNA, meaning that there should be no detection of closely related species.

If GCN DNA is present, the DNA is amplified up to a detectable level, resulting in positive species detection. If GCN DNA is not present then amplification does not occur, and a negative result is recorded.

Analysis of eDNA requires scrupulous attention to detail to prevent risk of contamination. True positive controls, negative controls and spiked synthetic DNA are included in every analysis and these have to be correct before any result is declared and reported. Stages of the DNA analysis are also conducted in different buildings at our premises for added security.

SureScreen Scientifics Ltd is ISO9001 accredited and participate in Natural England's proficiency testing scheme for GCN eDNA testing. We also carry out regular inter-laboratory checks on accuracy of results as part of our quality control procedures.

INTERPRETATION OF RESULTS

SIC: **Sample Integrity Check** [Pass/Fail]
When samples are received in the laboratory, they are inspected for any tube leakage, suitability of sample (not too much mud or weed etc.) and absence of any factors that could potentially lead to inconclusive results.

DC: **Degradation Check** [Pass/Fail]
Analysis of the spiked DNA marker to see if there has been degradation of the kit or sample between the date it was made to the date of analysis. Degradation of the spiked DNA marker may lead indicate a risk of false negative results.

IC: **Inhibition Check** [Pass/Fail]
The presence of inhibitors within a sample are assessed using a DNA marker. If inhibition is detected, samples are purified and re-analysed. Inhibitors cannot always be removed, if the inhibition check fails, the sample should be re-collected.

Result: **Presence of GCN eDNA** [Positive/Negative/Inconclusive]
Positive: GCN DNA was identified within the sample, indicative of GCN presence within the sampling location at the time the sample was taken or within the recent past at the sampling location.
Positive Replicates: Number of positive qPCR replicates out of a series of 12. If one or more of these are found to be positive the pond is declared positive for GCN presence. It may be assumed that small fractions of positive analyses suggest low level presence, but this cannot currently be used for population studies. In accordance with Natural England protocol, even a score of 1/12 is declared positive. 0/12 indicates negative GCN presence.
Negative: GCN eDNA was not detected or is below the threshold detection level and the test result should be considered as evidence of GCN absence, however, does not exclude the potential for GCN presence below the limit of detection.

SureScreen Scientifics

Folio No: E11839
Report No: 1
Purchase Order: JUL2141
Client: MIDDLEMARCH ENVIRONMENTAL
Contact: Carol Flaxman

TECHNICAL REPORT

ANALYSIS OF ENVIRONMENTAL DNA IN POND WATER FOR THE DETECTION OF GREAT CRESTED NEWTS (TRITURUS CRISTATUS)

SUMMARY

When great crested newts (GCN), *Triturus cristatus*, inhabit a pond, they continuously release small amounts of their DNA into the environment. By collecting and analysing water samples, we can detect these small traces of environmental DNA (eDNA) to confirm GCN habitation or establish GCN absence.

RESULTS

Date sample received at Laboratory: 20/07/2021
Date Reported: 22/07/2021
Matters Affecting Results: None

Lab Sample No.	Site Name	O/S Reference	SIC	DC	IC	Result	Positive Replicates
5219	POND 6	SP 04725 69411	Pass	Pass	Pass	Negative	0
6931	POND 7	SP 04741 69427	Pass	Pass	Pass	Negative	0
6932	POND 11	SP 04873 69497	Pass	Pass	Pass	Negative	0
6933	POND 9	SP 04720 69442	Pass	Pass	Pass	Negative	0
6934	POND 8	SP 04737 69434	Pass	Pass	Pass	Negative	0
7229	POND 3	SP 04542 69497	Pass	Pass	Pass	Negative	0

If you have any questions regarding results, please contact us: ForensicEcology@surescreen.com

Reported by: Jennifer Higginbottom **Approved by:** Chris Troth

METHODOLOGY

The samples detailed above have been analysed for the presence of GCN eDNA following the protocol stated in DEFRA WC1067 'Analytical and methodological development for improved surveillance of the Great Crested Newt, Appendix 5.' (Biggs et al. 2014). Each of the 6 sub-sample tubes are first centrifuged and pooled together into a single sample which then undergoes DNA extraction. The extracted sample is then analysed using real time PCR (qPCR), which uses species-specific molecular markers to amplify GCN DNA within a sample. These markers are unique to GCN DNA, meaning that there should be no detection of closely related species.

If GCN DNA is present, the DNA is amplified up to a detectable level, resulting in positive species detection. If GCN DNA is not present then amplification does not occur, and a negative result is recorded.

Analysis of eDNA requires scrupulous attention to detail to prevent risk of contamination. True positive controls, negative controls and spiked synthetic DNA are included in every analysis and these have to be correct before any result is declared and reported. Stages of the DNA analysis are also conducted in different buildings at our premises for added security.

SureScreen Scientifics Ltd is ISO9001 accredited and participate in Natural England's proficiency testing scheme for GCN eDNA testing. We also carry out regular inter-laboratory checks on accuracy of results as part of our quality control procedures.

INTERPRETATION OF RESULTS

SIC: **Sample Integrity Check** [Pass/Fail]
When samples are received in the laboratory, they are inspected for any tube leakage, suitability of sample (not too much mud or weed etc.) and absence of any factors that could potentially lead to inconclusive results.

DC: **Degradation Check** [Pass/Fail]
Analysis of the spiked DNA marker to see if there has been degradation of the kit or sample between the date it was made to the date of analysis. Degradation of the spiked DNA marker may lead indicate a risk of false negative results.

IC: **Inhibition Check** [Pass/Fail]
The presence of inhibitors within a sample are assessed using a DNA marker. If inhibition is detected, samples are purified and re-analysed. Inhibitors cannot always be removed, if the inhibition check fails, the sample should be re-collected.

Result: **Presence of GCN eDNA** [Positive/Negative/Inconclusive]
Positive: GCN DNA was identified within the sample, indicative of GCN presence within the sampling location at the time the sample was taken or within the recent past at the sampling location.
Positive Replicates: Number of positive qPCR replicates out of a series of 12. If one or more of these are found to be positive the pond is declared positive for GCN presence. It may be assumed that small fractions of positive analyses suggest low level presence, but this cannot currently be used for population studies. In accordance with Natural England protocol, even a score of 1/12 is declared

positive. 0/12 indicates negative GCN presence.

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

APPENDIX 2

LEGISLATION

Great crested newts (GCN) and the places they use for shelter or protection receive legal protection under the Conservation of Habitats and Species Regulations 2017, (Habitats Regulations 2017) and the Conservation of Habitats and Species Regulations (Amendment) (EU Exit) Regulations 2019 (Habitats Regulations 2019). They receive further legal protection under the Wildlife and Countryside Act (WCA) 1981, as amended. This protection means that GCN, and the places they use for shelter or protection, are capable of being a material consideration in the planning process.

Regulation 41 of the Habitats Regulations 2017, states that a person commits an offence if they:

- deliberately capture, injure or kill a GCN;
- deliberately disturb GCN;
- deliberately take or destroy eggs of a GCN; or
- damage or destroy a GCN breeding site or resting place.

Disturbance of animals includes in particular any disturbance which is likely to impair their ability to survive, to breed or reproduce, or to rear or nurture their young, or in the case of animals of a hibernating or migratory species, to hibernate or migrate; or to affect significantly the local distribution or abundance of the species to which they belong.

It is an offence under the Habitats Regulations 2017 for any person to have in his possession or control, to transport, to sell or exchange or to offer for sale, any live or dead GCN, part of a GCN or anything derived from GCN, which has been unlawfully taken from the wild. This legislation applies to all life stages of GCN.

Changes have been made to parts of the Habitats Regulations 2017 so that they operate effectively from 1st January 2021. The changes are made by the Habitats Regulations 2019, which transfer functions from the European Commission to the appropriate authorities in England and Wales.

All other processes or terms in the 2017 Regulations remain unchanged and existing guidance is still relevant.

The obligations of a competent authority in the 2017 Regulations for the protection of species do not change. A competent authority is a public body, statutory undertaker, minister or department of government, or anyone holding public office.

Whilst broadly similar to the above legislation, the WCA 1981 (as amended) differs in the following ways:

- Section 9(1) of the WCA makes it an offence to *intentionally* kill, injure or take any protected species.
- Section 9(4)(a) of the WCA makes it an offence to *intentionally or recklessly** damage or destroy, *or obstruct access to*, any structure or place which a protected species uses for shelter or protection.
- Section 9(4)(b) of the WCA makes it an offence to *intentionally or recklessly** disturb any protected species *while it is occupying a structure or place which it uses for shelter or protection*.

*Reckless offences were added by the Countryside and Rights of Way (CRoW) Act 2000.

The reader should refer to the original legislation for the definitive interpretation.

GCN are listed a Species of Principal Importance for Nature Conservation in England which means they are a material consideration in the planning process. The list of species is derived from Section 41 list of the Natural Environmental and Rural Communities (NERC) Act 2006.

ECOLOGY

The great crested newt is the largest of the three newt species in the UK. Like all UK amphibians, they breed within ponds but great crested newts spend the majority of the year on land. Great crested newts prefer to breed in medium to large ponds without fish or significant numbers of waterfowl. Ponds which lack shade on the southern margins appeared to be favoured. Newts enter the ponds to breed in the spring, immediately after they come out of their winter dormancy. The females lay eggs individually on the leaves of aquatic vegetation, and these generally hatch within four weeks, although the exact timing is dependent on environmental conditions. The larvae then stay in the water until the metamorphosing into adult newts (when they lose their external gills) between August and October and are now able to leave the water. Great crested newts can live up to 14 years in the wild and spend most of their lives out of the ponds, foraging at night in areas of undisturbed habitat, favouring rough grassland, scrub and woodland areas. Newts may travel up to 1 km from a breeding pond, but most tend to travel no more than 250 m if the ponds are close to suitable terrestrial habitat. Great crested newts are predators from birth, taking a variety of live prey including aquatic invertebrates, frog tadpoles, slugs, earthworms, spiders and other land invertebrates. Great crested newt hibernate during the winter months in underground crevices, such as gaps between tree roots, or under piles of logs, rubble etc.

Great crested newt populations have declined significantly in Britain, and continental Europe, since the 1940s as a result of habitat loss.