



Norfolk County Council

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# NORWICH WESTERN LINK ROAD

Great Crested Newt eDNA Survey Report





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## Great Crested Newt eDNA Survey Report

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# 1. INTRODUCTION

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## 1.1. PROJECT BACKGROUND

- 1.1.1. The Norwich Western Link Road (NWL) is a highway scheme linking the A1270 Broadland Northway from its junction with the A1067 Fakenham Road to the A47 trunk road near Honingham.
- 1.1.2. The NWL, hereafter referred to as the Scheme, will comprise the following listed below.
- Dualling the A1067 Fakenham Road westwards from its existing junction with the A1270 to a new roundabout located approximately 400m to the north west.
  - Construction of a new roundabout.
  - Constructing a dual carriageway link from the new roundabout to a new junction with the A47 near Honingham.
- 1.1.3. As part of a separate planned scheme, Highways England proposes to realign and dual the A47 from the existing roundabout at Easton to join the existing dual carriageway section at North Tuddenham. If that scheme proceeds, it is expected that Highways England will construct the Honingham junction and the Norwich Western Link will connect to the north-eastern side of that junction.
- 1.1.4. The Scheme will cross the River Wensum and its floodplain by means of a viaduct. The Scheme will also cross four minor roads by means of overpass or underpass bridges. The Scheme will include ancillary works such as provision for non-motorised users, necessary realignment of the local road network and the provision of environmental mitigation measures.

## 1.2. ECOLOGICAL BACKGROUND

- 1.2.1. A Phase 1 Habitat Survey (WSP UK Ltd., 2020), undertaken in 2020, identified suitable aquatic and terrestrial habitat which could support Great Crested Newt *Triturus cristatus* (GCN). Habitats included numerous water bodies and terrestrial habitat such as tussocky grassland, woodland, scrub, wetland, field margins and other boundary features such as ditches and hedgerows. It was therefore recommended that a GCN environmental DNA (eDNA) survey be undertaken to establish a sufficient baseline to inform impact assessment.

## 1.3. BRIEF AND OBJECTIVES

- 1.3.1. WSP UK Ltd was commissioned by Norfolk County Council to complete GCN surveys, with the following objectives:
- Complete a Habitat Suitability Index (HSI) assessment of water bodies within the Scheme boundary and within 500m of the Scheme boundary to assess their suitability as aquatic habitat for great crested newts.

- Complete a GCN eDNA survey to determine the presence or likely absence of this species from water bodies within the Scheme boundary and within 500m of the Scheme boundary.
- Present the findings of the survey in a baseline report.

1.3.2. The survey findings will be used to inform the impact assessment and proposed mitigation for GCN and other amphibian species present across the Scheme. Details of the impact assessment and mitigation will be included within the Biodiversity Chapter of the Environmental Statement for the Scheme.

## **1.4. STUDY AND SURVEY AREA**

- 1.4.1. An ecological Desk Study was completed in March 2020 to include recent data relevant to the Route. The Desk Study Area for this was defined as a 2km radius of the Scheme boundary (drawing 70061370-09-07-0001 see separate document, **Error! Reference source not found.** ).
- 1.4.2. The Survey Area in relation to GCN comprised a 500m buffer of the Scheme. All suitable water bodies, where access was permitted, identified as having potential to support GCN populations were surveyed. The Scheme and Survey Area are shown on drawing 70061370-09-07-0001, see separate document **Error! Reference source not found.**).
- 1.4.3. This report will be updated with the results of further great crested newt surveys to be undertaken in 2021 to complete the baseline. This will include further population size class estimate surveys on waterbodies which returned positive results for great crested newt eDNA, as well as further eDNA surveys of ponds which could not be surveyed in 2020 due to access or being dry, or where the result was classed as inconclusive/indeterminate.



## 2. RELEVANT LEGISLATION

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### 2.1. LEGAL COMPLIANCE

- 2.1.1. GCN are afforded a high level of protection under the Conservation of Habitats and Species Regulations 2017 (the 'Habitats Regulations'), the legislation means that it is an offence to;
- deliberately capture, injure or kill a wild great crested newt;
  - deliberately disturb wild great crested newts; '*disturbance of animals includes in particular any disturbance which is likely:*'
    - (a) *to impair their ability —*
      - (i) *to survive, to breed or reproduce, or to rear or nurture their young; or*
      - (ii) *in the case of animals of a hibernating or migratory species, to hibernate or migrate; or*
    - (b) *to affect significantly the local distribution or abundance of the species to which they belong.'*
  - damage or destroy a breeding Site or resting place used by this species.
- 2.1.2. Protection is also afforded under the Wildlife and Countryside Act 1981 (as amended) with respect to disturbance of animals when using places of shelter, and obstruction of access to places of shelter.
- 2.1.3. Due to the high level of protection afforded to GCN and their habitat, mitigation for this species is governed by a strict licensing procedure administered by Natural England (normally, planning permission must be obtained before a licence can be sought. However, works which do not require planning permission must still adhere to licensing requirements).
- 2.1.4. Licencing is subject to three tests, as defined under the Habitats Regulations, these must also be applied by a planning authority before granting permission for activities affecting GCN. For permission to be granted the following criteria must be satisfied;
- the proposal is necessary '*to preserve public health or public safety or other imperative reasons of overriding public interest including those of a social or economic nature and beneficial consequences of primary importance for the environment*';
  - '*there is no satisfactory alternative*'; and
  - the proposals '*will not be detrimental to the maintenance of the population of the species concerned at a favourable conservation status in their natural range*'.
- 2.1.5. GCN are also listed as a Species of Principal Importance (SPI) for the Conservation of Biodiversity in England in accordance with Section 41 of the Natural Environment and Rural Communities (NERC) Act 2006. Under Section 40 of the NERC Act (2006) public bodies (including local planning authorities) have a duty to have regard for the conservation of SPI when carrying out their functions, including determining planning applications.



## 3. METHODS

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### 3.1. OVERVIEW

- 3.1.1. In total, 49 water bodies were identified. Of these, 39 were visited as part of an HSI assessment and 24 subject to an eDNA survey.
- 3.1.2. Each water body identified, access permitting, was subject to an HSI assessment. Water bodies that were found to be suitable for GCN were then subject to water sampling for eDNA testing. The surveys took place within in the eDNA testing season on the 15<sup>th</sup>, 19<sup>th</sup> and 20<sup>th</sup> May and 30<sup>th</sup> June 2020. Only one water body, 23, was subject to surveys outside the GCN eDNA testing season on 14<sup>th</sup> July 2020.

### 3.2. DESK STUDY

- 3.2.1. An ecological desk study was completed in March 2020 to include recent data relevant to the Scheme. Records of any notable or legally protected species, including GCN and other amphibians, from within the Study Area were requested from Norfolk Biodiversity Information Service (NBIS). Freely downloadable datasets (available from Multi Agency Geographic Information for the Countryside (MAGIC), Department for Environment, Food and Rural Affairs) were consulted for information regarding records of European Protected Species Mitigation Licence (EPSML) and survey class licence returns within the Desk Study Area.

### 3.3. HABITAT SUITABILITY INDEX (HSI) ASSESSMENT

- 3.3.1. All water bodies within the Survey Area to which access was possible were assessed for their suitability to support great crested newts using the standard HSI assessment method (ARG UK, 2010) and Oldham *et al.* 2000. Water bodies were identified using 1:25,000 OS mapping; this was also cross referenced against aerial photography.
- 3.3.2. Water bodies were assessed and scored on ten key variables which are known to influence breeding populations of great crested newts, in accordance with standard methods (ARG UK, 2010). These variables are;
- geographic location;
  - water body area;
  - water body permanence;
  - water quality;
  - water body shading;
  - impact of waterfowl;
  - fish stocks;
  - number of water bodies within 1km;
  - terrestrial habitat around the water body; and
  - macrophyte cover of the water body.

3.3.3. Scores for each of the above variables were used to calculate an overall HSI value for each water body. This was then cross referenced with the guidelines (ARG UK, 2010) to assign the pond to one of five categories, poor, below average, average, good or excellent, as shown in Table 3-1. Index calculation is not a failsafe method of identifying whether a water body supports great crested newts or not; therefore, professional judgement and availability of records of GCN in the locality has also been used to inform the requirement for further survey.

**Table 3-1 – Pond suitability categorisation based upon HSI score**

| HSI score  | Pond suitability |
|------------|------------------|
| <0.5       | Poor             |
| 0.5 – 0.59 | Below average    |
| 0.6 – 0.69 | Average          |
| 0.7 – 0.79 | Good             |
| >0.8       | Excellent        |

### 3.4. eDNA WATER SAMPLING

3.4.1. All water bodies found to provide suitable habitat for GCN, e.g. those ranging from poor to excellent suitability (see Table 3-1 above), to which access was possible, were subject to further survey to determine the presence or likely absence of this species. A small number of water bodies though were excluded from the eDNA survey effort. Their exclusion was based on professional judgement and where the habitat was considered completely unsuitable for GCN due to the size, depth and nature of the water body (for example, a concrete well with no features present to support GCN). Water bodies isolated from the Scheme by significant barriers to dispersal such as busy main roads were also discounted. The survey comprised eDNA water sampling. Sampling of eDNA was undertaken concurrently with the HSI survey. Professional judgement gained from previous experience and knowledge of GCN ecology, was exercised in selecting water bodies appropriate for sampling.

3.4.2. Research published in 2013 established a technique for reliably detecting newt eDNA in water bodies, and Natural England subsequently approved a protocol for this to become a survey method. The surveys were undertaken following survey techniques described in Biggs et al. (Biggs *et al.*, 2014):

- A single visit to each target water body was made between mid-April and late-June, during the newt breeding season. One water body, pond 23, was subject to a visit in July, outside the newt breeding season.
- Twenty sub-samples of water were taken from each water body using sterile sampling equipment provided by the laboratory (ADAS).
- The locations of the 20 sub-samples were spaced as evenly as possible around the water body margin, and where possible targeted areas of vegetation which could be used as egg laying substrate and open water areas which newts could use for displaying.
- The sub-samples were mixed and pipetted into six sample tubes containing an alcohol and pH buffer solution.
- The samples were sent to ADAS for laboratory testing using real time polymerase chain reaction (PCR) to amplify part of the cytochrome 1 gene found in mitochondrial DNA.
- The water samples from each water body were assigned a positive or negative result as well as a score between 0 and 12 representing the number of positive replicates from a series of 12.

3.4.3. A positive eDNA result concludes that GCN DNA is present in the water sample, whilst a negative result concludes that the presence of GCN is considered unlikely within that water body. Negative eDNA results cannot conclusively say that a GCN are not present within the water body, rather that DNA from the species was not detected. GCN expel DNA into the ponds in which they live when they deposit; skin cells, faeces, mucus, sperm or eggs into the water. The DNA in this material can persist, and be detected, in the water for several weeks.

### 3.5. DATES OF SURVEY AND PERSONNEL

3.5.1. Lead surveyors were competent and experienced in conducting these surveys and both hold a Natural England survey licence for this species (licence numbers can be made available on request).

3.5.2. The date for each survey visit is displayed in Table 3-2 beneath.

**Table 3-2 – Survey Dates**

| Water Body Ref. | Date of HSI | Date of eDNA |
|-----------------|-------------|--------------|
| 1               | 15/05/2020  | N/A          |
| 2               | 15/05/2020  | 15/05/2020   |
| 3               | 15/05/2020  | 15/05/2020   |
| 4               | 15/05/2020  | 15/05/2020   |
| 5               | 15/05/2020  | 15/05/2020   |
| 6               | 30/06/2020  | 30/06/2020   |
| 7               | 15/05/2020  | 15/05/2020   |

| Water Body Ref. | Date of HSI | Date of eDNA |
|-----------------|-------------|--------------|
| 8               | 15/05/2020  | N/A          |
| 9               | 15/05/2020  | 15/05/2020   |
| 10              | 15/05/2020  | 15/05/2020   |
| 11              | N/A         | N/A          |
| 12              | 19/05/2020  | 19/05/2020   |
| 13              | 19/05/2020  | 19/05/2020   |
| 14              | 19/05/2020  | 19/05/2020   |
| 15              | 19/05/2020  | 19/05/2020   |
| 16              | 19/05/2020  | 19/05/2020   |
| 17              | 19/05/2020  | 19/05/2020   |
| 18              | 19/05/2020  | 19/05/2020   |
| 19              | 19/05/2020  | 19/05/2020   |
| 20              | 30/06/2020  | N/A          |
| 21              | 30/06/2020  | N/A          |
| 22              | N/A         | N/A          |
| 23              | 14/07/2020  | 14/07/2020   |
| 24              | 30/06/2020  | N/A          |
| 25              | 30/06/2020  | 30/06/2020   |
| 26              | 30/06/2020  | N/A          |
| 27              | 20/05/2020  | N/A          |
| 28              | 20/05/2020  | 20/05/2020   |
| 29              | 20/05/2020  | 20/05/2020   |
| 30              | 20/05/2020  | 20/05/2020   |
| 31              | 30/06/2020  | N/A          |
| 32              | 20/05/2020  | 20/05/2020   |
| 33              | N/A         | N/A          |
| 34              | 30/06/2020  | 30/06/2020   |
| 35              | 20/05/2020  | 20/05/2020   |
| 36              | 19/05/2020  | N/A          |
| 37              | N/A         | N/A          |

| Water Body Ref. | Date of HSI | Date of eDNA |
|-----------------|-------------|--------------|
| 38              | N/A         | N/A          |
| 39              | N/A         | N/A          |
| 40              | 19/05/2020  | N/A          |
| 41              | N/A         | N/A          |
| 42              | N/A         | N/A          |
| 43              | N/A         | N/A          |
| 44              | N/A         | N/A          |
| 45              | 20/05/2020  | N/A          |
| 46              | 20/05/2020  | N/A          |
| 47              | 20/05/2020  | N/A          |
| 48              | N/A         | N/A          |
| 49              | 30/06/2020  | N/A          |

### 3.6. NOTES AND LIMITATIONS

- 3.6.1. One water body, 23, was sampled for eDNA testing outside the recommended survey period (mid- April to late-June). As the water body returned a negative result, further survey will be required in the 2021 survey season as this year’s result cannot be used as evidence of likely absence of GCN.
- 3.6.2. Seven water bodies were dry at the time of survey. Sampling took place within the recommended period (mid-April – late June), however dry, warm weather prior to the surveys in May and June may have caused water bodies to dry prematurely and therefore may still be suitable for GCN breeding in other years. Therefore, these water bodies should be subject to a walkover during the next suite of GCN surveys and should be sampled for GCN eDNA if found to be holding water.
- 3.6.3. Due to access restrictions water samples were unable to be taken from two ponds. The status of these ponds and likelihood that they could support GCN will be reviewed after further survey has taken place.
- 3.6.4. Survey data is considered to be out of date after three years (CIEEM, 2019). As such, this conclusion of likely absence can be considered valid until 2023, after which time an ecologist should be consulted as to the need for updated GCN surveys.

## 4. RESULTS

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### 4.1. DESK STUDY

- 4.1.1. The data search returned by NBIS did not contain any records of amphibians, including GCN, within 2km of the Scheme used for the data search. The Scheme and Study Area is included within separate document **Error! Reference source not found..**
- 4.1.2. A review of freely available data from MAGIC (Defra) returned a record of a GCN EPSML mitigation licence approximately 100m from the Scheme boundary. However, a freedom of information (FOI) request found that this licence was in relation to construction of the Broadland Northway. The junction of the Broadland Northway (west) with the A1067 lies within the Study Area, however the water bodies covered by the EPSML are outside the 2km Desk Study Area, with the nearest water body being approximately 3km from the Scheme.
- 4.1.3. A further five records for GCN class survey licence returns were found on MAGIC within 2km, the nearest being approximately 0.8km south of the Scheme.

### 4.2. HABITAT SUITABILITY INDEX (HSI) ASSESSMENT

- 4.2.1. A summary of the HSI results and location information for the water bodies is included on drawing 70061370-09-07-0003, see separate document Appendix C. Water body numbers correspond to those in separate document Appendix B and the HSI calculation is included in Table D-1, Appendix D. Photographs of each water body are included in Appendix E.
- 4.2.2. A total of 49 water bodies were identified as part of the aerial mapping, prior to the HSI surveys, one water body, 48, was ruled out as it was determined that the A47 provided a sufficient barrier to GCN movement. Nine water bodies were not subject to HSI survey due to access restrictions.
- 4.2.3. As a result, a total of 39 water bodies were visited as part of an HSI assessment. Of these water bodies, three were no longer present, seven were dry and two were classed as unsuitable because they lacked the appropriate habitat to support GCN. Therefore, 27 water bodies were able to be assessed for GCN suitability. The water bodies in each category is as follows;
- **poor** – five water bodies (3, 6, 7, 18 and 30)
  - **below average** – six water bodies (2, 5, 15, 21, 32 and 34)
  - **average** – seven water bodies (12, 13, 17, 23, 29, 36, and 40)
  - **good** – seven water bodies (4, 9, 10, 14, 16, 25 and 35); and
  - **excellent** – two water bodies (19 and 28).

### 4.3. eDNA WATER SAMPLING

- 4.3.1. A summary of the results is provided alongside the HSI scores in Table 4-1 and shown on drawing 70061370-09-07-0003, see separate document Appendix C. Full laboratory results are available in separate document Appendix F.

- 4.3.2. Water sampling for eDNA analysis, where possible, was undertaken immediately following the HSI assessment.
- 4.3.3. Of the 27 suitable water bodies, 23 were able to be subject to eDNA sampling during the optimal period (mid-April – late-June), with one water body subject to sampling outside this optimal period. The remaining three water bodies could not be sampled due to either low water levels (assessed as dry in the eDNA result) or as being inaccessible for water sampling.
- 4.3.4. Of the 23 water bodies sampled within the optimal period, two, 15 and 16, returned positive results and the 20 remaining water bodies (2 – 7, 9 and 10, 12 – 14, 17, 19, 25, 28 – 30, 32, 34 and 35) returned negative results. One of the water bodies, 18, returned an indeterminate<sup>1</sup> result and therefore will likely require further survey.
- 4.3.5. The water body, 23, tested outside the optimal survey season for GCN eDNA returned a negative eDNA result. This though has been classed as inconclusive, as the negative result cannot be used to confirm likely absence of GCN and therefore will require further survey.

#### **4.4. SUMMARY OF HSI AND eDNA RESULTS**

- 4.4.1. The Desk Study did not return any records of amphibians, including GCN, within 2km of the Scheme Boundary used for the data search. A review of freely available data from MAGIC (Defra) returned a record of a GCN EPSL mitigation licence outside the 2km Desk Study Area and a further five GCN class licence returns within the 2km Desk Study Area.
- 4.4.2. A total of 49 water bodies were identified through aerial mapping. Prior to the surveys, water body 48 was ruled out of surveys as it was determined that the A47 provided a significant barrier to GCN movement. Nine of the water bodies were not subject to surveys due to access restrictions and therefore will require further survey once access is available. Therefore, only 39 water bodies were subject to surveys.
- 4.4.3. Out of the 39 water bodies that were surveyed, three were found to be no longer present and seven were dry. As a result, 29 waterbodies were assessed for their suitability to support GCN. The results of the HSI assessment were as follows: two ponds were immediately ruled out as unsuitable, five ponds were categorised as poor, six as below average, seven as average, seven as good and two as excellent suitability for GCN.
- 4.4.4. Of the 27 suitable water bodies, 23 were able to be subject to eDNA sampling during the optimal period (mid-April – late-June), with one water body subject to sampling outside this optimal period. The remaining three water bodies could not be sampled due to either low water levels (assessed as dry in the eDNA result) or as being inaccessible for water sampling.

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<sup>1</sup> Results will be recorded as indeterminate if the GCN result is negative and the degradation result is recorded as:  
a. evidence of decay - meaning that the degradation control was outside of accepted limits  
b. evidence of degradation or residual inhibition - meaning that the degradation control was outside of accepted limits but that this could have been due to inhibitors not being removed sufficiently by the dilution of inhibited samples (ADAS, 2020).



4.4.5. The results returned two positive results, 20 negative results and one indeterminate result for GCN eDNA. The water body, pond 23, tested outside the optimal survey season for GCN eDNA and returned a negative result. This has been omitted from the above results and classed as inconclusive.

**Table 4-1 – Summary of HSI and eDNA results**

| Water body Ref. | Grid Reference | Proximity to Scheme (m) | Connectivity to Scheme       | HSI Score   | HSI Category  | eDNA Result                         |
|-----------------|----------------|-------------------------|------------------------------|-------------|---------------|-------------------------------------|
| 1               | TG1037712012   | 377                     | Over 250m from Scheme        | Dry         | Dry           | Not suitable for eDNA testing - dry |
| 2               | TG1037112032   | 365                     | Over 250m from Scheme        | 0.53        | Below Average | Negative                            |
| 3               | TG1019212272   | 144                     | Good                         | 0.41        | Poor          | Negative                            |
| 4               | TG1007812272   | 25                      | Good                         | 0.77        | Good          | Negative                            |
| 5               | TG1036012369   | 327                     | Over 250m from Scheme        | 0.56        | Below Average | Negative                            |
| 6               | TG0954712601   | 123                     | Isolated within arable field | 0.46        | Poor          | Negative                            |
| 7               | TG1018512635   | 198                     | Good                         | 0.43        | Poor          | Negative                            |
| 8               | TG0997612905   | 12                      | Good                         | Dry         | Dry           | Not suitable for eDNA testing - dry |
| 9               | TG1011913482   | 69                      | Good                         | 0.80        | Good          | Negative                            |
| 10              | TG1022013444   | 65                      | Good                         | 0.71        | Good          | Negative                            |
| 11              | TG1121913288   | Not present             | N/A                          | Not present | Not present   | Not present                         |
| 12              | TG1151713700   | 87                      | Good                         | 0.63        | Average       | Negative                            |

| Water body Ref. | Grid Reference | Proximity to Scheme (m) | Connectivity to Scheme       | HSI Score | HSI Category  | eDNA Result                         |
|-----------------|----------------|-------------------------|------------------------------|-----------|---------------|-------------------------------------|
| 13              | TG1007314111   | 323                     | Over 250m from Scheme        | 0.62      | Average       | Negative                            |
| 14              | TG1009414218   | 388                     | Over 250m from Scheme        | 0.70      | Good          | Negative                            |
| 15              | TG1020014165   | 280                     | Over 250m from Scheme        | 0.56      | Below Average | Positive                            |
| 16              | TG1038814219   | 272                     | Over 250m from Scheme        | 0.76      | Good          | Positive                            |
| 17              | TG1033814219   | 259                     | Over 250m from Scheme        | 0.68      | Average       | Negative                            |
| 18              | TG1135814249   | 162                     | Isolated within arable field | 0.25      | Poor          | Indeterminate                       |
| 19              | TG1148314557   | 14                      | Within Scheme                | 0.84      | Excellent     | Negative                            |
| 20              | TG1139514861   | 317                     | Over 250m from Scheme        | Dry       | Dry           | Not suitable for eDNA testing - dry |
| 21              | TG1176915218   | 356                     | Over 250m from Scheme        | 0.51      | Below Average | Not suitable for eDNA testing - dry |
| 22              | TG1139215764   | 408                     | Over 250m from Scheme        | No access | No access     | No access                           |
| 23              | TG1163616380   | 150                     | Good                         | 0.68      | Average       | Inconclusive <sup>2</sup>           |

<sup>2</sup> Due to late sampling outside the recommended survey period, this result cannot be used to confirm likely absence of GCN and therefore will be subject to further survey.

| Water body Ref. | Grid Reference | Proximity to Scheme (m) | Connectivity to Scheme | HSI Score          | HSI Category                    | eDNA Result        |
|-----------------|----------------|-------------------------|------------------------|--------------------|---------------------------------|--------------------|
| 24              | TG1247015804   | 445                     | Over 250m from Scheme  | Unsuitable for GCN | Unsuitable for GCN <sup>3</sup> | Unsuitable for GCN |
| 25              | TG1283215954   | 246                     | Good                   | 0.74               | Good                            | Negative           |
| 26              | TG1300416367   | Not present             | N/A                    | Not present        | Not present                     | Not present        |
| 27              | TG1329115209   | 0                       | Within Scheme          | 0.51               | Unsuitable for GCN <sup>4</sup> | Unsuitable for GCN |
| 28              | TG1349015353   | 0                       | Within Scheme          | 0.83               | Excellent                       | Negative           |
| 29              | TG1354915740   | 361                     | Over 250m from Scheme  | 0.63               | Average                         | Negative           |
| 30              | TG1372715865   | 258                     | Over 250m from Scheme  | 0.31               | Poor                            | Negative           |
| 31              | TG1366815516   | Not present             | N/A                    | Not present        | Not present                     | Not present        |
| 32              | TG1380315733   | 149                     | Good                   | 0.59               | Below Average                   | Negative           |
| 33              | TG1445716195   | 480                     | Over 250m from Scheme  | No access          | No access                       | No access          |
| 34              | TG1384915163   | 127                     | Good                   | 0.55               | Below Average                   | Negative           |
| 35              | TG1406915409   | 21                      | Within Scheme          | 0.71               | Good                            | Negative           |

<sup>3</sup> Unsuitable for GCN as water body was identified to be a concrete well with no features present to support GCN.

<sup>4</sup> HSI assessment categorised water body as below average suitability, however categorised as unsuitable for GCN due to the size, depth and nature of the water body (<1m area, shallow depth and lined).

| Water body Ref. | Grid Reference | Proximity to Scheme (m) | Connectivity to Scheme | HSI Score | HSI Category | eDNA Result                                  |
|-----------------|----------------|-------------------------|------------------------|-----------|--------------|--|
| 36              | TG1409715079   | 326                     | Over 250m from Scheme  | 0.70      | Average      | Not suitable for eDNA testing - inaccessible |
| 37              | TG1427615335   | 187                     | Good                   | No access | No access    | No access                                    |
| 38              | TG1436715263   | 212                     | Good                   | No access | No access    | No access                                    |
| 39              | TG1435315237   | 249                     | Good                   | No access | No access    | No access                                    |
| 40              | TG1446415082   | 365                     | Over 250m from Scheme  | 0.70      | Average      | Not suitable for eDNA testing - inaccessible |
| 41              | TG1453514973   | 425                     | Over 250m from Scheme  | No access | No access    | No access                                    |
| 42              | TG1457014927   | 466                     | Over 250m from Scheme  | No access | No access    | No access                                    |
| 43              | TG1458515014   | 412                     | Over 250m from Scheme  | No access | No access    | No access                                    |
| 44              | TG1457014927   | 485                     | Over 250m from Scheme  | No access | No access    | No access                                    |
| 45              | TG1481915393   | 0                       | Within Scheme          | Dry       | Dry          | Not suitable for eDNA testing - dry          |
| 46              | TG1481915393   | 0                       | Within Scheme          | Dry       | Dry          | Not suitable for eDNA testing - dry          |
| 47              | TG1481915393   | 0                       | Within Scheme          | Dry       | Dry          | Not suitable for eDNA testing - dry          |

| Water body Ref. | Grid Reference | Proximity to Scheme (m) | Connectivity to Scheme | HSI Score                         | HSI Category         | eDNA Result                         |
|-----------------|----------------|-------------------------|------------------------|-----------------------------------|----------------------|-------------------------------------|
| 48              | TG0949411924   | 434                     | Isolated by A47        | Surveys not required <sup>5</sup> | Surveys not required | Surveys not required                |
| 49              | TG1147814649   | 87                      | Good                   | Dry                               | Dry                  | Not suitable for eDNA testing - dry |

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<sup>5</sup> Surveys were not required for water body 48 as it is considered that the A47 provides a sufficient barrier to prevent GCN moving onto the Scheme.

## 5. FURTHER SURVEY WORK IN 2021

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- 5.1.1. Recommended survey work to be conducted in 2021 which follows on from the 2020 surveys includes:
- Population size class assessment surveys of ponds 16 and 17 which tested positive for GCN eDNA;
  - An update walkover of ponds found to be dry or inaccessible for sampling in 2020, with follow-up eDNA surveys where ponds are found to be accessible or holding water sufficient for sampling;
  - Repeat eDNA surveys of ponds which returned an inconclusive (i.e. 23) or indeterminate (i.e. 18) result in 2020.

## 6. REFERENCES

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### 6.1. PROJECT REFERENCES

WSP UK Ltd. (2020). *Phase 1 Habitat Survey*. Cambridge

### 6.2. TECHNICAL REFERENCES

ARG UK, 2010. *ARG UK Advice Note 5: Great Crested Newt Habitat Suitability Index*. UK: Amphibian and Reptile Groups of the United Kingdom.

Biggs, J. et al., 2014. *Analytical and methodological development for improved surveillance of great crested newt. Appendix 5. Technical advice note for field and laboratory sampling of great crested newt (Triturus cristatus) environmental DNA.* Oxford: Freshwater Habitats Trust.

CIEEM, 2019. *Advice Note on the Lifespan of Ecological Reports and Surveys*, Winchester: CIEEM.

Oldham, R., Keeble, J., Swan, M. & Jeffcote, M., 2000. Evaluating the suitability of habitat for the great crested newt.. *Herpetological Journal*, Issue 10, pp. 143-155.



# Appendix A

**SURVEY AND DESK STUDY AREA  
(SEPARATE DOCUMENT)**

# Appendix B

**EDNA RESULTS 2020 (SEPARATE DOCUMENT)**

# Appendix C

**HSI RESULTS 2020 (SEPARATE DOCUMENT)**

# Appendix D

## **HSI CALCULATIONS**

**Table D-1 – Habitat Suitability Indexes**

| <b>Pond reference</b> | <b>Grid reference</b> | <b>Date of HSI</b> | <b>Geographic</b> | <b>Pond area</b> | <b>Permanence</b> | <b>Water quality</b> | <b>Shade</b> | <b>Fowl</b> | <b>Fish</b> | <b>Pond count</b> | <b>Terrestrial</b> | <b>Macrophytes</b> | <b>HSI score</b> | <b>HSI category</b> |
|-----------------------|-----------------------|--------------------|-------------------|------------------|-------------------|----------------------|--------------|-------------|-------------|-------------------|--------------------|--------------------|------------------|---------------------|
| 1                     | TG1037712012          | 15/05/2020         |                   |                  |                   |                      |              |             |             |                   |                    |                    | N/A              | Dry                 |
| 2                     | TG1037112032          | 15/05/2020         | 1                 | 0.1              | 0.5               | 0.33                 | 0.6          | 1           | 1           | 0.85              | 0.67               | 0.3                | 0.53             | Below average       |
| 3                     | TG1019212272          | 15/05/2020         | 1                 | 0.1              | 0.1               | 0.33                 | 0.2          | 1           | 1           | 0.9               | 0.67               | 0.3                | 0.41             | Poor                |
| 4                     | TG1007812272          | 15/05/2020         | 1                 | 0.6              | 1                 | 0.67                 | 1            | 0.67        | 0.67        | 0.9               | 0.67               | 0.7                | 0.77             | Good                |
| 5                     | TG1036012369          | 15/05/2020         | 1                 | 0.2              | 0.5               | 0.33                 | 0.6          | 1           | 1           | 0.9               | 0.33               | 0.5                | 0.56             | Below average       |
| 6                     | TG0954712601          | 30/06/2020         | 1                 | 0.9              | 0.5               | 0.33                 | 1            | 1           | 1           | 0.9               | 0.01               | 0.35               | 0.46             | Poor                |
| 7                     | TG1018512635          | 15/05/2020         | 1                 | 0.4              | 1                 | 0.33                 | 0.6          | 1           | 1           | 0.95              | 0.01               | 0.3                | 0.43             | Poor                |
| 8                     | TG0997612905          | 15/05/2020         |                   |                  |                   |                      |              |             |             |                   |                    |                    | N/A              | Dry                 |
| 9                     | TG1011913482          | 15/05/2020         | 1                 | 0.8              | 0.9               | 0.67                 | 1            | 0.67        | 1           | 0.9               | 1                  | 0.35               | 0.80             | Good                |
| 10                    | TG1022013444          | 15/05/2020         | 1                 | 0.8              | 1                 | 0.33                 | 0.6          | 0.67        | 1           | 0.9               | 1                  | 0.35               | 0.71             | Good                |
| 11                    | TG1121913288          | N/A                |                   |                  |                   |                      |              |             |             |                   |                    |                    | N/A              | Not present         |



| Pond reference | Grid reference | Date of HSI | Geographic | Pond area | Permanence | Water quality | Shade | Fowl | Fish | Pond count | Terrestrial | Macrophytes | HSI score | HSI category  |
|----------------|----------------|-------------|------------|-----------|------------|---------------|-------|------|------|------------|-------------|-------------|-----------|---------------|
| 12             | TG1151713700   | 19/05/2020  | 1          | 0.85      | 1          | 0.67          | 0.3   | 0.67 | 0.67 | 0.65       | 0.67        | 0.3         | 0.63      | Average       |
| 13             | TG1007314111   | 19/05/2020  | 1          | 1         | 0.5        | 0.33          | 0.2   | 1    | 1    | 0.85       | 1           | 0.3         | 0.62      | Average       |
| 14             | TG1009414218   | 19/05/2020  | 1          | 0.85      | 0.9        | 0.33          | 1     | 0.67 | 0.67 | 0.85       | 1           | 0.3         | 0.70      | Good          |
| 15             | TG1020014165   | 19/05/2020  | 1          | 1         | 0.5        | 0.01          | 1     | 1    | 1    | 0.85       | 1           | 0.7         | 0.56      | Below average |
| 16             | TG1038814219   | 19/05/2020  | 1          | 0.6       | 0.9        | 0.67          | 1     | 0.67 | 1    | 0.85       | 0.33        | 1           | 0.76      | Good          |
| 17             | TG1033814219   | 19/05/2020  | 1          | 0.8       | 0.33       | 0.2           | 0.67  | 1    | 1    | 0.85       | 1           | 0.7         | 0.68      | Average       |
| 18             | TG1135814249   | 19/05/2020  | 1          | 0.2       | 0.1        | 0.01          | 0.6   | 1    | 1    | 0.85       | 0.01        | 1           | 0.25      | Poor          |
| 19             | TG1148314557   | 19/05/2020  | 1          | 0.95      | 0.9        | 1             | 1     | 0.67 | 0.67 | 0.7        | 0.67        | 1           | 0.84      | Excellent     |
| 20             | TG1139514861   | 30/06/2020  |            |           |            |               |       |      |      |            |             |             | N/A       | Dry           |
| 21             | TG1176915218   | 30/06/2020  | 1          | 0.2       | 0.1        | 0.33          | 1     | 1    | 1    | 0.65       | 0.67        | 0.4         | 0.51      | Below average |
| 22             | TG1139215764   | N/A         |            |           |            |               |       |      |      |            |             |             | N/A       | No access     |
| 23             | TG1163616380   | 14/07/2020  | 1          | 0.4       | 0.5        | 0.67          | 0.8   | 0.67 | 0.67 | 0.45       | 1           | 1           | 0.68      | Average       |



| Pond reference | Grid reference | Date of HSI | Geographic | Pond area | Permanence | Water quality | Shade | Fowl | Fish | Pond count | Terrestrial | Macrophytes | HSI score | HSI category                    |
|----------------|----------------|-------------|------------|-----------|------------|---------------|-------|------|------|------------|-------------|-------------|-----------|---------------------------------|
| 24             | TG1247015804   | N/A         |            |           |            |               |       |      |      |            |             |             | N/A       | Unsuitable for GCN <sup>6</sup> |
| 25             | TG1283215954   | 30/06/2020  | 1          | 0.4       | 1          | 0.67          | 1     | 1    | 0.33 | 0.85       | 1           | 0.7         | 0.74      | Good                            |
| 26             | TG1300416367   | 30/06/2020  |            |           |            |               |       |      |      |            |             |             | N/A       | Not present                     |
| 27             | TG1329115209   | 20/05/2020  | 1          | 0.1       | 0.5        | 0.33          | 0.33  | 1    | 1    | 1          | 0.7         | 0.3         | 0.51      | Unsuitable for GCN <sup>7</sup> |
| 28             | TG1349015353   | 20/05/2020  | 1          | 0.9       | 1          | 0.67          | 0.7   | 0.67 | 0.67 | 0.95       | 1           | 0.9         | 0.83      | Excellent                       |
| 29             | TG1354915740   | 20/05/2020  | 1          | 0.8       | 0.9        | 0.67          | 0.3   | 0.67 | 0.33 | 1          | 1           | 0.3         | 0.63      | Average                         |
| 30             | TG1372715865   | 20/05/2020  | 1          | 0.1       | 0.1        | 1             | 0.3   | 1    | 1    | 1          | 0.01        | 0.3         | 0.31      | Poor                            |
| 31             | TG1366815516   | 30/06/2020  |            |           |            |               |       |      |      |            |             |             | N/A       | Not present                     |
| 32             | TG1380315733   | 20/05/2020  | 1          | 0.1       | 0.5        | 1             | 1     | 1    | 1    | 1          | 0.33        | 0.3         | 0.59      | Below average                   |
| 33             | TG1445716195   | N/A         |            |           |            |               |       |      |      |            |             |             | N/A       | No access                       |

<sup>6</sup> Unsuitable for GCN as water body was identified to be a concrete well with no features present to support GCN.

<sup>7</sup> HSI assessment categorised water body as below average suitability, however classed as unsuitable for GCN due the size, depth and nature of the water body (<1m area, shallow depth and lined).





| Pond reference | Grid reference | Date of HSI | Geographic | Pond area | Permanence | Water quality | Shade | Fowl | Fish | Pond count | Terrestrial | Macrophytes | HSI score | HSI category  |
|----------------|----------------|-------------|------------|-----------|------------|---------------|-------|------|------|------------|-------------|-------------|-----------|---------------|
| 34             | TG1384915163   | 30/06/2020  | 1          | 0.2       | 1          | 0.33          | 1     | 0.67 | 0.33 | 1          | 0.33        | 0.5         | 0.55      | Below average |
| 35             | TG1406915409   | 20/05/2020  | 1          | 0.8       | 0.9        | 0.67          | 1     | 0.67 | 0.33 | 1          | 1           | 0.3         | 0.71      | Good          |
| 36             | TG1409715079   | 19/05/2020  | 1          | 1         | 0.1        | 0.33          | 1     | 1    | 1    | 1          | 1           | 0.8         | 0.70      | Average       |
| 37             | TG1427615335   | N/A         |            |           |            |               |       |      |      |            |             |             | N/A       | No access     |
| 38             | TG1436715263   | N/A         |            |           |            |               |       |      |      |            |             |             | N/A       | No access     |
| 38             | TG1435315237   | N/A         |            |           |            |               |       |      |      |            |             |             | N/A       | No access     |
| 40             | TG1446415082   | 19/05/2020  | 1          | 0.95      | 0.1        | 0.33          | 1     | 1    | 1    | 1          | 1           | 0.85        | 0.70      | Average       |
| 41             | TG1453514973   | N/A         |            |           |            |               |       |      |      |            |             |             | N/A       | No access     |
| 42             | TG1457014927   | N/A         |            |           |            |               |       |      |      |            |             |             | N/A       | No access     |
| 43             | TG1458515014   | N/A         |            |           |            |               |       |      |      |            |             |             | N/A       | No access     |
| 44             | TG1457014927   | N/A         |            |           |            |               |       |      |      |            |             |             | N/A       | No access     |
| 45             | TG1481915393   | 20/05/2020  |            |           |            |               |       |      |      |            |             |             | N/A       | Dry           |





| Pond reference | Grid reference | Date of HSI | Geographic | Pond area | Permanence | Water quality | Shade | Fowl | Fish | Pond count | Terrestrial | Macrophytes | HSI score | HSI category          |
|----------------|----------------|-------------|------------|-----------|------------|---------------|-------|------|------|------------|-------------|-------------|-----------|-----------------------|
| 46             | TG1481915393   | 20/05/2020  |            |           |            |               |       |      |      |            |             |             | N/A       | Dry                   |
| 47             | TG1481915393   | 20/05/2020  |            |           |            |               |       |      |      |            |             |             | N/A       | Dry                   |
| 48             | TG0949411924   | N/A         |            |           |            |               |       |      |      |            |             |             | N/A       | Not subject to survey |
| 49             | TG1147814649   | 30/06/2020  |            |           |            |               |       |      |      |            |             |             | N/A       | Dry                   |



# Appendix E



## **PHTOTOGRAPHS**

**Table E-1 - Photographs of Ponds**

| Pond Ref. | Image   |
|-----------|---|
| 1         |   |
| 2         |  |



| Pond Ref. | Image  |
|-----------|--|
| 3         |   |
| 4         |  |

| Pond Ref. | Image   |
|-----------|---|
| 5         |   |
| 6         |  |



| Pond Ref. | Image  |
|-----------|--|
| 7         |   |
| 8         |  |



| Pond Ref. | Image   |
|-----------|---|
| 9         |   |
| 10        |  |
| 11        | Water body not present  |



| Pond Ref. | Image  |
|-----------|--|
| 12        |  A photograph showing a pond partially obscured by a dense canopy of green trees. The foreground is covered in a thick layer of fallen brown leaves and some bare branches, suggesting an autumn or early winter setting.         |
| 13        |  A photograph of a pond in a wooded area. The water is dark and reflects the surrounding trees. Numerous thin, bare tree trunks and branches are visible, some leaning over the water, indicating a late autumn or winter scene. |



| Pond Ref. | Image   |
|-----------|---|
| 14        |   |
| 15        |  |

| Pond Ref. | Image   |
|-----------|---|
| 16        |   |
| 17        |  |



| Pond Ref. | Image  |
|-----------|--|
| 18        |   |
| 19        |  |

| Pond Ref. | Image  |
|-----------|--|
| 20        |   |
| 21        |  |
| 22        | No access in 2020  |
| 23        | No picture taken   |



| Pond Ref. | Image  |
|-----------|--|
| 24        |   |
| 25        |  |
| 26        | Water body not present   |

| Pond Ref. | Image  |
|-----------|--|
| 27        |   |
| 28        |  |





| Pond Ref. | Image  |
|-----------|--|
| 29        |    |
| 30        |   |
| 31        |  |



| Pond Ref. | Image  |
|-----------|--|
| 32        |   |
| 33        | No access in 2020  |
| 34        |  |

| Pond Ref. | Image  |
|-----------|--|
| 35        |   |
| 36        |  |
| 37        | No access in 2020  |
| 38        | No access in 2020  |
| 39        | No access in 2020  |



| Pond Ref. | Image  |
|-----------|--|
| 40        |    |
| 41        | No access in 2020  |
| 42        | No access in 2020  |
| 43        | No access in 2020  |
| 44        | No access in 2020  |
| 45        |  |

| Pond Ref. | Image   |
|-----------|---|
| 46        |   |
| 47        |  |
| 48        | Surveys not required  |



| Pond Ref. | Image  |
|-----------|--|
| 49        |  A photograph showing a natural area with dense green foliage, including trees and bushes, surrounding a dark, possibly water-filled or muddy area. The scene is captured from a slightly elevated perspective, looking down into the vegetation. |

# Appendix F

**LABORATORY RESULTS (SEPARATE DOCUMENT)**



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