Sands of LIFE – Great Crested Newt Survey Report

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JBA Consulting

NRW Evidence Report No. 425

SoLIFE: LIFE 17 NAT/UK/000023
The Twyni Byw-Sands of LIFE project has received funding from the LIFE Programme of the European Union
Part funded by the Welsh Government

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Report series:	NRW Evidence Report Series - Sands of LIFE
Report number:	425
Publication date:	May 2020
Contract number:	SoLIFE Physical Monitoring
Contractor:	JBA Consulting
Contract Manager:	T. Carter
Title:	**Sands of LIFE – Great Crested Newt Survey Report**
Author(s):	**J.E. Pullen and S.J. Heathcote**
Peer Reviewer(s)	D. Denman, J. Creer, M. Ellis
Approved By:	K. Hewitt
Series editor(s):	K. Hewitt
Restrictions:	None

Distribution List (core)

NRW Library, Bangor	2
National Library of Wales	1
British Library	1
Welsh Government Library	1
Scottish Natural Heritage Library	1
Natural England Library (Electronic Only)	1

Distribution List (others)

None

Recommended citation for this volume:

Pullen, J.E., Heathcote, S.J., 2020. Sands of LIFE – Great Crested Newt Survey Report. NRW Evidence Report No. 425, 76pp, Natural Resources Wales, Bangor

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Crynodeb Gweithredol

Mae Twyni Byw (Sands of LIFE; SoLIFE LIFE17 NAT/UK/000023) yn brosiect cadwraeth mawr i adfywio twyni tywod ar draws Cymru. Mae'r adroddiad hwn yn asesu effeithiau posibl y prosiect ar Madfallod Ddŵr Gribog mewn pedwar safle lle cofnodwyd y rhywogaeth yn ystod y 10 mlynedd diwethaf, sef Tywyn Aberffraw, Coedwig Niwbwrch, Morfa Harlech a Cynffig.

Roedd angen asesiad o Madfallod Ddŵr Gribog ar draws yr ardaloedd ymyrraeth arfaethedig i benderfynu a yw niwed neu effeithiau niweidiol yn debygol o gael eu hachosi i'r Madfallod Ddŵr Gribog o ganlyniad i'r prosiect. Mae'r adroddiad hwn yn manylu ar ganlyniadau arolygon y Madfall Ddŵr Gribog a gynhaliwyd gan JBA Consulting o dan gontract gan Cyfoeth Naturiol Cymru fel rhan o'r prosiect Twyni Byw.

Nodwyd ardaloedd arolwg ym mhob safle ar sail cofnodion hanesyddol a lleoliad ymyriadau arfaethedig. Nodwyd pyllau bridio posibl ym mhob ardal arolwg gan ddefnyddio awyrluniau, mapiau arolwg ordnans a nodiadau ynghlwm i gofnodion hanesyddol. Aseswyd pob corff dŵr gan ddefnyddio'r Mynegai Addasrwydd Cynefinoedd, chwiliad yng ngolau dydd am wyau ac arolygon ger golau fflachlamp yn ystod y nos.

Aseswyd addasrwydd cynefin daearol yn seiliedig ar strwythur cyffredinol y llystyfiant a phresenoldeb neu absenoldeb nodweddion y gwyddys eu bod yn cael eu defnyddio fel llochesau (e.e. pentyrrau coed, tyllau).

Penderfynwyd ar bresenoldeb bridio Madfallod Ddŵr Gribog yn safleoedd y prosiect fel a ganlyn:

- Tywyn Aberffraw: Roedd Madfallod Ddŵr Gribog yn bresennol mewn dwy gorff dŵr a sychodd ar ôl yr arolwg cyntaf. Ystyriwyd bod y cynefinoedd daearol yn gymedrol yn bennaf gydag addasrwydd uchel o amgylch 'Pwll B' oherwydd safleoedd lloches sydd ar gael yn rhwydd gan gynnwys prysgwydd, wal gerrig sych, a thyllau cwningen.
- Coedwig Niwbwrch: Cadarnhawyd saith pwll bridio yn ardaloedd ymyrraeth y prosiect neu'n agos atynt, ac ystyriwyd bod y cynefinoedd daearol yn gymedrol gydag ardaloedd o addasrwydd uchel.
- Morfa Harlech: Ni nodwyd unrhyw byllau bridio ar y safle. Fodd bynnag, mae yna dri phwll sydd â chofnodion Newt Cribog Mawr (2018) hanesyddol. Aseswyd bod y cynefinoedd daearol o amgylch yr ardaloedd ymyrraeth yn addas iawn.
- Cynffig: Cadarnhawyd wyth pwll bridio yn ardal y safle, ac aseswyd bod y cynefinoedd daearol o ansawdd uchel i gymedrol.

Yn seiliedig ar ganlyniadau'r arolwg a'r ymyriadau arfaethedig, mae'r angen am liniaru trwyddedig wedi'i nodi yng Nghoedwig Niwbwrch a Cynffig. Mae angen lliniaru hefyd ar gyfer Tywyn Aberffraw, ond oherwydd y risg isel, ni fydd angen trwyddedu hyn.

Yn gyffredinol, disgwylir i'r prosiect gael effaith gadarnhaol ar y Madfallod Ddŵr Gribog, ond mae angen y lliniaru a gynghorir yma i sicrhau bod y gwaith yn cydymffurfio â deddfwriaeth berthnasol.

Executive Summary

Sands of LIFE (SoLIFE LIFE17 NAT/UK/000023) is a major conservation project to rejuvenate sand dunes across Wales. This report assesses potential impacts of the project on Great Crested Newt at four sites where the species has been recorded within the past 10 years, namely Tywyn Aberffraw, Newborough Forest, Morfa Harlech and Kenfig.

Assessment of Great Crested Newts across the proposed intervention areas was required to determine if adverse effects or harm is likely to be caused to Great Crested Newts as a result of the project. This report, therefore, details the results of Great Crested Newt surveys carried out by JBA Consulting under contract from Natural Resources Wales as part of the Sands of LIFE project.

Within each site, survey areas were identified based on historic records and location of proposed interventions. Potential breeding ponds were identified within each survey area using aerial images, Ordnance Survey maps and notes attached to historic records. Each waterbody was assessed using the Habitat Suitability Index, a daylight search for eggs and night-time torchlight surveys.

The suitability of terrestrial habitat was assessed based on the general structure of the vegetation and the presence or absence of features known to be used as refuges (e.g. log piles, burrows).

Presence of Great Crested Newt breeding was determined at the project sites as follows:

- Tywyn Aberffraw: Great Crested Newts were present in two waterbodies which dried after the first survey. The terrestrial habitat was deemed as primarily moderate with high suitability surrounding Pond B due to readily available refuge sites including scrub, drystone wall and rabbit burrows.
- Newborough Forest: Seven breeding ponds were confirmed within or near the project intervention areas and the terrestrial habitat was considered moderate with areas of high suitability.
- Morfa Harlech: No breeding ponds were identified on site, however, there are three ponds with historic (2018) Great Crested Newt records. The terrestrial habitat surrounding the intervention areas was assessed as high suitability.
- Kenfig: Eight breeding ponds were confirmed in the site area and the terrestrial habitat was assessed as high to moderate quality.

Based on the survey results and proposed interventions, the need for licenced mitigation has been identified at Newborough Forest and Kenfig. Mitigation is also needed for Tywyn Aberffraw, but due to the low risk this will not need to be licenced.

Overall the project is expected to have a positive impact on Great Crested Newt, but the mitigation advised here is necessary to ensure the works comply with relevant legislation.

Introduction

This report presents the results of Great Crested Newt surveys carried out by JBA Consulting under contract from Natural Resources Wales (NRW) as part of the Sands of LIFE project.

Sands of LIFE Project

Sands of LIFE is a major conservation project to rejuvenate 2400 hectares of sand dunes across Wales. The project aims to recreate movement in the dunes and revitalise habitats which support some of Europe's rarest wildlife. Sands of LIFE will encourage dynamic geomorphological processes by reprofiling the dunes and creating bare sand. The project will also lower the surface of dried-out dune slacks to recreate pools and wet habitat, promote sustainable grazing by livestock and rabbits and remove scrub and invasive non-native species.

The project covers 10 sites across four Special Areas of Conservation. These are: Tywyn Aberffraw; Newborough; Morfa Dinlle; Morfa Harlech; Morfa Dyffryn; Laugharne-Pendine Burrows; Pembrey Burrows; Whiteford Burrows; Kenfig and Merthyr Mawr. The project will run from September 2018 to December 2022.

Purpose of the Great Crested Newt Monitoring

Great Crested Newts are a European Protected Species listed on Annex II and IV of the Habitats Directive. In Wales they are legally protected under the Conservation of Habitats and Species Regulations 2017 (as amended) and Schedule 5 Section 9 of the Wildlife and Countryside Act 1981 (as amended). Great Crested Newts are also a Section 7 species under the Environment (Wales) Act 2016 which requires public authorities to 'seek to maintain and enhance biodiversity', 'promote the resilience of ecosystems' and 'embed the consideration of biodiversity and ecosystems into their early thinking and business planning'.

Therefore, population assessment of Great Crested Newts across the proposed intervention areas are required to determine if adverse effects or harm is likely to be caused to Great Crested Newts as a result of the project. Where likely effects are identified, avoidance and mitigation measures are discussed.

Project Sites and Historic Records

Three SACs were included for Great Crested Newt monitoring based on historic records and known populations of this species (Figure 1) these were:

- Y Twyni o Abermenai i Aberffraw / Abermenai to Aberffraw Dunes SAC (UK0020021) which included surveys at the following project sites:
  - Tywyn Aberffraw
  - Newborough Forest
- Morfa Harlech a Morfa Dyffryn SAC (UK0030049) which included surveys at the following project sites:
  - Morfa Harlech
- Kenfig/ Cynffig SAC (UK0012566) which included surveys at the following project sites:
  - Kenfig

A brief review of the historic Great Crested Newt records, as well as other newt records, for these sites is presented below. The discussion includes records provided under licence by North Wales Environmental Information Service (Cofnod) and South East Wales Biodiversity Records Centre (SEWBReC).

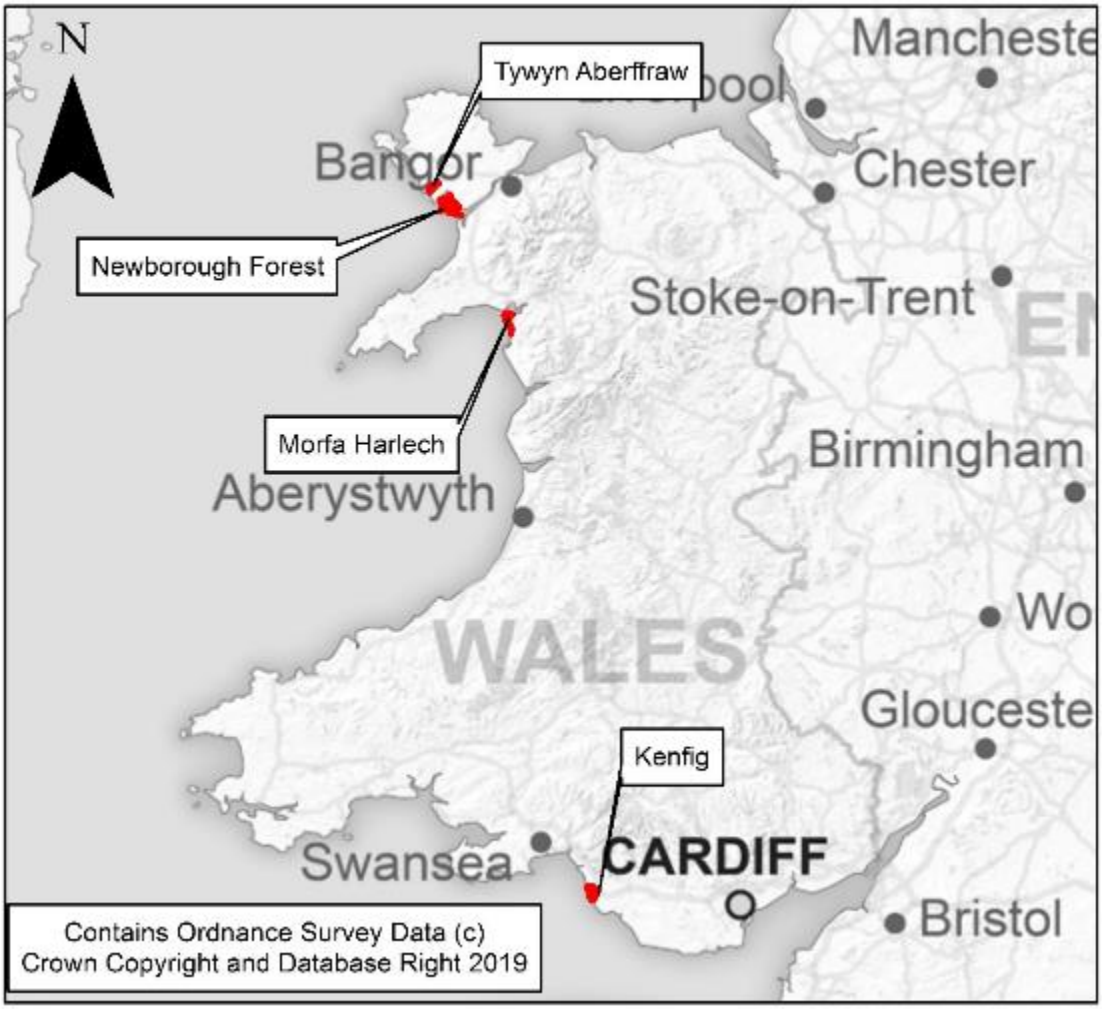

Figure 1: Location of project sites included for Great Crested Newt survey

Tywyn Aberffraw

Tywyn Aberffraw is a 3km long hindshore dune system which meets the sea along its south-west boundary (Ashall *et al*., 1991a). It is bordered by the Afon Ffraw to the north, Llyn Coron to the east and grazing land to the south.

Just behind the foredunes, the only part of the site with historic Great Crested Newt records, waterbodies are represented by a small group of natural dune slacks. Adjacent agricultural land has some ponds likely to be artificial (as water sources for livestock). There are other deeper ponds further inland on the site, and a large lake (Llyn Coron) lies at the north-eastern boundary of the site.

The first available Great Crested Newt records held by Cofnod from these dune slacks in the front section of the site were from 2014, with records again in 2016. Count information suggests small numbers were recorded in both years, but eggs

were present and show the sites were breeding ponds. It is unclear whether Great Crested Newts only colonised the site at this time, or if they went just undocumented previously.

Newborough Forest

Newborough Forest is large coniferous plantation on a sand dune. The forest was planted in the second half of the 20th Century. A number of ponds were created within the forest.

There are records of Great Crested Newts in ponds in the forest from 1985 onwards, and they have been recorded in the ponds consistently from that time onwards. Canada Pool (N) and Dune Slack Pond have both had very high counts of Great Crested Newts (>100 individuals in one survey) between 2005 and 2010. Glantraeth SAC, located approximately 300m north-east of Newborough Forest site boundary, is designated for its Great Crested Newt population. Although there is a road between Newborough Forest and Glantraeth, the road is relatively minor and is not considered a barrier to Great Crested Newt dispersal. It is almost certain that sub-populations located in Glantraeth and Newborough Forest interact regularly (Haubrock & Altrichter 2016).

Morfa Harlech

Morfa Harlech is a cuspate foreland fixed dune system which is actively accreting (Ashall *et al*. 1991b). Much of the northern part of the site is grazed and there are areas of forestry plantation. In the central section of the dune system, there are a number of large dune slacks, probably linked when water levels are high, as well as a couple of deeper ponds that appear to have been deliberately excavated to supply water to the grazing animals. Much of the southern portion of the site is a golf course (Royal St. David's Golf Club), where there is a series of artificial ponds. The ponds here were created or deepened to provide irrigation water for the golf course, prior to the installation of a piped water system (Cartwright 2018).

There are no historic records for Great Crested Newts at Morfa Harlech. In 2018 Great Crested Newts were recorded in three ponds on the part of the site occupied by the golf course (Cartwright 2018).

Kenfig

Kenfig is a hindshore dune system with two main dune ridges separated by numerous parabolic slacks (Jones & Etherington 1988). The system has become very fixed and is subject to significant conservation work to rejuvenate dune slacks and increase the extent of mobile sand.

Great Crested Newts have been known throughout this site for a long time, with the first digitised records held by the South East Wales Biodiversity Records Centre (SEWBReC) from 1977. Since 2000 they have been recorded consistently throughout both the north and south of the dune system, as well as in Kenfig Pool. Records are typically for slacks and flooded parts of the dunes, with a good number of records for terrestrial finds as various refuges have been altered. The number of individual Great Crested Newts recorded during surveys is typically less than ten, with a few recent occasions from April to June 2018 when higher numbers, up to 30,

were recorded in slacks in the southern part of Kenfig. This may reflect the improved breeding habitat resulting from the significant conservation work, particularly slack rejuvenation, taking place at Kenfig. Higher counts were also made from Sker Pool immediately south of the SAC boundary and brownfield land immediately north of the boundary.

Methods

Pond Identification and Habitat Suitability Index Assessment

Areas to be included in the survey (hereafter 'survey areas') were specified by Sands of LIFE based on project intervention areas and historic records of Great Crested Newts. Areas falling within the SAC boundaries and in both the intervention areas and a 250m buffer of historic records were counted as the survey area. Within the survey areas potential breeding ponds were identified using aerial images, ordnance survey maps and notes attached to historic records.

Each waterbody identified within the survey area was assessed using the Habitat Suitability Index (HSI) method (ARG UK 2010) and recorded using the categories in the 'Wales Great Crested Newt monitoring form V1b' available on the Cofnod Local Environmental Records Centre website (Cofnod 2019). The HSI uses a scoring system (Table 1) as a means of assessing the habitat suitability for Great Crested Newt. An overall score between 0 and 1 is calculated by use of ten suitability indices (ARG UK 2010) which includes both desk-based and field data.

Table 1: HSI Scoring System

HSI Score	Suitability
<0.5	Poor
0.5 – 0.59	Below Average
0.6 – 0.69	Average
0.7 – 0.79	Good
>0.8	Excellent

The assessment for each waterbody was completed as part of the first visit for each site shown in Table 1-2, with the exception of some ponds at Kenfig which were completed on 30th April by Jon Harrison and Morfa Harlech which were completed on 16th June by Steven Heathcote.

Pond Survey Methods

The ponds were assessed using daylight searches for eggs and night-time torchlight surveys.

Egg searches were typically carried out during the HSI assessment and involved checking for leaves folded in the characteristic way (Figure 2) during a walk around the pond.

Where eggs were not found in the initial survey a note was made and further checks were carried out at the same time as night-time visits, with any folded leaves being investigated. Once a Great Crested Newt egg was found in a pond, no further egg searches were completed for that pond.

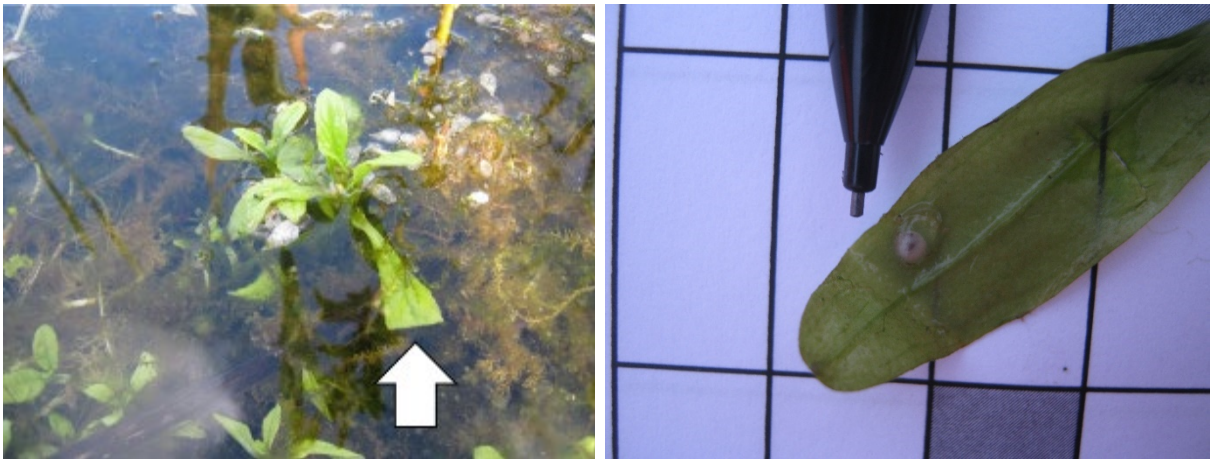

Figure 2: Examples of folded leaf (white arrow) and Great Crested Newt egg (pencil lead 5mm for scale)

Night-time torchlight surveys were carried out using 1 million candlepower torches to search for Great Crested Newts in ponds. Each pond was surveyed for 15 minutes per 50m of shoreline, unless vegetation or terrain prevented access to any particular section of shoreline. Individual amphibians (including Great Crested Newts) were counted and recorded and where identification was possible, the species, sex and life-stage were noted. Air and water temperatures were taken with a digital probe thermometer, accurate to ±0.2°C. All surveys started at least 15 minutes after sunset.

Ponds dried significantly over the course of the survey period at Tywyn Aberffraw, Morfa Harlech and Kenfig. Therefore, some ponds were not surveyed in every visit as they became unsuitable for use by amphibians.

Survey Dates and Personnel

Surveys of all four sites were carried out during April and June 2019. Details of the licenced surveyor or accredited agent are given for each survey below.

Table 1-2: Site visits for Great Crested Newt survey

Site	Date of Survey	Licenced Surveyor	Notes
Tywyn Aberffraw	8th May 2019	Jennifer Pullen	N/A
Tywyn Aberffraw	16th May 2019	Jennifer Pullen	N/A
Tywyn Aberffraw	18th June 2019	Jennifer Pullen	All dune slacks dry
Newborough Forest	15th May 2019	Steven Heathcote Jennifer Pullen	N/A
Newborough Forest	18th June 2019	Steven Heathcote Jennifer Pullen	N/A
Morfa Harlech	23rd April 2019	Steven Heathcote	N/A
Morfa Harlech	9th May 2019	Jennifer Pullen	Only Golf Course ponds surveyed due to safety reasons
Morfa Harlech	16th May 2019	Steven Heathcote	All dune slacks too dry. Golf course ponds still holding water
Morfa Harlech	23rd June 2019	Tim Bailey (accredited agent)	All dune slacks too dry. Golf course ponds still holding water

Site	Date of Survey	Licenced Surveyor	Notes
Kenfig	25th April 2019	Steven Heathcote Jonathan Harrison (accredited agent)	N/A
Kenfig	30th April 2019	Jonathan Harrison (accredited agent)	N/A
Kenfig	2nd May 2019	Jonathan Harrison (accredited agent)	N/A
Kenfig	9th May 2019	Jonathan Harrison (accredited agent) Tim Bailey (accredited agent)	N/A
Kenfig	23rd May 2019	Jonathan Harrison (accredited agent)	N/A
Kenfig	6th June 2019	Jonathan Harrison (accredited agent)	N/A
Kenfig	20th June 2019	Jonathan Harrison (accredited agent)	N/A

Terrestrial Habitat Assessment

The suitability of terrestrial habitat was assessed based on the general structure of the vegetation and the presence or absence of features known to be used as refuges (e.g. log piles, burrows) (Natural England 2010; Jehle *et al*. 2011).

Terrestrial ecology of Great Crested Newts in sand dune habitat is not well-studied. The suitability of terrestrial habitat is therefore largely based on inferences from the study of this species in other habitats and extrapolated to sand dune habitat.

Population Sizes

The population size class for each pond (or pond group) was based on the broad categories given in Natural England (2010).

Impact Assessment

Impact assessments have been provided for some interventions within the survey area only. Assessments were based on outline details of the proposed works, combined with population estimates and details of terrestrial habitat suitability. The proposed works are temporary, so the impacts are assessed for a search area of 250m around breeding ponds which is the standard radius used to assess impacts in Natural England (2010). Not all interventions have been assessed, although the impacts of particular work types have been covered as far as possible, it is important that the potential impacts of each intervention on Great Crested Newts are checked.

Limitations

Pond Survey

Access to pond edges was not possible (e.g. scrub or steep slopes) for some ponds. This is noted in the detailed results for each pond and is taken into consideration when evaluating the results.

Pwll Traeth Bach, located at Newborough Forest, was not surveyed due to health and safety restrictions. NRW site staff advised that the walk to this pond was not

considered safe to undertake at night. Only a HSI assessment was carried out for this pond.

Sometimes small newts (mainly Palmate Newts) occurred in quantities too large to be reliably counted, particularly in some of the Newborough Forest ponds. The numbers were therefore estimated cautiously, and it is likely that counts for these animals under-represent the population.

Terrestrial Habitat Assessment

Access was limited within some of the intervention areas due to dense scrub vegetation and/or livestock. These areas were assessed on their general suitability and point features were not included in the survey. The intervention areas assessed were those proposed up to July 2019.

Records Management

All amphibian records including absence results and Habitat Suitability Index (HSI) data were uploaded into the online Wales Great Crested Newt Monitoring scheme[1].

[1] https://www.cofnod.org.uk/LinkInfo?ID=7

Results

Great Crested Newts were recorded at three of the four sites (Aberffraw, Newborough and Kenfig). All four sites have good quality terrestrial habitat for Great Crested Newts, and a summary of the results are presented by site below, from north to south. Refer to the Appendices, Section 0, for detailed HSI results and photographs.

Tywyn Aberffraw

Within the survey area, three waterbodies were identified and the HSI result for all three showed they were potentially suitable for Great Crested Newt breeding. Great Crested Newts were confirmed to be breeding in two of the dune slacks in 2019, and the third large slack has records of breeding from within the last five years (Table 3-3). Unfortunately, as the water levels dropped many eggs were left above the water. No efts were recorded, and it seems likely that breeding attempts in 2019 would have been unsuccessful. Refer to the Appendices, Section 0, for the HSI breakdown and photographs of each waterbody.

Breeding Pond Assessment

Within the survey area a total of three potential breeding ponds were identified. These are summarised below, and the locations shown in Figure . Great Crested Newts were recorded in one of the ponds, and their eggs were found in another. The third pond was too dry to support breeding newts, but there are historic records of breeding in this pond.

Table 1: HSI and breeding status for Tywyn Aberffraw

Pond ID	Type	HSI result	GCN status	Notes
A	Large dune slack	0.72 (Good)	Present – breeding	An egg was recorded but no GCN seen. Ponds were drying out on first visit and were dry on following surveys.
A1	Small dune slack	0.53 (Below average)	Present - possible breeding	A male and female GCN was recorded.
B	Dune slack (flushed)	0.73 (Good)	Present – historic records only	Ponded areas were drying out on first visit and water level was too low on subsequent surveys

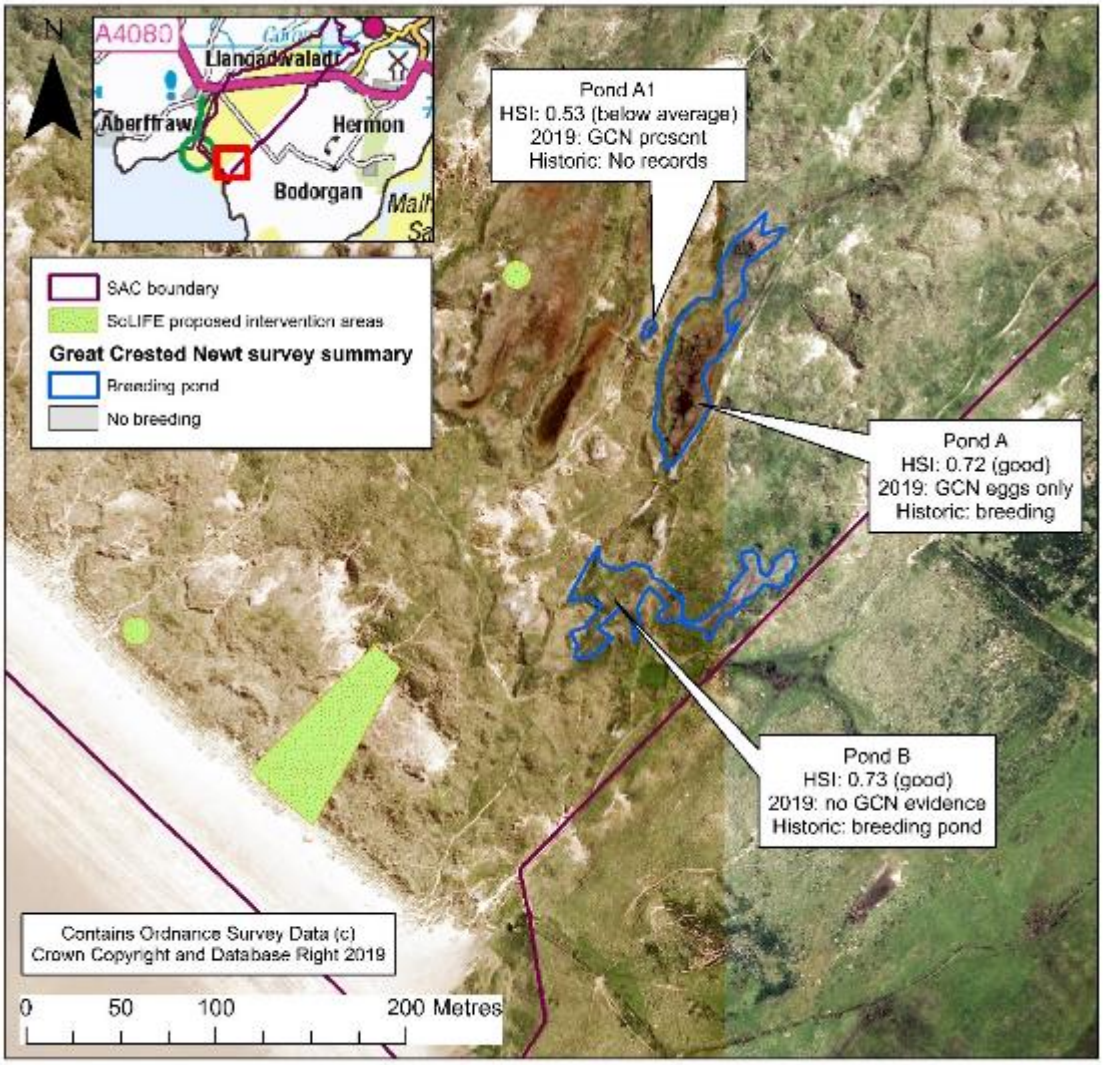

Figure 3: Tywyn Aberffraw – Great Crested Newt breeding status. Blue outlines show extent of slack within which there are small deep water areas preferred for breeding.

Terrestrial Habitat Assessment

The terrestrial habitat within 250m of breeding ponds is split into two areas. The foredunes have very open, semi-mobile, Marram-dominated vegetation which is largely unsuitable for Great Crested Newts due to large areas of bare sand with few refuge features. The fixed dunes inland of this main dune ridge provide a range of medium and high-quality habitat. Areas with a coarse, tussocky structure provide habitat that fits with the traditional view of 'good quality' newt habitat. However, the large areas of fixed Red Fescue (*Festuca rubra*) grassland and primarily dry dune slack have a predominantly low sward, creating sub-optimal habitat for foraging. Specific features likely to provide refuge sites include rabbit burrows, scrub including Grey Willow (*Salix cinerea*) and Bramble (*Rubus fruticosus* agg.), as well as a drystone wall located along the eastern boundary of the site.

Table 4: Terrestrial habitat assessment of Tywyn Aberffraw intervention areas

Intervention Area	Planned intervention	Habitat Assessment	Comment
1	Removal of invasive alien species	Moderate	Located within 65m of nearest breeding pond A1. No specific refuge features were determined within this intervention area. However, scrub surrounding the intervention area provides suitable refuge features and the dense layer of moss in the slack may provide shelter for newts.
2	Removal of invasive alien species	Low	Not located within 250m of a breeding pond. Habitat suitability is low within the intervention area located on the beach front offering few features suitable for Great Crested Newts.
3	Frontal dune notch	Low	Large intervention area located within 250m of a breeding pond. Located within low habitat suitability for Great Crested Newts.

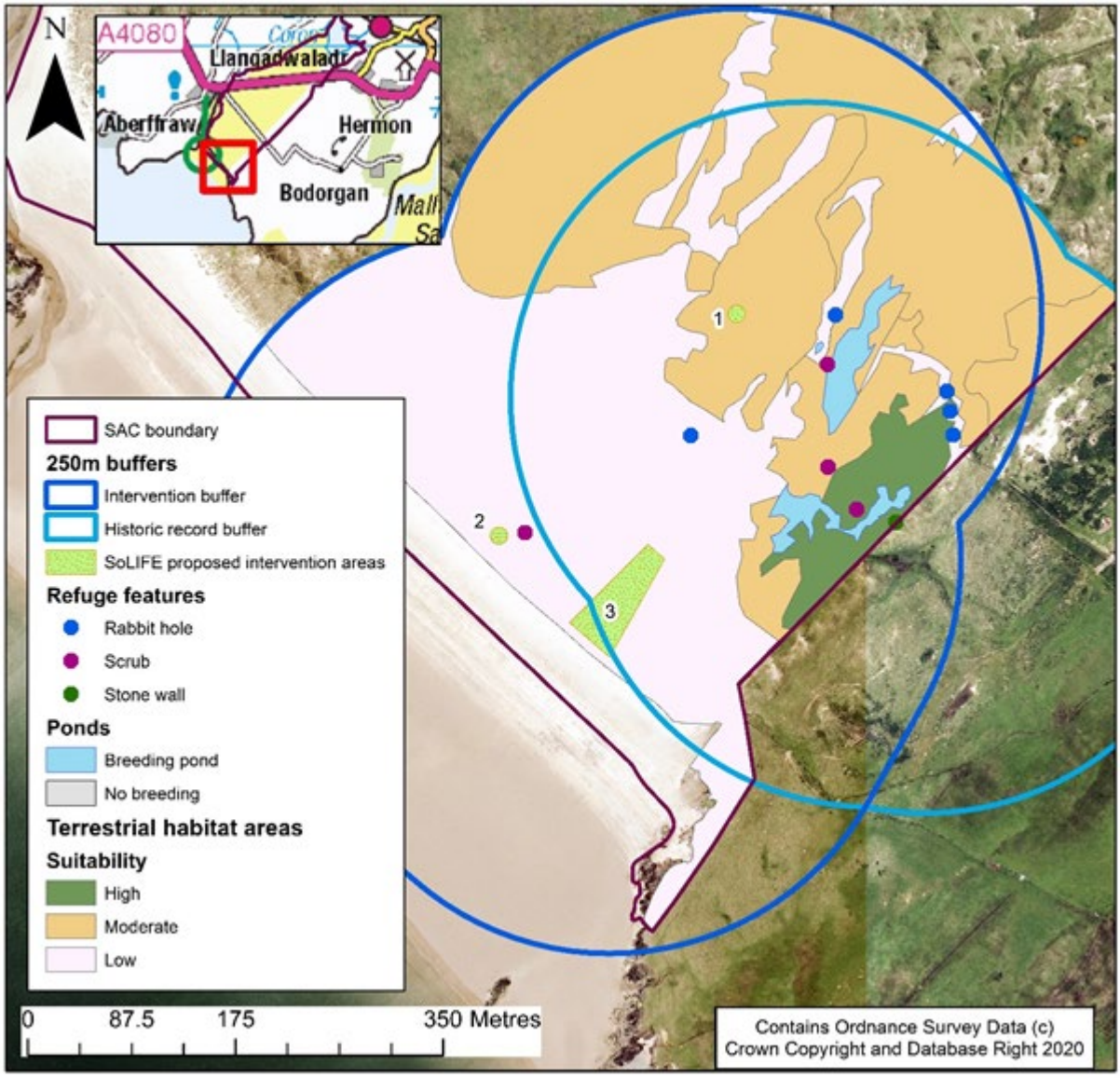

Figure 4: Tywyn Aberffraw - Terrestrial habitat features in intervention area buffers

Newborough Forest

The important Great Crested Newt populations in Newborough Forest have been known about for a long time. Great Crested Newt presence was confirmed by the surveys and all seven ponds surveyed were found to have breeding populations. Appendices Section 0, provide a detailed breakdown of the HSI and photographs for each waterbody surveyed.

Breeding Pond Assessment

Within the survey area a total of eight potential breeding ponds were identified, seven of which were assessed as suitable based on HSI scores and subsequently surveyed using night-time searches. Pwll Traeth Bach was assessed as being of poor suitability using the HSI and was also considered unsafe to survey at night-time, due to difficulty of access, so no further surveys were carried out on this pond. One historic breeding pond, Hendai Pond, has records of breeding Great Crested Newts, but is now too shallow due to natural vegetation succession and a punctured liner. The pond was therefore not surveyed. The results are summarised below, and the locations shown in

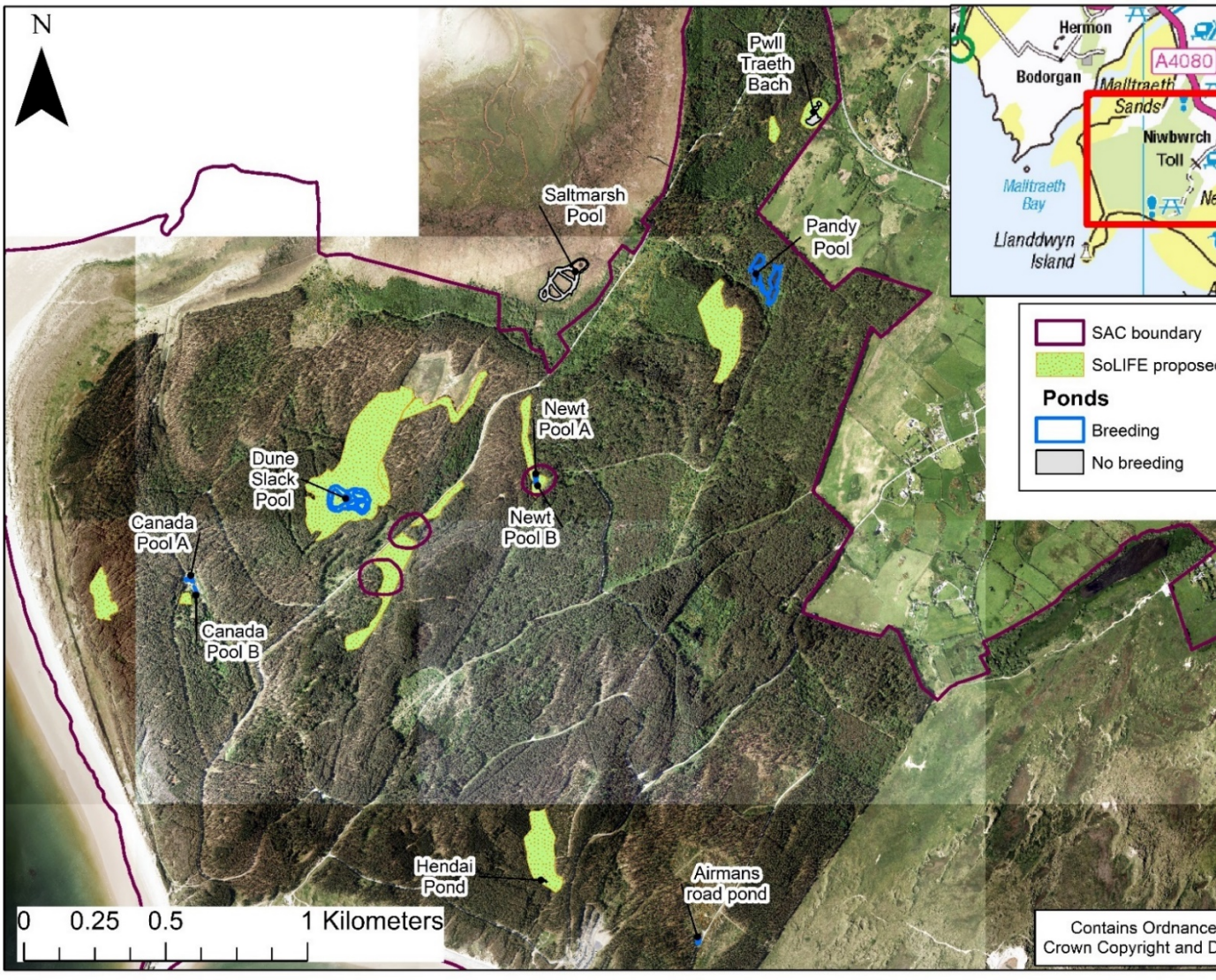

Figure . Larger numbers of Great Crested Newt were recorded in the two Canada Pools and Dune Slack Pool (Pant Mawr Pool). Airman's Road Pond, Ffrydiau and Pandy Pool all supported small numbers of Great Crested Newts. Evidence of breeding was confirmed for all ponds where Great Crested Newts were present. Palmate Newts were abundant in all the ponds at Newborough Forest.

Table 1: HSI and breeding status for Newborough Forest ponds

Pond ID	Type	HSI result	GCN status	Notes
Airman's Road Pond	Forestry pond	0.57 (Below average)	Present, likely breeding – low population	N/A
Hendai Pond	Lined pond now punctured	N/A	N/A	Pond too dry – historic records but not suitable for breeding anymore.
Canada Pool A	Forestry pond	0.69 (Average)	Breeding – medium population	Adjacent ponds considered together.
Canada Pool B	Forestry pond	0.65 (Average)	Breeding – medium population	Adjacent ponds considered together.
Dune Slack Pool (Pant Mawr Pool)	Shallow forestry pond	0.61 (Average)	Breeding – medium population	Island margins not surveyed.
Ffrydiau A	Forestry pond	0.62 (Average)	Breeding – small population	Adjacent ponds considered together
Ffrydiau B	Forestry pond	0.56 (Below average)	Breeding – small population	Adjacent ponds considered together
Pandy Pool	Forestry pond	0.7 (Good)	Breeding – small population	Access around the pond was limited. Surveying was undertaken from the southern end only.
Pwll Traeth Bach	Forestry pond	0.47 (Poor)	Unknown	Not surveyed for safety reasons

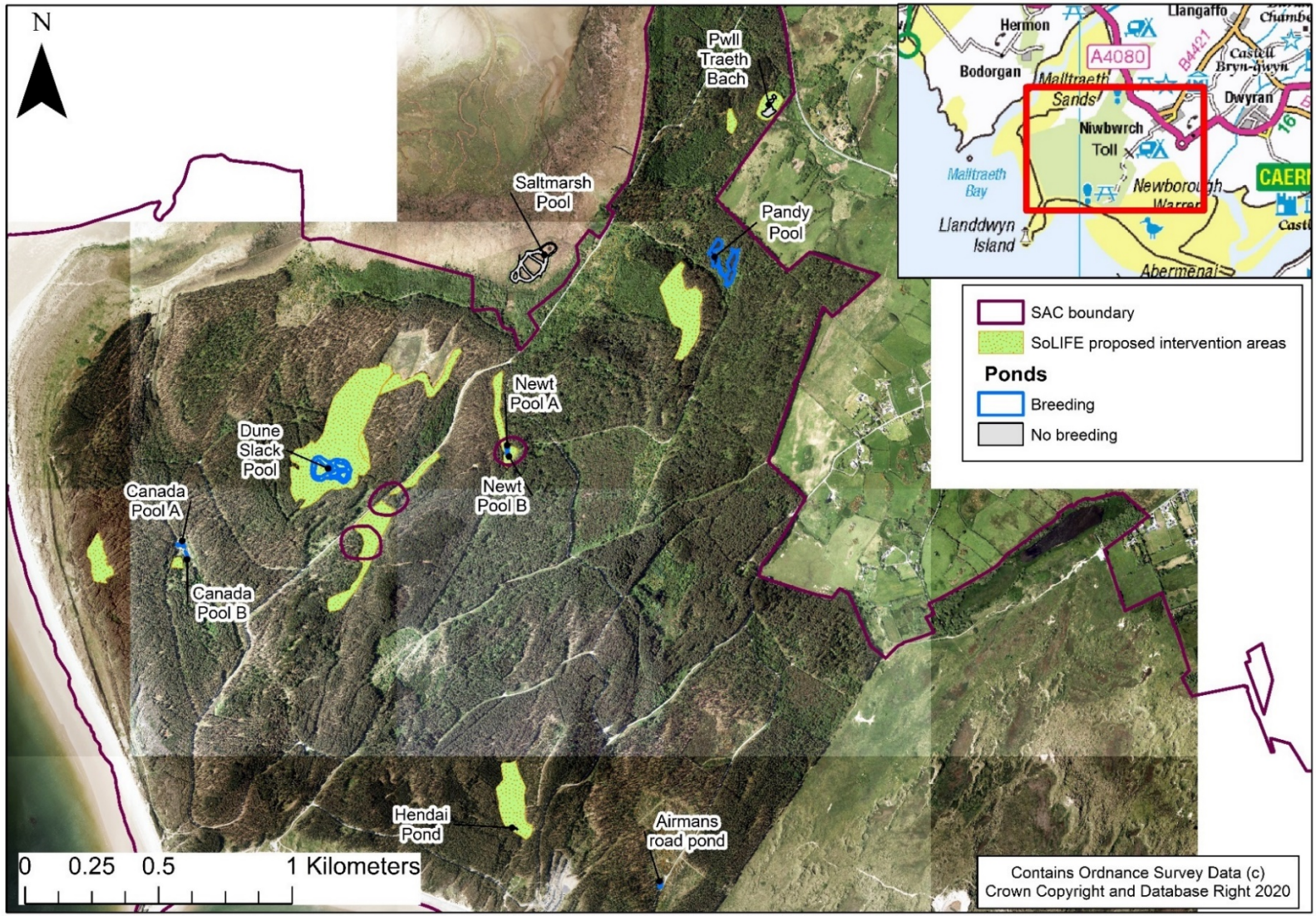

Figure 5: Newborough Forest – Great Crested Newt breeding status.

Terrestrial Habitat Assessment

The terrestrial habitat within 250m of breeding ponds, where it overlaps with intervention areas, was assessed as low and moderate quality terrestrial habitat for Great Crested Newt. See Table , below, for assessment of each intervention area and Figure for terrestrial habitat mapping.

Scrub habitat, comprising of, but not limited to, Creeping Willow (*Salix repens*), Gorse (*Ulex europaeus*), and Bramble (*Rubus fruticosus* agg.*)*, was a dominant habitat within the plantation understorey and provides potential hibernaculum features for Great Crested Newts. Several woody debris features were noted during the field assessment, some of these are clearly the result of deliberate attempts to provide refuge and hibernation sites for wildlife. In some areas, away from the proposed interventions, there are rocky outcrops providing potential refuge sites.

Overall Newborough Forest provides moderate quality terrestrial habitat with dense conifers over free-draining sandy soil creating a shady, open understorey. However, rides, artificial glades and natural glades around rock outcrops all provide good quality habitat. The rides also provide links for most of this habitat through the forest. In some places the forest understorey is scrubby with numerous treefall gaps, glades and rides. Some areas within the forest are grazed, and these are more suitable for Great Crested Newts, having a more open vegetation structure.

Table 6: Terrestrial habitat assessment of Newborough Forest intervention areas.

Intervention Area	Planned intervention	Habitat Assessment	Comment
1	Dune slack scrape and native scrub removal	Moderate	A dense scrub understorey was noted within the surrounding woodland habitat. Access was limited but it is considered there would be woody debris present. Close proximity to Pwll Traeth Bach.
2	Native scrub removal	Low	Dense stands of Creeping Willow, but the footprint of the intervention area is predominantly a clearing offering few features. Woodland surrounding the intervention area potentially offers features such as fallen debris.
3 Pant y Fuches	Native scrub removal	Low	Large clearing and no features noted.
4 Ffrydiau	De-stumping and brash removal Re-profiling dunes	Moderate	Scrub woodland understorey creating potential refugia with sporadic woodland debris recorded. Limited access (dense scrub) reduced the survey area. Ffrydiau A and B are within the intervention area, therefore, due to these being breeding ponds it is considered likely that newts use habitat within the intervention area as hibernaculum.
5 Parnassus	De-stumping and brash removal	Low	Conifer woodland intervention area with occasional scrub and woodland debris. Dune Slack Pool (Pant Mawr Pool) is the nearest breeding pond located approx. 300m south-west.
6 Pant Mawr	Native scrub removal	Moderate	Intervention area surrounding Dune Slack Pool (Pant Mawr Pool) - breeding pond. Areas of dense scrub and woody debris were noted within the area.
7	Native scrub removal and	Low	Strip of conifer woodland with a dense scrub understorey located immediately next to a track.

Intervention Area	Planned intervention	Habitat Assessment	Comment
	removal of conifer seedlings from slacks		Nearest breeding pond is Dune Slack Pool (Pant Mawr Pool) - approx. 160m south-west. Limited features noted.
8 Cerrig Duon	Native scrub removal and removal of conifer seedlings from slacks	Low	Access was not undertaken due to horses within gated area. Intervention area included a large clearing with scrub and conifer woodland.
9 Canada Pool	Dune slack scrape and native scrub removal	Moderate	Intervention area was not accessible due to scrub. Located within close proximity to Canada Pool A and B, both of which are breeding ponds.
10 Hendai	Native scrub removal and removal of conifer seedlings from slacks	Moderate	Hendai Pond is located within this intervention area. This pond is not a breeding pond due to being dry at the time of survey. However, several areas of woody debris and scrub were recorded.
11 Gull Slack	Mowing and native scrub removal	Low	Clearing with an area of conifer woodland. Creeping willow dominated the area but few suitable features for hibernaculum were noted. Woody debris was occasionally noted along the edge of the woodland. Nearest breeding pond are the Canada Pools located approx. 280m east.

Figure 6: Palmate Newts were abundant in all the ponds at Newborough Forest, including this male in Airman's Pond.

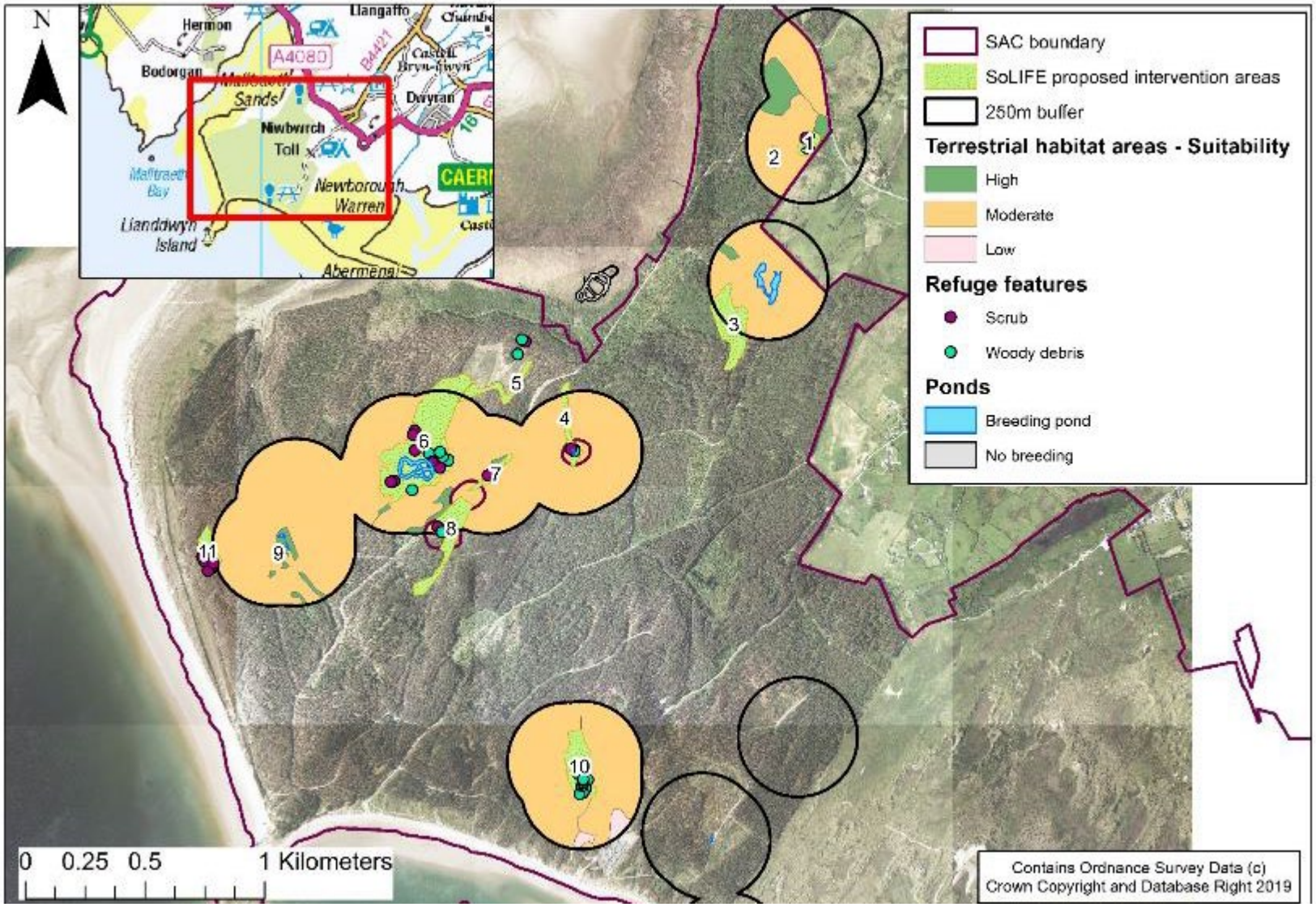

Figure 7: Terrestrial habitat features within Newborough Forest intervention areas. The two south-east buffer circles were not included in the terrestrial habitat assessment as they were located >250m from the nearest intervention area.

Morfa Harlech

Great Crested Newts have only been recorded at Morfa Harlech recently. It seems likely that population levels are very low, making detection difficult. A total of 12 ponds were identified within the survey area on the golf course. (Five more were recorded in Cartwright (2018) but were outside the survey area for this study).

The large complex of slacks to the north of the golf course were divided into nine separate areas, but these would likely all be connected (or at least form a few large slacks) at very high water and split into smaller areas as water levels fall. When wet, the dune slacks have a range of good to very good HSI scores but as water levels dropped during the survey period, many were only surveyed once, or were too shallow even on the first survey. One pond is present just inside the forest and had an average HSI score.

Neither Great Crested Newt presence, nor evidence of breeding, was detected at any of the waterbodies. Palmate Newts were recorded in the golf course ponds and the one forest pond. Refer to the Appendices, Section 0, for the HSI breakdown and photographs.

Breeding Pond Assessment

Within the survey area a total of 22 potential breeding ponds were identified. These formed two clear groups, these are summarised below and shown in

Figure .

Table 1-2: HSI and breeding status of Morfa Harlech ponds

Pond ID	Type	HSI result	GCN status	Notes
G01	Golf course pond	0.57	Absent	N/A
G02	Golf course pond	0.46	Absent	N/A
G03	Golf course pond	0.68	Absent	N/A
G05	Golf course pond	0.67	Absent	N/A
G06	Golf course pond	0.53	Absent	N/A
G08	Golf course pond	0.58	Absent	GCN records from 2018
G09	Golf course pond	0.45	Absent	N/A
G10	Golf course pond	0.51	Absent	N/A
G11	Golf course pond	0.62	Absent	GCN records from 2018
G15	Golf course pond	0.68	Absent	N/A
G16	Golf course pond	0.64	Absent	GCN records from 2018
G17	Golf course pond	0.64	Absent	N/A
S01	Dune slack	0.90	Absent	Slacks dried out after first survey.
S02	Dune slack	0.72	Absent	Slacks dried out after first survey.
S03	Dune slack	0.70	Absent	Slacks dried out after first survey.
S04	Dune slack	0.71	Absent	Slacks dried out after first survey.
S06	Dune slack	0.70	Absent	Slacks dried out after first survey.
S07	Forest pond	0.59	Absent	Old vehicle ruts but support breeding Palmate Newts.
S08	Dune slack	Too shallow, even on initial visit.	Too shallow, even on initial visit.	Too shallow for breeding.
S09	Dune slack	Too shallow, even on initial visit.	Too shallow, even on initial visit.	Too shallow for breeding.
S10	Dune slack	Too shallow, even on initial visit.	Too shallow, even on initial visit.	Too shallow for breeding.
S11	Dune slack	Too shallow, even on initial visit.	Too shallow, even on initial visit.	Too shallow for breeding.

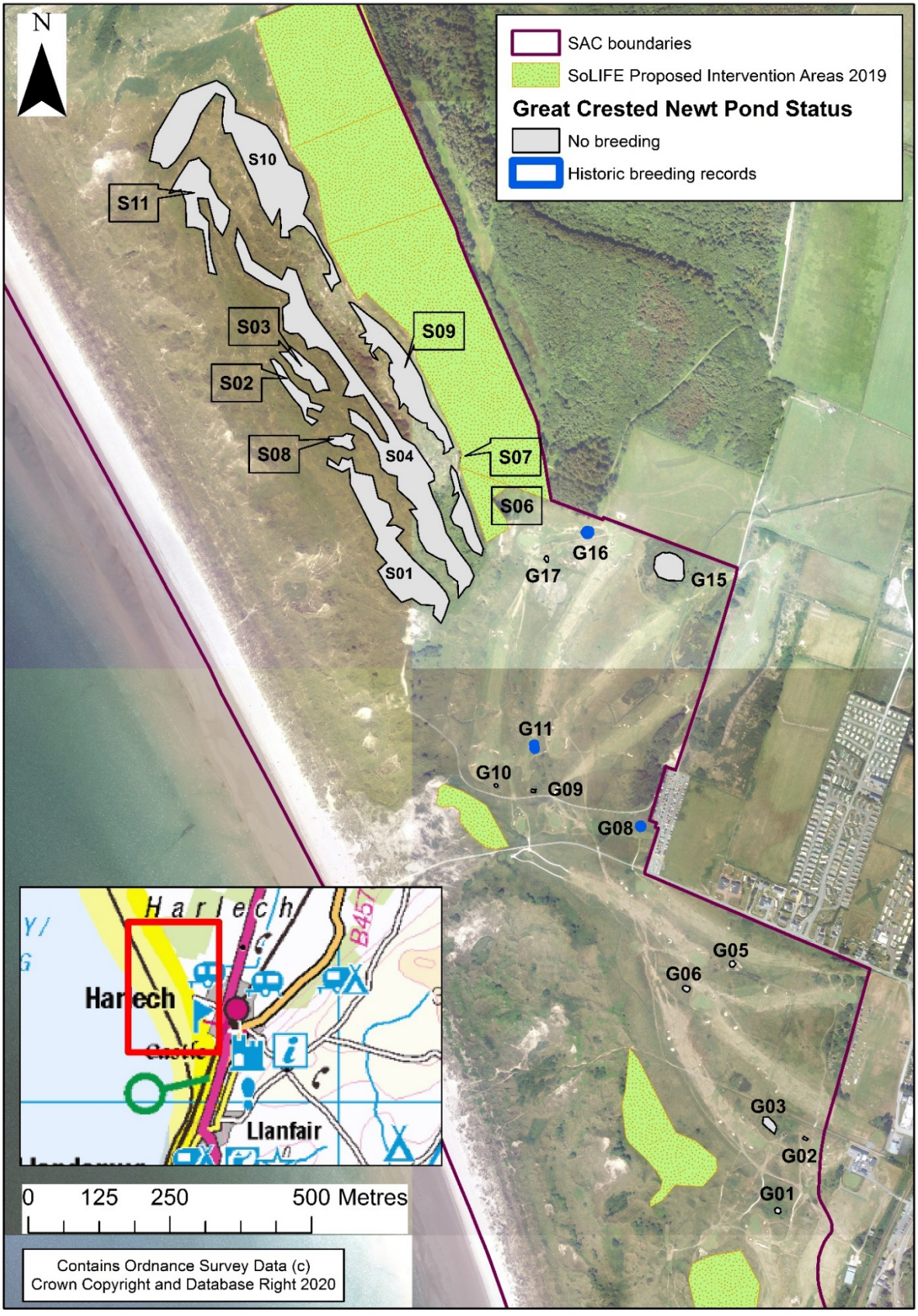

Figure 8: Morfa Harlech Great Crested Newt pond overview

Terrestrial Habitat Assessment

The terrestrial habitat within 250m of potential breeding ponds is generally of high suitability for Great Crested Newts. In the area around the golf course, closely-mown areas are of low suitability, but sit within a matrix of areas of tall and infrequently mown golf course 'rough', which provides good quality habitat with areas of scrub scattered throughout. The dune ridge to the west of the golf course is tussocky Marram with False Oat-grass (*Arrhenatherum elatius*) which provides a tussocky structure, thought to be good terrestrial habitat for Great Crested Newts. North of the golf course is a large complex of dune slacks with some scrubby areas, although there has been a large amount of scrub clearance within the previous year opening up most of this habitat. The conifer plantation also has large areas of scrubby habitat throughout providing good terrestrial habitat.

Refer to **Error! Reference source not found.** for an overview of terrestrial habitat suitability at Morfa Harlech and Table for assessment of one of the three proposed dune reprofiling and dune slack scrape intervention areas. Individual refuge features are not mapped, but in the forest, there were a large number of deadwood features throughout. Elsewhere, features are limited to a small number of rabbit burrows, common across the site at a low density.

Table 8: Terrestrial habitat assessment of Morfa Harlech intervention area

Intervention Area	Planned intervention	Habitat Assessment	Comment
1	Reprofiling dunes; dune slack scrape; Native scrub removal; and Native species management	High	Located 400m south-west of the nearest historic breeding pond. Area of tussocky Marram and False Oat-grass with Grey Willow scrub on location of old slack. Provides good quality habitat but a long way from nearest known breeding pond.
2	Re-profiling and scrub removal	High	Located 760m south of the nearest historic breeding pond.
3	Re-profiling and scrub removal	High	Located 135m west of the nearest historic breeding pond.
4	Some removal of conifer, de-stumping, non-native species management and ordnance removal.	Moderate	A large intervention area with the nearest point located 115m north-west of the nearest historic breeding pond.

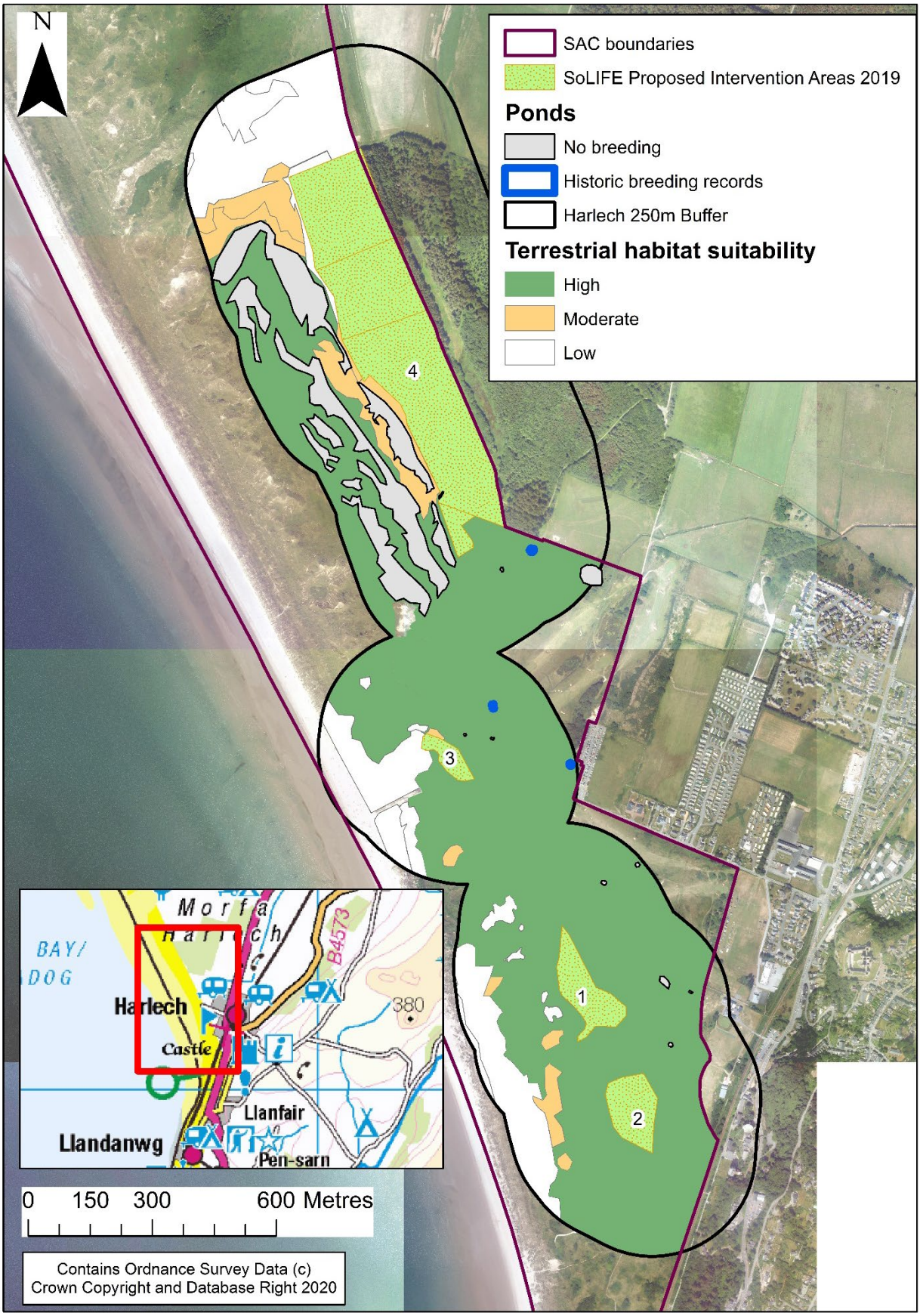

Figure 9: Terrestrial habitat suitability for Great Crested Newts at Morfa Harlech

Kenfig

19 waterbodies were identified within the Kenfig survey area, although more were initially identified and found to be slacks that were too dry to support breeding Great Crested Newts this year. Of these, eight were determined to be breeding Great Crested Newt ponds. Refer to the Appendices Section 6.1.4, for the HSI breakdown and photographs. Dune slacks that have recently been restored (or created) supported the best quality habitat and consequently were the location for most of the sightings. The high quality of the waterbodies at Kenfig means that a rich and dense aquatic macrophyte flora were present.

There are two historic records for Great Crested Newt in Kenfig Pool, one of a single individual and one record of eggs. The presence of the newts is despite historic stocking of the Pool with fish. Due to Kenfig Pool's large size and extensive margins with dense vegetation, no night-time surveys were undertaken at the Pool, but it is likely there remain suitable areas around the margins for Great Crested Newts to breed, particularly where vegetation in shallow water provides some refuge from fish.

Breeding Pond Assessment

Within the survey area a total of eight breeding ponds were identified. These are summarised in Table 3-9 below and shown in Figure 1.

Table 1-3: HSI and breeding status of Kenfig ponds

Pond ID	Type	HSI result	GCN breeding in 2019	Notes
Pond 01	Dune slacks	0.71	No	Recent scrub clearance from margin
Pond 02	Dune slacks	0.80	No	Recent scrub clearance from margin
Pond 03a	Dune slacks	0.84	Yes	Group of slacks restored in winter 2016/17
Pond 03b	Dune slacks	0.84	No	Group of slacks restored in winter 2016/17
Pond 03c	Dune slacks	0.84	Yes	Group of slacks restored in winter 2016/17
Pond 03d	Dune slacks	0.84	Yes	Group of slacks restored in winter 2016/17
Pond 03e	Dune slacks	0.84	No	Group of slacks restored in winter 2016/17
Pond 04	Dune slacks	0.66	No	N/A
Pond 05	Dune slacks	0.75	No	N/A
Pond 06	Dune slacks	0.68	No	N/A
Pond 07	Dune slacks	0.84	Yes	Western end with deep pool recently restored. Connected to extensive shallow slack which dried after first survey
Pond 08	Dune slacks	0.78	Yes	Slack with well-worn footpath through centre which was flooded by spring water levels.
Pond 09	Dune slacks	0.62	No	Near, or part of, the pond historically called 'Bomb Hole Pond'
Pond 10	Dune slacks	0.82	Yes	N/A

Pond ID	Type	HSI result	GCN breeding in 2019	Notes
Pond 11	Dune slacks	0.57	Yes	N/A
Pond 12	Dune slacks	0.68	No	Falls just outside SAC boundary but included due to proximity to works
Pond 13	Dune slacks	0.41	No	N/A
Pond 14	Dune slacks	0.59	Yes	N/a
Kenfig Pool	Lake	0.69	No	Not surveyed

Figure 10: Pond 03c showing bare sandy margins. The slacks in this area were rejuvenated in winter of 2016/17.

Figure 11: Female Great Crested Newt in Pond 03d, 25 April 2019.

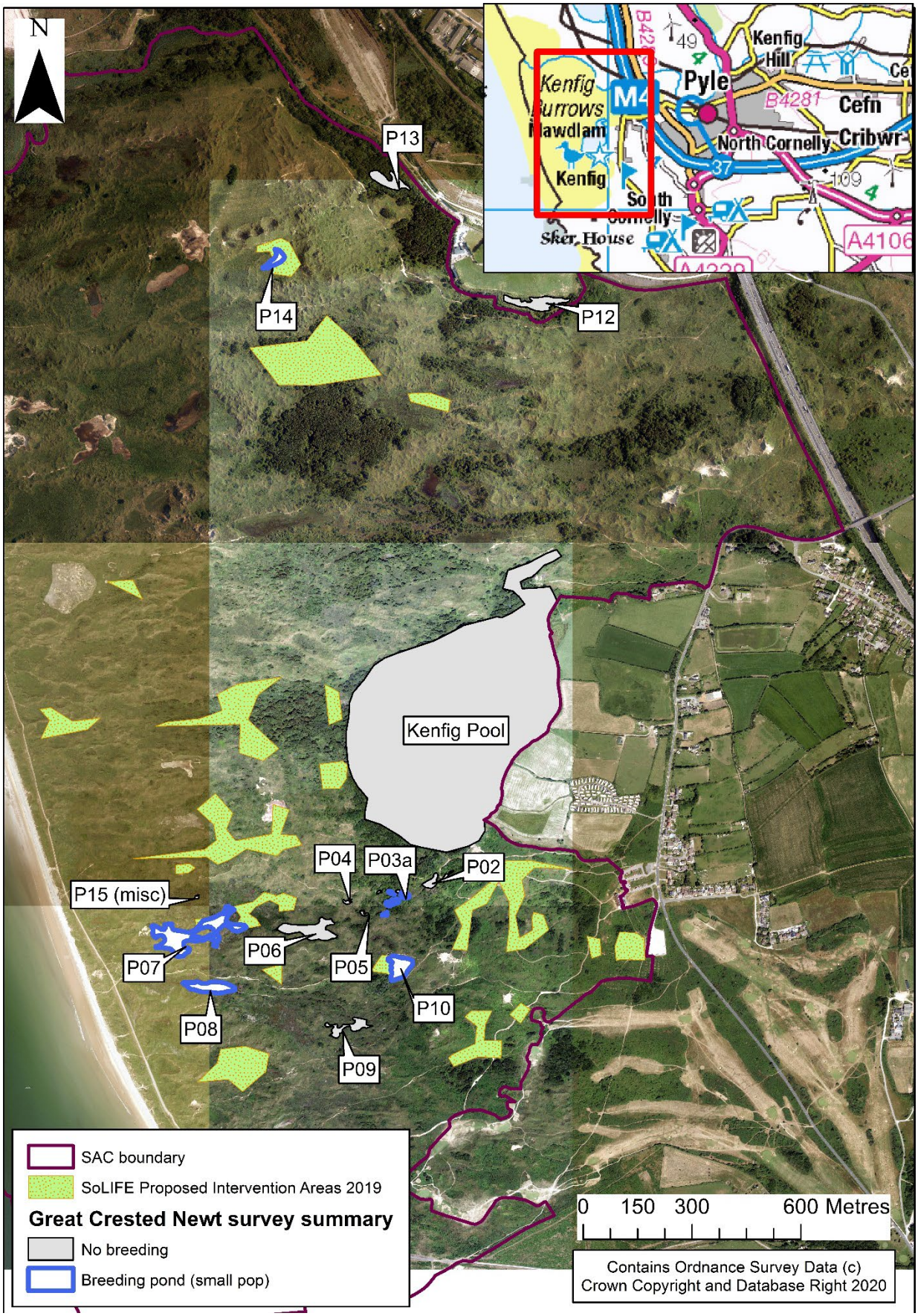

Figure 12: Great Crested Newt breeding status of ponds for Kenfig

Terrestrial Habitat Assessment

The terrestrial habitat within 250m of breeding ponds, where it overlaps with intervention areas, was assessed as high to moderate suitability for Great Crested Newts. Table details habitat types within each intervention area and nearest breeding pond. No assessment was completed for the south-easterly survey buffer around the visitor centre, nor a single polygon to the west of site (not shown) as these were over 250m from the nearest ponds.

Specific features likely to provide resting places were not mapped individually, but natural features include areas of scrub that are common throughout the site, particularly around mature dune slacks, and rabbit burrows that are present at moderate density across the site. During recent scrub clearance, piles of brash have been left in locations around ponds as a deliberate conservation measure and provide good quality refuge features.

Generally, the terrestrial habitat at Kenfig is of moderate suitability, with much of the fixed dune grassland being grazed to create a low, open sward with relatively few refuge opportunities. However, there are plenty of areas of scrub and more tussocky vegetation on dune ridges where grazing intensity is lower, creating areas of high-quality terrestrial habitat. This is supplemented by areas of conservation interventions where activities such as scrub clearance have been used to provide habitat piles.

Table 10: Terrestrial habitat assessment of Kenfig intervention areas

Intervention Area	Planned intervention	Habitat Assessment	Comment
1	Native scrub management	High	Nearest breeding pond is P14 located 225m north of the intervention area. The vegetation in this area is fenny birch woodland which is invading a deep dune slack. Parts of the woodland and adjacent scrub with tussocky vegetation provides good refuge and protection from predation.
5	Native scrub management	NA	Nearest breeding pond is P07 located 420m south of this intervention area.
6	Native scrub management	High	P10 breeding pond is located within this intervention area. Habitat within this area comprises Willow scrub on low ground and Sea Buckthorn on higher ground surrounded by dune slack and has habitat suitable for refuge.
12	Mowing	NA	Nearest breeding pond is P07 located 600m south-east of this intervention area.
13	Mowing	Moderate - High	P07 is the nearest breeding pond to this intervention area located 120m south. This intervention area is large and spreads into both moderate and high habitat suitability.
14	Mowing	High	Nearest breeding pond is P03c located 350m south-east of the intervention area. The habitat within this area comprises of willow woodland and fen vegetation on the lake margins.
15	Mowing	High	Nearest breeding pond is P03c located 490m south-east of the intervention area. This intervention area is primarily within high suitability habitat. However, part of the intervention area is located within low suitability habitat providing few features for Great Crested Newts.

Intervention Area	Planned intervention	Habitat Assessment	Comment
16	Mowing	NA	P07 is the nearest breeding pond located 140m south of this intervention area.
17	Rabbit management	High	Nearest breeding pond is P10 located 215m north of the intervention area. The vegetation in this area is dense bracken and bramble, which provides good refuge and protection from predation, however, is of only moderate value for foraging.
18	Rabbit control area	High	No impacts in this area.
19	Birch slack scrape; Native scrub removal	Moderate	Nearest breeding pond is P14 located 435m north-west of the intervention area. The area consists of a wet slack with scrub adjacent to a larger area of birch scrub.
20, 21 & 51	Horseshoe slack scrape; re-profiling dunes	Moderate	This intervention area is located within breeding pond P14. This is a typical dune slack with a low canopy of Creeping Willow over a grassy field layer. Around the slack are areas of grazed grassland on low dune ridges.
22	Mowing	NA	P10 is the nearest breeding pond located 500m west of this intervention area.
23	Mowing	NA	P10 is the nearest breeding pond located 550m west of this intervention area.
24	Small blowouts	NA	Nearest breeding pond is P08 located 200m south-west of this intervention area.
25	Small blowouts	NA	Nearest breeding pond is P14 located 950m north-east of this intervention area.
28	Slack scrapes	Moderate	P14, a breeding pond, is located within this intervention area. It is an extensive area of dune slack with wet woodland surrounded by typical dry dune grassland.
29	Slack scrapes	Moderate	Nearest breeding pond is P14 located 500m north-west of the intervention area. The area consists of a large slack with deep area and small patches of willow.

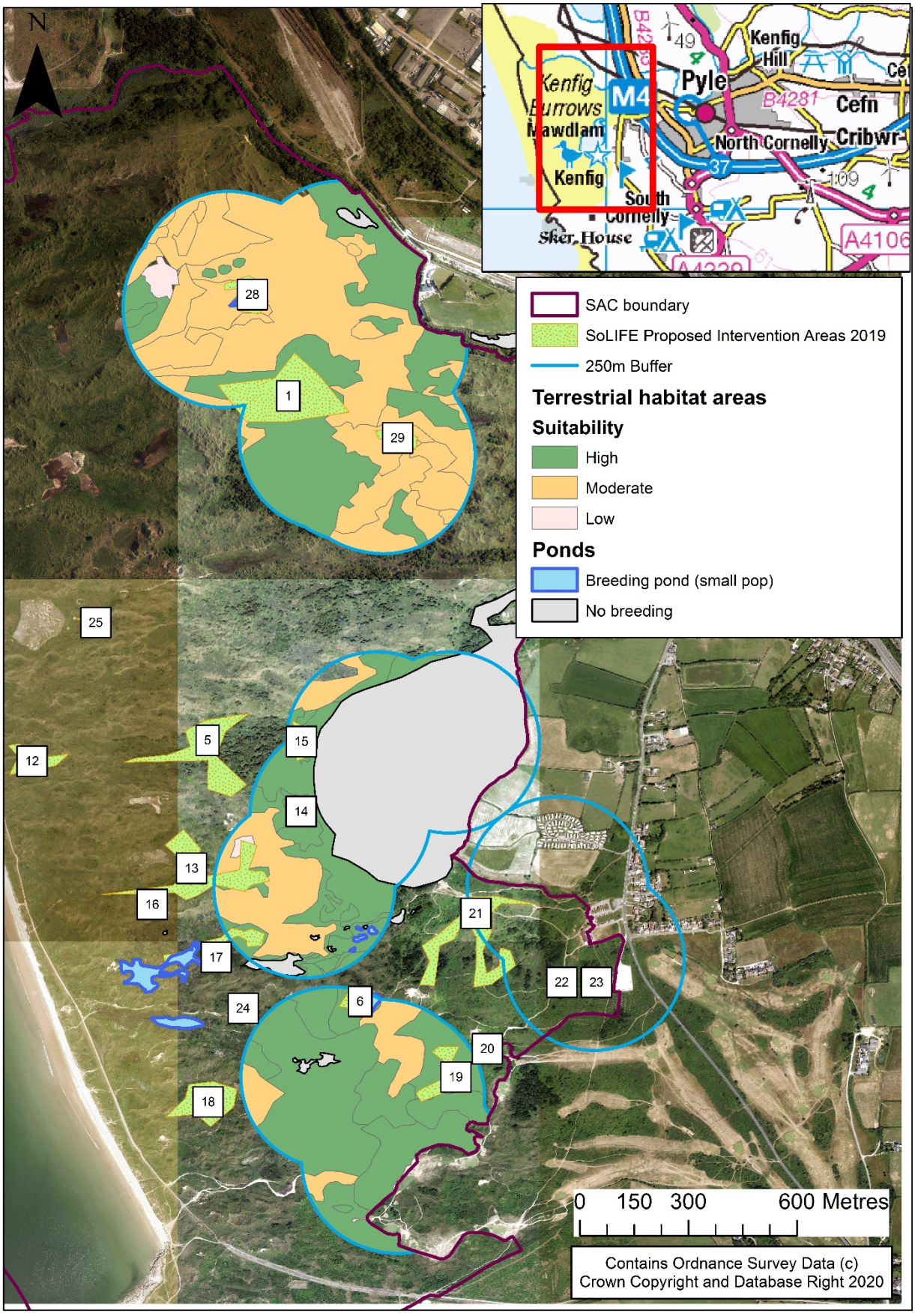

Figure 13: Terrestrial habitat suitability for Great Crested Newts at Kenfig

Conclusion

Scheme Impact

The proposed works that will be completed as part of the Sands of LIFE project will result in better quality dune habitat for a wide variety of species. The re-profiling of old dune slacks is likely to result in an increase in potential breeding habitat for Great Crested Newt, as demonstrated by the breeding populations recorded at Kenfig in Ponds 03a to 03e, an area where an old slack was rejuvenated by Amphibian and Reptile Conservation in 2016/17. Although this is only anecdotal evidence, assessment based on known habitat preferences from other habitats (not sand dunes) suggests that terrestrial habitats around established slacks in fixed dune grassland (open scrub, tussock grassland) provides habitat with abundant refuges for Great Crested Newt. Works to rejuvenate these slacks is therefore likely to result in a very small short-term negative impact following by significant medium-term benefit through improved breeding habitat, until natural succession results in slacks becoming too shallow again. Even in the absence of specific mitigation to protect individual newts this would likely still be true, although mitigation is required anyway to comply with legislation.

In contrast, there is little evidence on the impact of the creation of more mobile sand. The mobile sand provides no cover for Great Crested Newt and would likely bury refuges. There may be longer-term benefits through natural creation or rejuvenation of slacks, but there seems to be little evidence of this.

The inventions to remove invasive species and thin or clear native scrub are likely to have very small short-term negative impact on Great Crested Newt, with the structure of vegetation that develops following the works being the most important factor in determining impact. Where this vegetation is tussocky, dune grassland or open scrub, this will be a medium-term positive impact. The impacts on Great Crested Newts are likely to be similar to impacts on Palmate Newts, Smooth Newts and other amphibians.

Mitigation Summary

Any works to be undertaken within 250m of a breeding pond will require mitigation (hand search and/or destructive search). Depending on the scale of the works a mitigation licence may be necessary, for example, for large scrape interventions within 250m of a breeding pond. Some interventions will be able to take place without specific mitigation, due to distance from a breeding pond and lack of suitable terrestrial habitat, however, a toolbox talk to all site contractors will be necessary.

The below table summarises what mitigation measures are advised for the specified intervention areas. The intervention areas assessed were those proposed up to July 2019. Interventions introduced after this date will need assessing separately, although the principles used here should apply. The details of each proposed mitigation are described in the following sections.

Table 11: Proposed mitigation for interventions at Tywyn Aberffraw, Newborough Forest, Morfa Harlech and Kenfig.

Site	Intervention	Within 250m of a breeding pond (Y / N)	Hand search	Destructive search	Mitigation licence	Comments
Tywyn Aberffraw	1 Removal of invasive alien species	Y	Advised	Not advised	Not advised	Located within 250m of a breeding pond but tiny area (<20m^2). Should vegetation clearance be necessary a hand search of potential refuge features is recommended prior to works commencing. In this location this will just require searching around the base of plants and under the cover of the dense ground-layer bryophytes. This should be specified in a Reasonable Avoidance Measures Mitigation Statement (RAMMS)
Tywyn Aberffraw	2 Removal of invasive alien species	N	Not advised	Not advised	Not advised	The foredunes are unsuitable for Great Crested Newts.
Tywyn Aberffraw	3 Frontal dune notch	Y	Not advised	Not advised	Not advised	The foredunes are unsuitable for Great Crested Newts.

Site	Intervention	Within 250m of a breeding pond (Y / N)	Hand search	Destructive search	Mitigation licence	Comments
Newborough Forest	Open warren interventions	N	Not advised	Not advised	Not advised	These interventions are located over 750m from a confirmed breeding pond. Therefore, no mitigation is necessary.
Newborough Forest	Scrapes (1; 9)	Y	Advised	Advised	Advised	Large scrape interventions located within 250m of a breeding pond will require a mitigation licence, which will include a range of mitigation measures such as hand search of suitable habitat and the provision of refuge features.
Newborough Forest	Native scrub removal (2; 3; 6; 7; 8; 9;10; 11)	Y	Advised	Possibly	Advised	Hand search is advised prior to vegetation removal. Should there be rabbit burrows present within the works area, a destructive search may be required. A licence would be required.
Newborough Forest	De-stumping and brash removal (4; 5) Mowing (11)	N	Not advised	Not advised	Not advised	Unless removing significant habitat features (e.g. log piles) then no mitigation will be required.
Morfa Harlech	1,2 Reprofiling dunes; native scrub removal; and Native species management	N	Not advised	Not advised	Not advised	No breeding pond within 250m. No specific mitigation advised.
Morfa Harlech	3 Reprofiling and vegetation management	Y	Not advised	Not advised	Not advised	Historic breeding pond within 250m, but population so low that encounter very unlikely.
Morfa Harlech	4 Tree and stump	Y	Not advised	Not advised	Not advised	Historic breeding pond within 250m, but population so low that encounter very unlikely.

Site	Intervention	Within 250m of a breeding pond (Y / N)	Hand search	Destructive search	Mitigation licence	Comments
	removal, ordnance					
Kenfig	1, 6 Native scrub management	Y	Advised	Possibly	Advised	Hand search is advised prior to vegetation removal. Should there be rabbit burrows present within the works area, a destructive search may be required. A licence would be required.
Kenfig	5 Native scrub management	N	Not advised	Not advised	Not advised	No breeding pond within 250m
Kenfig	13, 16 Mowing	Y	Advised	Possibly	Advised	Hand search is advised prior to mowing. Should there be rabbit burrows present within the works area, a destructive search may be required. A licence would be required.
Kenfig	12, 14, 15, 22, 23 Mowing	N	Not advised	Not advised	Not advised	No breeding pond within 250m.
Kenfig	17 Rabbit management	Y	Not advised	Not advised	Not advised	Rabbit management interventions carried out by hand are not considered to pose any threat to Great Crested Newts. If machinery were to be used, then this would need to be reviewed.
Kenfig	19 Birch slack scrape; Native scrub removal	N	Not advised	Not advised	Not advised	No breeding pond within 250m.
Kenfig	20, 21, 51 Re-profiling dunes	Y	Advised	Advised	Advised	Breeding pond, P14, is located within the horseshoe slack scape. Mitigation licence will be required.
Kenfig	24 small blowout	Y	Advised	Advised	Advised	Breeding pond within 200m, reasonable likelihood of encountering newts.
Kenfig	25 small blowout	N	Not advised	Not advised	Not advised	No breeding pond within 250m.

Site	Intervention	Within 250m of a breeding pond (Y / N)	Hand search	Destructive search	Mitigation licence	Comments
Kenfig	28 slack scrape	Y	Advised	Advised	Advised	Large scrape interventions located within 250m of a breeding pond will require a mitigation licence, which will include a range of mitigation measures such as hand search of suitable habitat and the provision of refuge features.
	29 slack scrape	N	Not advised	Not advised	Not advised	No breeding pond within 250m.

Mitigation – Timing of Vegetation Clearance

The hand searching and destructive searches should only take place outside hibernation season (typically November to March), as disturbing newts from hibernation is likely to result in death. As many works will need to take place over winter, then some small-scale advanced preparation, such as removal of potential likely hibernacula, may need to be completed in the summer or autumn to avoid the risk of disturbing a hibernating newt. This measure would also help protect hibernating reptiles, which would use similar features.

Mitigation - Hand and Destructive Searches

If works are within 250m of a breeding pond a hand and/or destructive search will be necessary. A hand search would involve finger-searching all suitable areas of habitat likely to be impacted upon by the works including log piles and deadwood, piles of leaf litter and moss around the base of scrub, around the base of tussocks, and under other debris. A destructive search may be necessary for areas that are not searchable by hand, such as rabbit burrows. A destructive search will require careful destruction of the burrow either using hand tools, or where necessary a mechanical excavator, digging back into the tunnels searching for newts during the process. Both the excavated material and the exposed ground should then be searched for newts and the work should be supervised by an experienced amphibian and reptile handler.

Where these searches are necessary in moderate or good quality habitat within 250m of known breeding pond a derogation licence will be necessary (Section 0). This would permit individual newts to be disturbed (relocated to a safe place) and also the destruction of resting places.

Works in low quality habitat, or over 250m from a breeding pond do not require a licence, due to the very low likelihood of encountering an individual newt. However, if newts are found, then works would have to stop and a licence would be required before they could continue.

Access and Temporary Works Areas

Site access routes should follow areas of less suitable terrestrial habitat for Great Crested Newt, favouring open areas, or areas of short-cropped vegetation with few refuges. For Newborough Forest and Kenfig there are already access tracks and routes used by machinery previously. Once confirmed access routes should be assessed for potential refuges sites that might be used by Great Crested Newts and further mitigation put in place.

Temporary storage areas and any site compounds must also be assessed for potential impacts on Great Crested Newts. As well as avoiding impacts during establishment, these areas also have the potential to create new refuge sites which newts will be attracted to during works. Measures will need to be in place to avoid this otherwise there may be additional delays to any works.

Mitigation Fenced Translocations

The use of fenced translocations is not advised for the proposed interventions. The use of fencing and pitfall traps, which require daily checking, would be disproportionately intrusive and expensive in the open sand dune setting, as well as

creating potential issues around public access and interference. Instead, avoidance measures are focussed on searching discussed in Section 4.1.2.

Reasonable Avoidance Measures Mitigation Statement (RAMMS)

For the three sites where Great Crested Newts are present, a Reasonable Avoidance Measures Mitigation Statement should be produced to provide a concise summary for works. As well as formalising the measures discussed above for each site, this will cover additional areas should as temporary site compounds, materials storage and other intervention-related issues that will be best to assess once details of the interventions have been formalised.

European Protected Species Derogation Licence

Where works result in damage or destruction of a breeding site or resting place and or cause disturbance injury or death a European protected species derogation licence will be required. This is likely to be the case for some of the scrapes and de-stumping works at Newborough Forest and slack scraping at Kenfig. The survey results contained within this report should form the basis of the licence application. The application process may determine additional mitigation measures that would be necessary during the works.

The nature and location of the proposed works at Aberffraw mean that an offence is highly unlikely to be committed. The population at Morfa Harlech is very low, undetectable in the present survey, so again an offence is highly unlikely. No derogation licence is advised for the project activities as understood at either of these sites.

Conclusion

The proposed interventions for the Sands of LIFE project is expected to improve the breeding habitat, and to a lesser extent terrestrial habitat, for Great Crested Newt (as well as improving habitat for a wide range of other species). Breeding populations were confirmed at three of the four sites surveyed Tywyn Aberffraw, Newborough Forest and Kenfig. It is possible that Great Crested Newts remain present at very low density at Morfa Harlech but were not recorded in this survey. At all these sites the re-profile of old scrapes should result in their rejuvenation with springtime open water habitat created that could be used by Great Crested Newt for breeding.

Potential threats to Great Crested Newt from the proposed interventions include disturbance, killing or injuring during ground works and destruction of resting places. Mitigation measures have been advised to ensure the works do not negatively impact upon Great Crested Newts using the site, primarily focussing on careful search of works areas. Some of the interventions at Newborough Forest and Kenfig will need to be carried out under a derogation licence.

Whilst sufficient detail of each intervention is available to make these outline assessments the full details of each intervention will be decided close to implementation and at this stage the activity should be re-assessed to confirm the potential risk to Great Crested Newts and ensure the appropriate mitigation is in place.

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Appendices

Habitat Suitability Index (HSI) Results and Photographs

Tywyn Aberffraw

Table 12: HSI of Tywyn Aberffraw waterbodies

HSI	Pond suitability
<0.5	Poor
0.5-0.59	Below Average
0.6-0.069	Average
0.7-0.079	Good
>0.8	Excellent

GCN Habitat Suitability Index	Ponds	Ponds	Ponds	Ponds
Indices	Pond A	Pond B	Pond C (outside survey area)	Pond A1
Location	0.5	0.5	0.5	0.5
Pond Area	0.8	0.8	0.8	0.05
Pond Drying	0.5	0.5	0.5	0.5
Water Quality	0.67	0.67	0.67	0.33
Shade	1	1	1	1
Fowl	1	1	1	1
Fish	1	1	1	1
Ponds	0.9	0.9	0.9	0.9
Terrestrial Habitat	0.67	0.67	0.33	0.67
Macrophytes	0.5	0.6	0.6	0.8
Total	**0.040401**	**0.048481**	**0.0238788**	**0.00199**
HSI Score	**0.73**	**0.74**	**0.69**	**0.54**

Tywyn Aberffraw waterbodies photographs

Pond A
HSI: 0.72
Breeding GCN 2019

Pond A1
HSI: 0.53
Breeding GCN 2019

Pond B
HSI: 0.73
Historic GCN breeding (2016)

Pond C
HSI: 0.68
No GCN

Newborough Forest

Table 13: HSI breakdown of Newborough Forest ponds

GCN Habitat Suitability Index	Ponds	Ponds	Ponds	Ponds	Ponds	Ponds	Ponds	Ponds	Ponds
Indices	1 (Pwll Traeth Bach)	2 (Pandy Pools)	3 (Ffrydiau A)	4 (Ffrydiau B)	5 (Canada Pool A)	6 (Canada Pool B)	7 (Dune Slack Pool / Pant Mawr)	8 (Saltmarsh Pool)	9 (Airmans Road pond)
Location	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Pond Area	0.8	0.8	0.1	0.1	0.6	0.4	0.8	0.8	0.1
Pond Drying	0.9	0.9	0.9	0.9	0.9	0.9	0.1	0.9	1
Water Quality	0.67	0.67	0.67	0.67	1	0.33	1	1	0.67
Shade	0.85	1	1	1	1	1	1	1	0.55
Fowl	0.01	0.67	0.67	0.67	1	1	0.67	0.67	1
Fish	0.67	0.67	0.67	0.67	0.67	0.67	1	0.67	1
Ponds	0.55	0.55	0.65	0.65	0.55	0.55	0.7	0.7	0.45
Terrestrial Habitat	1	1	1	1	0.67	0.67	0.67	0.67	0.67
Macrophytes	0.8	0.5	0.4	0.9	0.4	1	0.6	0.8	0.7
Total	**0.0006044**	**0.029776**	**0.003519**	**0.007918**	**0.026665**	**0.014666**	**0.007542**	**0.060634**	**0.003889**
HSI Score	**0.47657622**	**0.703697**	**0.568383**	**0.616395**	**0.695975**	**0.655586**	**0.613403**	**0.755564**	**0.574089**

Newborough Forest surveyed waterbodies photographs

Pwll Traeth Bach
HSI: 0.47
(Not surveyed)

Pandy Pools
HSI: 0.7
Breeding GCN 2019

Ffrydiau A
HSI: 0.62
Breeding GCN 2019

Ffrydiau B
HSI: 0.56
Breeding GCN 2019

Canada Pool A
HSI: 0.67
Breeding GCN 2019

Canada Pool B
HSI: 0.65
Breeding GCN 2019

Dune Slack Pool (Pant Mawr Pool)
HSI: 0.61
Breeding GCN 2019

Saltmarsh Pool
HSI: 0.75
(Not surveyed)

Airman’s Road Pond
HSI: 0.57
Breeding GCN 2019

Morfa Harlech

Table 14: HSI breakdown for Morfa Harlech ponds

GCN Habitat Suitability Index	Ponds	Ponds	Ponds	Ponds	Ponds	Ponds	Ponds	Ponds	Ponds	Ponds	Ponds	Ponds
Indices	G01	G02	G03	G05	G06	G08	G09	G10	G11	G15	G16	G17
Location	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Pond Area	0	0.05	1	0.2	0.2	0.05	0.05	0.05	0.05	0.8	0.1	0.05
Pond Drying	0.9	0.9	0.9	1	0.5	0.5	0.9	0.9	0.9	0.1	0.9	0.9
Water Quality	0.33	0.33	0.33	1	0.67	0.67	0.67	0.67	0.67	1	1	0.67
Shade	0.4	1	1	0.9	0.4	1	0.25	0.85	1	1	0.9	1
Fowl	1	1	1	0.67	1	1	1	1	1	1	1	1
Fish	1	0.33	0.67	0.67	0.67	1	0.67	0.33	1	1	0.67	1
Ponds	1	1	1	1	1	1	1	1	1	1	1	1
Terrestrial Habitat	1	0.33	1	0.67	0.67	0.67	0.33	0.67	0.67	1	0.67	1
Macrophytes	0.3	0.5	0.3	0.7	0.3	0.8	0.5	0.4	0.8	0.55	0.7	0.85
Total	**0.003564**	**0.000404**	**0.023879**	**0.018948**	**0.001805**	**0.004489**	**0.000417**	**0.001133**	**0.00808**	**0.022**	**0.012726**	**0.012814**
HSI Score	**0.56910679**	**0.457793**	**0.688337**	**0.672599**	**0.531664**	**0.582391**	**0.459172**	**0.507496**	**0.61765**	**0.682719**	**0.646354**	**0.646796**

GCN Habitat Suitability Index	**Ponds**	**Ponds**	**Ponds**	**Ponds**	**Ponds**	**Ponds**	**Ponds**	**Ponds**	**Ponds**	**Ponds**
Indices	S01	S02	S03	S04	S06	S07	S08	S09	S10	S11
Location	0.5	0.5	0.5	0.5	0.5	0.5	Not assessed	Not assessed	Not assessed	Not assessed
Pond Area	0.8	0.8	0.8	0.8	0.8	0.15	Not assessed	Not assessed	Not assessed	Not assessed
Pond Drying	1	0.5	0.1	0.5	0.1	0.5	Not assessed	Not assessed	Not assessed	Not assessed
Water Quality	1	0.67	1	0.67	1	0.67	Not assessed	Not assessed	Not assessed	Not assessed
Shade	0.9	1	1	1	1	0.6	Not assessed	Not assessed	Not assessed	Not assessed
Fowl	1	0.67	0.67	0.67	0.67	1	Not assessed	Not assessed	Not assessed	Not assessed
Fish	1	1	1	1	1	1	Not assessed	Not assessed	Not assessed	Not assessed
Ponds	1	1	1	1	1	1	Not assessed	Not assessed	Not assessed	Not assessed
Terrestrial Habitat	1	0.67	1	0.67	1	1	Not assessed	Not assessed	Not assessed	Not assessed
Macrophytes	1	0.6	1	0.6	1	0.35	Not assessed	Not assessed	Not assessed	Not assessed
Total	**0.36**	**0.036092**	**0.0268**	**0.036092**	**0.0268**	**0.005276**	Not assessed	Not assessed	Not assessed	Not assessed
HSI Score	**0.90288**	**0.717366**	**0.696327**	**0.717366**	**0.696327**	**0.591878**	Not assessed	Not assessed	Not assessed	Not assessed

Morfa Harlech surveyed waterbodies photographs

G02
HSI: 0.46
No GCN

G03
HSI: 0.68
No GCN

G08
HSI: 0.58
No GCN

G09
HSI: 0.45
No breeding

G10
HSI: 0.51
No GCN

G11
HSI: 0.62
No GCN

G15
HSI: 0.68
Not surveyed

G16
HSI: 0.64
No GCN

G17
HSI: 0.64
No GCN

S01
HSI: 0.9
No GCN

S04
HSI: 0.71
No GCN

S07
HSI: 0.59
No GCN

Kenfig

Table 15: HSI breakdown of Kenfig waterbodies

GCN Habitat Suitability Index	Ponds	Ponds	Ponds	Ponds	Ponds	Ponds	Ponds	Ponds	Ponds	Ponds	Ponds	Ponds
Indices	1	2	3a,b,c + e	4	5	6	7	8	9	10	11	12
Location	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Pond Area	0.35	0.95	1	0.35	0.35	0.8	0.8	0.8	0.2	0.8	0.1	0.8
Pond Drying	0.5	0.5	1	0.1	0.5	0.1	1	0.5	0.1	1	0.1	0.1
Water Quality	1	1	1	1	1	1	1	0.67	1	1	1	1
Shade	1	1	1	1	1	0.67	1	1	1	1	1	1
Fowl	0.67	0.67	0.67	1	1	1	0.67	0.67	1	0.67	1	1
Fish	0.67	0.67	0.67	1	0.67	1	0.67	1	1	0.67	0.67	0.67
Ponds	1	1	1	1	1	1	1	1	1	1	1	1
Terrestrial Habitat	1	1	1	1	1	1	1	1	1	1	1	1
Macrophytes	0.9	1	0.8	0.85	0.9	0.8	1	0.9	0.85	0.8	1	0.8
Total	**0.03535088**	**0.106614**	**0.17956**	**0.014875**	**0.052763**	**0.02144**	**0.17956**	**0.080802**	**0.0085**	**0.143648**	**0.00335**	**0.02144**
HSI Score	**0.72**	**0.80**	**0.84**	**0.66**	**0.75**	**0.68**	**0.84**	**0.78**	**0.62**	**0.82**	**0.57**	**0.68**

GCN Habitat Suitability Index	Ponds	Ponds	Ponds
Indices	13	14	Kenfig Pool
Location	0.5	0.5	0.5
Pond Area	0.8	0.9	0.8
Pond Drying	0.5	0.1	0.9
Water Quality	1	1	1
Shade	0.45	0.45	1
Fowl	0.01	1	0.67
Fish	0.33	0.67	0.33
Ponds	1	1	1
Terrestrial Habitat	1	1	1
Macrophytes	0.4	0.4	0.3
Total	**0.000119**	**0.005427**	**0.0238788**
HSI Score	**0.41**	**0.59**	**0.69**

Kenfig surveyed waterbodies photographs

Pond 1
HSI: 0.71
No GCN

Pond 2
HSI: 0.8
No GCN

Pond 3a
HSI: 0.84
Historic breeding (2018)

Pond 3b
HSI: 0.84
No GCN

Pond 3c
HSI: 0.84
Breeding GCN 2019

Pond 3d
HSI: 0.84
No GCN

Pond 4
HSI: 0.66
No GCN

Pond 5
HSI: 0.75
No GCN

Pond 6
HSI: 0.68
No GCN

Pond 7
HIS: 0.84
Breeding GCN 2019

Pond 8
HSI: 0.78
Breeding GCN 2019

Pond 9
HSI: 0.62
No GCN

Pond 10
HSI: 0.82
Breeding GCN 2019

Pond 12
HSI: 0.68
No GCN

Pond 13
HSI: 0.41
No GCN

Pond 14
HSI: 0.59
Breeding GCN 2019

Kenfig Pool
HSI: 0.69
Not surveyed

Species Records on Cofnod

Table 16: The species records collected as a result of this study summarised from the Cofnod Great Crested Newt surveillance database.

Scientific Name	Grid Reference	Site Name	Adult NA	Adult F	Adult M	Egg	Juv	Larvae	Negative Record	Date	Recorder Names	Comments
Triturus cristatus	SH5753331787	P10	0	0	0	0	0	0	TRUE	09/05/2019	Jennifer Pullen	N/A
Triturus cristatus	SH5721831782	P09	0	0	0	0	0	0	TRUE	09/05/2019	Jennifer Pullen	N/A
Triturus cristatus	SH5763531198	P03	0	0	0	0	0	0	TRUE	09/05/2019	Jennifer Pullen	N/A
Triturus cristatus	SH5769731171	P02	0	0	0	0	0	0	TRUE	09/05/2019	Jennifer Pullen	N/A
Lissotriton helveticus	SH57093237	P21 (Pond 07)	0	10	6	0	0	0	FALSE	16/05/2019	Steven Heathcote	N/A
Triturus cristatus	SH57093237	P21 (Pond 07)	0	0	0	0	0	0	TRUE	16/05/2019	Steven Heathcote	N/A
Lissotriton helveticus	SH57093237	P21 (Pond 07)	0	10	2	0	0	0	FALSE	23/04/2019	Steven Heathcote	N/A
Triturus cristatus	SH57093237	P21 (Pond 07)	0	0	0	0	0	0	TRUE	23/04/2019	Steven Heathcote	N/A
Natrix helvetica	SH57003249	P20 (Slack 09)	1	0	0	0	0	0	FALSE	23/04/2019	Steven Heathcote	Seen foraging in wet dune slack at 20:45. Night-time air temperatures warm (c. 17C).
Rana temporaria	SH57003249	P20 (Slack 09)	1	0	0	0	0	0	FALSE	23/04/2019	Steven Heathcote	N/A
Bufo bufo	SH57003249	P20 (Slack 09)	2	0	0	0	0	0	FALSE	23/04/2019	Steven Heathcote	N/A
Triturus cristatus	SH57003249	P20 (Slack 09)	0	0	0	0	0	0	TRUE	23/04/2019	Steven Heathcote	N/A
Lissotriton helveticus	SH56993214	P19 (Slack 01)	0	3	0	0	0	0	FALSE	23/04/2019	Steven Heathcote	All three individuals located in the southern part of the slack which had the deepest areas of water
Triturus cristatus	SH56993214	P19 (Slack 01)	0	0	0	0	0	0	TRUE	23/04/2019	Steven Heathcote	N/A
Triturus cristatus	SS79188278	P14	0	0	0	0	0	0	TRUE	20/06/2019	Jonathan Harrison	N/A
Triturus cristatus	SS79498299	P13	0	0	0	0	0	0	TRUE	20/06/2019	Jonathan Harrison	N/A
Triturus cristatus	SS79908265	P12	0	0	0	0	0	0	TRUE	20/06/2019	Jonathan Harrison	N/A
Triturus cristatus	SS79528083	P10	0	0	0	0	0	0	TRUE	20/06/2019	Jonathan Harrison	N/A
Triturus cristatus	SS79408067	P09	0	0	0	0	0	0	TRUE	20/06/2019	Jonathan Harrison	N/A
Triturus cristatus	SS79488098	P11	0	0	0	0	0	1	FALSE	20/06/2019	Jonathan Harrison	N/A
Triturus cristatus	SS78998077	P08	0	0	0	0	0	2	FALSE	20/06/2019	Jonathan Harrison	N/A

Scientific Name	Grid Reference	Site Name	Adult NA	Adult F	Adult M	Egg	Juv	Larvae	Negative Record	Date	Recorder Names	Comments
Triturus cristatus	SS78908090	P07	0	0	0	0	0	0	TRUE	20/06/2019	Jonathan Harrison	N/A
Triturus cristatus	SS79418097	P05	0	0	0	0	0	0	TRUE	20/06/2019	Jonathan Harrison	N/A
Triturus cristatus	SS79508103	P03c	0	0	0	0	0	0	TRUE	20/06/2019	Jonathan Harrison	N/A
Triturus cristatus	SS79528104	P03b	0	0	0	0	0	0	TRUE	20/06/2019	Jonathan Harrison	N/A
Triturus cristatus	SS79538102	P03a	0	0	0	0	0	0	TRUE	20/06/2019	Jonathan Harrison	N/A
Triturus cristatus	SS79618107	P02	0	0	0	0	0	0	TRUE	20/06/2019	Jonathan Harrison	N/A
Triturus cristatus	SS79658108	P01	0	0	0	0	0	0	TRUE	20/06/2019	Jonathan Harrison	N/A
Triturus cristatus	SS79188278	P14	0	0	0	0	0	0	TRUE	06/06/2019	Jonathan Harrison	N/A
Triturus cristatus	SS79498299	P13	0	0	0	0	0	0	TRUE	06/06/2019	Jonathan Harrison	N/A
Triturus cristatus	SS79908265	P12	0	0	0	0	0	0	TRUE	06/06/2019	Jonathan Harrison	N/A
Triturus cristatus	SS79488098	P11	0	0	0	0	0	7	FALSE	06/06/2019	Jonathan Harrison	N/A
Triturus cristatus	SS79528083	P10	0	0	0	0	0	0	TRUE	06/06/2019	Jonathan Harrison	N/A
Triturus cristatus	SS79408067	P09	0	0	0	0	0	0	TRUE	06/06/2019	Jonathan Harrison	N/A
Triturus cristatus	SS78998077	P08	0	0	0	0	0	0	TRUE	06/06/2019	Jonathan Harrison	N/A
Triturus cristatus	SS78968102	P15	0	0	0	0	0	0	TRUE	06/06/2019	Jonathan Harrison	N/A
Triturus cristatus	SS78908090	P07	0	0	0	0	0	0	TRUE	06/06/2019	Jonathan Harrison	N/A
Triturus cristatus	SS79418097	P05	0	0	0	0	0	0	TRUE	06/06/2019	Jonathan Harrison	N/A
Triturus cristatus	SS79538102	P03a	0	0	0	0	0	0	TRUE	06/06/2019	Jonathan Harrison	N/A
Triturus cristatus	SS79618107	P02	0	0	0	0	0	0	TRUE	06/06/2019	Jonathan Harrison	N/A
Triturus cristatus	SS79658108	P01	0	0	0	0	0	0	TRUE	06/06/2019	Jonathan Harrison	N/A
Triturus cristatus	SS79188278	P14	0	0	0	0	0	0	TRUE	23/05/2019	Jonathan Harrison	N/A
Triturus cristatus	SS79498299	P13	0	0	0	0	0	0	TRUE	23/05/2019	Jonathan Harrison	N/A
Triturus cristatus	SS79908265	P12	0	0	0	0	0	0	TRUE	23/05/2019	Jonathan Harrison	N/A
Triturus cristatus	SS79488098	P11	0	1	1	0	0	4	FALSE	23/05/2019	Jonathan Harrison	N/A
Triturus cristatus	SS79528083	P10	0	0	0	0	0	3	FALSE	23/05/2019	Jonathan Harrison	N/A
Triturus cristatus	SS79408067	P09	0	0	0	0	0	0	TRUE	23/05/2019	Jonathan Harrison	N/A
Triturus cristatus	SS78998077	P08	0	0	0	0	0	2	FALSE	23/05/2019	Jonathan Harrison	N/A
Triturus cristatus	SS78968102	P15	0	0	0	0	0	0	TRUE	23/05/2019	Jonathan Harrison	N/A
Triturus cristatus	SS78908090	P07	0	0	0	0	0	0	TRUE	23/05/2019	Jonathan Harrison	N/A
Triturus cristatus	SS79418097	P05	0	0	0	0	0	0	TRUE	23/05/2019	Jonathan Harrison	N/A
Triturus cristatus	SS79498100	P03d	0	0	0	0	0	0	TRUE	23/05/2019	Jonathan Harrison	N/A
Triturus cristatus	SS79508103	P03c	0	0	0	0	0	0	TRUE	23/05/2019	Jonathan Harrison	N/A
Triturus cristatus	SS79528104	P03b	0	0	0	0	0	0	TRUE	23/05/2019	Jonathan Harrison	N/A
Triturus cristatus	SS79538102	P03a	0	0	0	0	0	0	TRUE	23/05/2019	Jonathan Harrison	N/A

Scientific Name	Grid Reference	Site Name	Adult NA	Adult F	Adult M	Egg	Juv	Larvae	Negative Record	Date	Recorder Names	Comments
Triturus cristatus	SS79618107	P02	0	0	0	0	0	0	TRUE	23/05/2019	Jonathan Harrison	N/A
Triturus cristatus	SS79658108	P01	0	0	0	0	0	0	TRUE	23/05/2019	Jonathan Harrison	N/A
Triturus cristatus	SS79538102	P03a	0	0	0	0	0	0	TRUE	09/05/2019	Tim Bailey	N/A
Triturus cristatus	SS79188278	P14	0	0	0	0	0	0	TRUE	09/05/2019	Jonathan Harrison	N/A
Triturus cristatus	SS79498299	P13	0	0	0	0	0	0	TRUE	09/05/2019	Jonathan Harrison	N/A
Triturus cristatus	SS79908265	P12	0	0	0	0	0	0	TRUE	09/05/2019	Jonathan Harrison	N/A
Triturus cristatus	SS79188278	P14	0	0	0	0	0	0	TRUE	02/05/2019	Jonathan Harrison	N/A
Triturus cristatus	SS79498299	P13	0	0	0	0	0	0	TRUE	02/05/2019	Jonathan Harrison	N/A
Triturus cristatus	SS79908265	P12	0	0	0	0	0	0	TRUE	02/05/2019	Jonathan Harrison	N/A
Triturus cristatus	SS79488098	P11	0	2	1	1	0	0	FALSE	02/05/2019	Jonathan Harrison	N/A
Bufo bufo	SS79528083	P10	0	0	0	0	0	20	FALSE	02/05/2019	Jonathan Harrison	N/A
Triturus cristatus	SS79528083	P10	0	4	2	0	0	0	FALSE	02/05/2019	Jonathan Harrison	N/A
Anura	SS79408067	P09	0	0	0	0	0	Lots	FALSE	02/05/2019	Jonathan Harrison	N/A
Triturus cristatus	SS78998077	P08	0	1	0	1	0	0	FALSE	02/05/2019	Jonathan Harrison	N/A
Triturus cristatus	SS78968102	P15	0	0	0	0	0	0	TRUE	02/05/2019	Jonathan Harrison	N/A
Bufo bufo	SS78908090	P07	0	0	0	0		10	FALSE	02/05/2019	Jonathan Harrison	N/A
Rana temporaria	SS78908090	P07	0	0	0	0	0	50	FALSE	02/05/2019	Jonathan Harrison	N/A
Triturus cristatus	SS78908090	P07	0	0	0	0	0	0	TRUE	02/05/2019	Jonathan Harrison	N/A
Triturus cristatus	SS79418097	P05	0	0	0	0	0	0	TRUE	02/05/2019	Jonathan Harrison	N/A
Triturus cristatus	SS79498100	P03d	0	0	0	0	0	0	TRUE	02/05/2019	Jonathan Harrison	N/A
Triturus cristatus	SS79508103	P03c	0	0	0	0	0	0	TRUE	02/05/2019	Jonathan Harrison	N/A
Triturus cristatus	SS79528104	P03b	0	0	0	0	0	0	TRUE	02/05/2019	Jonathan Harrison	N/A
Triturus cristatus	SS79538102	P03a	0	1	1	0	0	0	FALSE	02/05/2019	Jonathan Harrison	N/A
Triturus cristatus	SS79618107	P02	0	0	0	0	0	0	TRUE	02/05/2019	Jonathan Harrison	N/A
Triturus cristatus	SS79658108	P01	0	0	0	0	0	0	TRUE	02/05/2019	Jonathan Harrison	N/A
Triturus cristatus	SS79188278	P14	0	0	0	1	0	0	FALSE	30/04/2019	Jonathan Harrison	N/A
Triturus cristatus	SS79498299	P13	0	0	0	0	0	0	TRUE	30/04/2019	Jonathan Harrison	N/A
Triturus cristatus	SS79908265	P12	0	0	0	0	0	0	TRUE	30/04/2019	Jonathan Harrison	N/A
Lissotriton	SH5745732176	P16	0	1	0	0	0	0	FALSE	24/06/2019	Tim Bailey	N/A
Triturus cristatus	SH5745732176	P16	0	0	0	0	0	0	TRUE	24/06/2019	Tim Bailey	N/A
Triturus cristatus	SH5776531450	P04	0	0	0	0	0	0	TRUE	24/06/2019	Tim Bailey	N/A
Triturus cristatus	SH4122665863	Pandy Pool P3	0	0	0	0	0	0	TRUE	24/06/2019	Tim Bailey	N/A
Triturus cristatus	SH5745732176	P16	0	0	0	0	0	0	TRUE	16/05/2019	Steven Heathcote	N/A
Lissotriton helveticus	SH5745732176	P16	0	1	2	0	0	0	FALSE	16/05/2019	Steven Heathcote	N/A

Scientific Name	Grid Reference	Site Name	Adult NA	Adult F	Adult M	Egg	Juv	Larvae	Negative Record	Date	Recorder Names	Comments
Rana temporaria	SH5753331787	P10	2	0	0	0	0	0	FALSE	16/05/2019	Steven Heathcote	N/A
Triturus cristatus	SH5753331787	P10	0	0	0	0	0	0	TRUE	16/05/2019	Steven Heathcote	N/A
Triturus cristatus	SH5721831782	P09	0	0	0	0	0	0	TRUE	16/05/2019	Steven Heathcote	N/A
Triturus cristatus	SH5753331787	P10	0	0	0	0	0	0	TRUE	23/04/2019	Steven Heathcote	N/A
Triturus cristatus	SH5721831782	P09	0	0	0	0	0	0	TRUE	23/04/2019	Steven Heathcote	N/A
Triturus cristatus	SH5727332176	P17	0	0	0	0	0	0	TRUE	23/04/2019	Steven Heathcote	N/A
Triturus cristatus	SH5745732176	P16	0	0	0	0	0	0	TRUE	23/04/2019	Steven Heathcote	N/A
Lissotriton helveticus	SH5745732176	P16	0	0	2	0	0	0	FALSE	23/04/2019	Steven Heathcote	N/A
Triturus cristatus	SS79488098	P11	0	0	0	0	0	0	TRUE	09/05/2019	Jonathan Harrison	N/A
Triturus cristatus	SS79418097	P05	0	0	0	0	0	0	TRUE	09/05/2019	Jonathan Harrison	N/A
Triturus cristatus	SS79618107	P02	0	0	0	0	0	0	TRUE	09/05/2019	Jonathan Harrison	N/A
Triturus cristatus	SS79658108	P01	0	0	0	0	0	0	TRUE	09/05/2019	Jonathan Harrison	N/A
Triturus cristatus	SS79528083	P10	0	0	0	0	0	0	TRUE	09/05/2019	Tim Bailey	N/A
Lissotriton	SS79528083	P10	0	1	0	0	0	0	FALSE	09/05/2019	Tim Bailey	N/A
Triturus cristatus	SS78998077	P08	0	0	0	0	0	0	TRUE	09/05/2019	Tim Bailey	N/A
Bufo bufo	SS79408067	P09	1	0	0	0	0	1	FALSE	09/05/2019	Tim Bailey	N/A
Lissotriton	SS79408067	P09	0	1	0	0	0	0	FALSE	09/05/2019	Tim Bailey	N/A
Triturus cristatus	SS79408067	P09	0	0	0	0	0	0	TRUE	09/05/2019	Tim Bailey	N/A
Bufo bufo	SS78908090	P07	0	0	0	0	0	1	FALSE	09/05/2019	Tim Bailey	N/A
Rana temporaria	SS78908090	P07	0	0	0	0	0	1	FALSE	09/05/2019	Tim Bailey	N/A
Lissotriton vulgaris	SS78908090	P07	0	4	3	0	0	0	FALSE	09/05/2019	Tim Bailey	N/A
Triturus cristatus	SS78908090	P07	0	0	0	0	0	0	TRUE	09/05/2019	Tim Bailey	N/A
Triturus cristatus	SS78968102	P15	0	0	0	0	0	0	TRUE	09/05/2019	Tim Bailey	N/A
Lissotriton helveticus	SH4041065132	Ffrydiau B (Newt Pool B) P8	1	0	0	0	0	0	FALSE	18/06/2019	Steven Heathcote; Jennifer Pullen	N/A
Triturus cristatus	SH4041065132	Ffrydiau B (Newt Pool B) P8	0	3	0	0	0	0	FALSE	18/06/2019	Jennifer Pullen; Steven Heathcote	N/A
Lissotriton helveticus	SH4041165131	Ffrydiau A (Newt Pool A) P7	0	2	0	0	0	0	FALSE	18/06/2019	Steven Heathcote; Jennifer Pullen	N/A

Scientific Name	Grid Reference	Site Name	Adult NA	Adult F	Adult M	Egg	Juv	Larvae	Negative Record	Date	Recorder Names	Comments
Triturus cristatus	SH4041165131	Ffrydiau A (Newt Pool A) P7	0	0	0	0	1	0	FALSE	18/06/2019	Steven Heathcote; Jennifer Pullen	N/A
Bufo bufo	SH3919564796	Canada Pool (N) P5	1	0	0	0	0	0	FALSE	18/06/2019	Steven Heathcote; Jennifer Pullen	N/A
Lissotriton helveticus	SH3919564796	Canada Pool (N) P5	75	0	0	0	0	0	FALSE	18/06/2019	Steven Heathcote; Jennifer Pullen	N/A
Triturus cristatus	SH3919564796	Canada Pool (N) P5	0	9	8	0	3	0	FALSE	18/06/2019	Steven Heathcote; Jennifer Pullen	N/A
Bufo bufo	SH3921564751	Canada Pool (S) P6	1	0	0	0	0	0	FALSE	18/06/2019	Steven Heathcote; Jennifer Pullen	N/A
Lissotriton helveticus	SH3921564751	Canada Pool (S) P6	43	13	7	0	0	0	FALSE	18/06/2019	Steven Heathcote; Jennifer Pullen	N/A
Triturus cristatus	SH3921564751	Canada Pool (S) P6	0	2	0	0	3	3	FALSE	18/06/2019	Steven Heathcote; Jennifer Pullen	N/A
Rana temporaria	SH4122665863	Pandy Pool P3	0	0	0	0	0	1	FALSE	18/06/2019	Steven Heathcote; Jennifer Pullen	N/A
Triturus cristatus	SH4122665863	Pandy Pool P3	0	0	0	0	0	0	TRUE	18/06/2019	Steven Heathcote; Jennifer Pullen	N/A
Bufo bufo	SH3975965076	Pwll Pant Mawr (Dune Slack Pool) P4	3	0	0	0	0	0	FALSE	18/06/2019	Steven Heathcote; Jennifer Pullen	N/A
Lissotriton helveticus	SH3975965076	Pwll Pant Mawr (Dune Slack Pool) P4	6	0	0	0	0	0	FALSE	18/06/2019	Steven Heathcote; Jennifer Pullen	N/A
Triturus cristatus	SH3975965076	Pwll Pant Mawr (Dune Slack Pool) P4	0	0	0	0	0	6	FALSE	18/06/2019	Steven Heathcote; Jennifer Pullen	N/A
Lissotriton helveticus	SH4098563519	Airman's Pond P11	89	0	0	0	0	0	FALSE	18/06/2019	Steven Heathcote; Jennifer Pullen	N/A
Triturus cristatus	SH4098563519	Airman's Pond P11	1	0	0	0	2	0	FALSE	18/06/2019	Jennifer Pullen; Steven Heathcote	N/A
Bufo bufo	SH4098563519	Airman's Pond P11	2	0	0	0	0	0	FALSE	15/05/2019	Steven Heathcote	N/A

Scientific Name	Grid Reference	Site Name	Adult NA	Adult F	Adult M	Egg	Juv	Larvae	Negative Record	Date	Recorder Names	Comments
Rana temporaria	SH4098563519	Airman's Pond P11	3	0	0	0	0	0	FALSE	15/05/2019	Steven Heathcote	N/A
Lissotriton helveticus	SH4098563519	Airman's Pond P11	0	50	50	0	0	0	FALSE	15/05/2019	Steven Heathcote	N/A
Triturus cristatus	SH4098563519	Airman's Pond P11	0	0	1	0	0	0	FALSE	15/05/2019	Steven Heathcote	N/A
Bufo bufo	SH3975965076	Pwll Pant Mawr (Dune Slack Pool) P4	3	0	0	0	0	0	FALSE	15/05/2019	Steven Heathcote	N/A
Rana temporaria	SH3975965076	Pwll Pant Mawr (Dune Slack Pool) P4	0	0	0	0	0	1000	FALSE	15/05/2019	Steven Heathcote	N/A
Lissotriton helveticus	SH3975965076	Pwll Pant Mawr (Dune Slack Pool) P4	0	37	15	0	0	0	FALSE	15/05/2019	Steven Heathcote	N/A
Triturus cristatus	SH3975965076	Pwll Pant Mawr (Dune Slack Pool) P4	0	12	27	0	0	0	FALSE	15/05/2019	Steven Heathcote	N/A
Bufo bufo	SH3921564751	Canada Pool (S) P6	1	0	0	0	0	0	FALSE	15/05/2019	Steven Heathcote	N/A
Lissotriton helveticus	SH3921564751	Canada Pool (S) P6	0	83	28	0	0	0	FALSE	15/05/2019	Steven Heathcote	N/A
Triturus cristatus	SH3921564751	Canada Pool (S) P6	0	1	1	0	0	0	FALSE	15/05/2019	Steven Heathcote	N/A
Lissotriton helveticus	SH3919564796	Canada Pool (N) P5	0	125	85	0	0	0	FALSE	15/05/2019	Steven Heathcote	N/A
Triturus cristatus	SH3919564796	Canada Pool (N) P5	0	11	11	0	0	0	FALSE	15/05/2019	Steven Heathcote	N/A
Triturus cristatus	SS79488098	P11	0	0	0	0	0	0	TRUE	25/04/2019	Steven Heathcote	N/A
Rana temporaria	SS79528083	P10	1	0	0	0	0	0	FALSE	25/04/2019	Steven Heathcote	N/A
Lissotriton	SS79528083	P10	0	5	0	0	0	0	FALSE	25/04/2019	Steven Heathcote	N/A
Lissotriton vulgaris	SS79528083	P10	0	0	1	0	0	0	FALSE	25/04/2019	Steven Heathcote	N/A
Triturus cristatus	SS79528083	P10	0	2	4	1	0	0	FALSE	25/04/2019	Steven Heathcote	N/A
Triturus cristatus	SS79408067	P09	0	0	0	0	0	0	TRUE	25/04/2019	Steven Heathcote	N/A
Triturus cristatus	SS78998077	P08	0	0	0	0	0	0	TRUE	25/04/2019	Steven Heathcote	N/A

Scientific Name	Grid Reference	Site Name	Adult NA	Adult F	Adult M	Egg	Juv	Larvae	Negative Record	Date	Recorder Names	Comments
Bufo bufo	SS78998077	P08	0	0	0	0	0	10	FALSE	25/04/2019	Steven Heathcote	N/A
Rana temporaria	SS78998077	P08	1	0	0	0	0	0	FALSE	25/04/2019	Steven Heathcote	N/A
Bufo bufo	SS78908090	P07	4	0	0	0	0	0	FALSE	25/04/2019	Steven Heathcote	N/A
Triturus cristatus	SS78908090	P07	0	0	3	0	0	0	FALSE	25/04/2019	Steven Heathcote	Only seen in small 'beach' area where disturbance has resulted in loss of marginal vegetation
Triturus cristatus	SS79418097	P05	0	0	0	0	0	0	TRUE	25/04/2019	Steven Heathcote	N/A
Triturus cristatus	SS79378101	P04	0	0	0	0	0	0	TRUE	25/04/2019	Steven Heathcote	N/A
Lissotriton	SS79378101	P04	0	1	0	0	0	0	FALSE	25/04/2019	Steven Heathcote	N/A
Triturus cristatus	SS79498100	P03d	0	0	0	0	0	0	TRUE	25/04/2019	Steven Heathcote	N/A
Rana temporaria	SS79508103	P03c	1	0	0	0	0	100	FALSE	25/04/2019	Steven Heathcote	N/A
Triturus cristatus	SS79508103	P03c	0	1	4	0	0	0	FALSE	25/04/2019	Steven Heathcote	N/A
Triturus cristatus	SS79528104	P03b	0	0	0	0	0	0	TRUE	25/04/2019	Steven Heathcote	N/A
Triturus cristatus	SS79538102	P03a	0	0	0	0	0	0	TRUE	25/04/2019	Steven Heathcote	N/A
Triturus cristatus	SS79618107	P02	0	0	0	0	0	0	TRUE	25/04/2019	Steven Heathcote	N/A
Triturus cristatus	SS79658108	P01	0	0	0	0	0	0	TRUE	25/04/2019	Steven Heathcote	N/A
Rana temporaria	SS79658108	P01	1	0	0	0	0	0	FALSE	25/04/2019	Steven Heathcote	N/A
Rana temporaria	SH4041165131	Ffrydiau A (Newt Pool A) P7	0	0	1	0	0	0	FALSE	15/05/2019	Jennifer Pullen	N/A
Lissotriton helveticus	SH4041165131	Ffrydiau A (Newt Pool A) P7	3	0	0	0	0	0	FALSE	15/05/2019	Jennifer Pullen	N/A
Anura	SH4122665863	Pandy Pool P3	0	0	0	100	0	0	FALSE	15/05/2019	Jennifer Pullen	N/A
Rana temporaria	SH4122665863	Pandy Pool P3	0	0	6	0	0	0	FALSE	15/05/2019	Jennifer Pullen	N/A
Lissotriton helveticus	SH4122665863	Pandy Pool P3	1	0	0	0	0	0	FALSE	15/05/2019	Jennifer Pullen	N/A
Triturus cristatus	SH4122665863	Pandy Pool P3	2	2	0	0	0	0	FALSE	15/05/2019	Jennifer Pullen	N/A
Triturus cristatus	SH3595167744	P04	0	2	0	0	0	0	FALSE	08/05/2019	Jennifer Pullen	N/A
Bufo bufo	SH3595167744	P04	1	0	0	0	0	0	FALSE	16/05/2019	Jennifer Pullen	N/A
Bufo bufo	SH3596667889	P08	1	0	0	0	0	0	FALSE	16/05/2019	Jennifer Pullen	N/A
Lissotriton helveticus	SH3596667889	P08	13	0	0	0	0	0	FALSE	16/05/2019	Jennifer Pullen	N/A

Scientific Name	Grid Reference	Site Name	Adult NA	Adult F	Adult M	Egg	Juv	Larvae	Negative Record	Date	Recorder Names	Comments
Triturus cristatus	SH3596667889	P08	0	0	1	1	0	0	FALSE	16/05/2019	Jennifer Pullen	N/A
Bufo bufo	SH3597367855	P01	2	0	0	0	0	0	FALSE	16/05/2019	Jennifer Pullen	N/A
Rana temporaria	SH3597367855	P01	3	0	0	0	0	0	FALSE	16/05/2019	Jennifer Pullen	N/A

Data Archive Appendix

Data outputs associated with this project are archived in Sands of LIFE (SoLIFE) DMS folders (D1 Physical Monitoring) on server–based storage at Natural Resources Wales.

The data archive contains:

[A] The final report in Microsoft Word and Adobe PDF formats.

[B] A full set of maps produced in JPEG format.

[C] A series of GIS layers on which the maps in the report are based with a series of word documents detailing the data processing and structure of the GIS layers.

[D] A full set of images produced in JPG format.

[E] A full set of species records also uploaded to Cofnod database.

Metadata for this project is publicly accessible through Natural Resources Wales' Library Catalogue https://libcat.naturalresources.wales (English Version) and https://catllyfr.cyfoethnaturiol.cymru (Welsh Version) by searching 'Dataset Titles'. The metadata is held as record no NRW_DS124900.

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Published by:
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