**THE MENDIP PONDS PROJECT**

# A PROPOSAL TO CONSERVE THE GREAT CRESTED NEWT (*Triturus cristatus*) IN THE MENDIP HILLS AONB.

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**The Reptile and Amphibian Group for Somerset, in partnership with The Mendip Hills AONB Unit and The Somerset Wildlife Trust.**

# Contents

# 1. Abstract


- The aim of this project is to restore a network of ponds in the Mendip Hills AONB to expand and connect a number of isolated subpopulations of crested newts. This will be the first major attempt to implement landscape-level conservation for this protected species. The project area extends over 23km$^2$, approximately 11% of the total AONB.

- Within this area 121 ponds have been identified of which 54 are wholly dysfunctional and beyond the scope of restoration. A further 12 are geographically isolated from any other ponds and unable to contribute to a crested newt metapopulation network.

- Of the remaining 55 ponds, nine are 'natural' ponds in which any intervention would be problematic. Therefore the project focuses on 46 man-made but functional ponds of which two-thirds are in very poor condition. Surveys found crested newts in 19 of the project ponds although in three of these only single individuals were seen.

- The project ponds constitute six discrete clusters. Each cluster has at least one pond supporting crested newts, but the clusters are all isolated from one another beyond the crested newt dispersal distance.

- The project strategy is to restore sufficient numbers of currently unsuitable ponds within each cluster to support viable crested newt populations, each with at least three breeding sites. In so doing some of the clusters will become connected, while a future aspiration may be to create new ponds to link all of the clusters.

- To achieve the project aims 43 of the 46 ponds will require some intervention ranging from simply excavating excess silt to repairing bases and completely rebuilding walls.

- The estimated cost of the project, and the total funding sought, amounts to £88,085.17, while RAGS is willing to contribute £9,225.00 as funding in kind for labour and expertise.

## 2. Introduction

In the past, ponds were an important feature of the Mendip landscape. Their primary purpose was to provide drinking opportunities for livestock, thus as the landscape was enclosed a pond became an important component of every enclosure. However, their functions went beyond this basic concern, as reflected in their various designs. The ponds on the Mendip Hills represent a variety of natural and man-made features of both geological and historical interest. The diversity of ponds include those formed during geological processes of the Pleistocene, together with others created to serve Mendip's industrial past, typical 'dew ponds' to maintain livestock and characteristic 'cart ponds' designed to maintain the timber wheels of horse-drawn carts. Ponds of all these types were a valuable commodity and were maintained accordingly.

Since the demise of traditional agricultural practices and with the expansion of mains water supply to drinking troughs, the number of ponds has decreased alarmingly. No longer considered valuable, many have been filled in to make additional space in fields, while others have been neglected and allowed to deteriorate as they filled with silt and trees took root within them.

However, ponds have a further function. They are vital for a large number of aquatic and semi-aquatic species of wildlife and as the number of ponds has declined so too have these species, with many now considered endangered.

*The Reptile and Amphibian Group for Somerset* (RAGS) has a particular interest in ponds as an essential habitat for amphibians. Five species of amphibians are found on the Mendips and all must, by necessity, breed in ponds.

These animals have metapopulation structures, in which the overall population exists as a series of smaller, discrete subpopulations. These are each separated from one another, yet are able to interact through occasional immigration of individuals from neighbouring subpopulations. In the case of amphibians, each subpopulation is centred around a breeding pool.

For this structure to work, two conditions must be met. Firstly, the breeding pools must be close enough to each other for dispersing individuals to reach their neighbours, and secondly, the terrain between pools must be hospitable enough to be crossed by dispersing animals. If these conditions are met the population can thrive as inbreeding is avoided, and should some calamity result in the extinction of a subpopulation, the pond can be recolonized from another subpopulation. If, however, a subpopulation becomes isolated from all others, for example by the loss of a pond within the network, then the isolated group is likely to be lost.

Of the five species of amphibians found on the Mendips, the one of greatest conservation concern is the great crested newt, *Triturus cristatus*. This species was listed in the Mendip

AONB Management Plan 2009-2014 as one of 15 species of conservation priority within the AONB. The Mendips fall within the nationally optimal habitat region for great crested newts (Oldham et al, 2000) and the species was historically widespread on the AONB.

Currently, however, the population of crested newts, and probably that of other amphibians, within the AONB is highly fragmented and vulnerable, as the loss of ponds has resulted in small isolated pockets of animals across the landscape. In order to secure the future of the species in the Mendips, the ***Mendip Ponds Project*** proposes to establish, or more correctly re-establish, a network of ponds suitable for crested newts, across part of the Mendip Hills AONB from the eastern edge of Cheddar Gorge to Priddy and Westbury-sub Mendip. This will be achieved by restoring existing ponds that have become unsuitable through neglect.

The project can be considered a pilot which, if successful, could potentially be extended across the whole region and indeed elsewhere in the future.

While the focus of the project is on the conservation of the great crested newt, the restoration of a network of ponds across a swathe of the AONB will also greatly benefit a wide range of other aquatic and semi-aquatic wildlife.

Some examples of ponds within the AONB are illustrated below.

**Plate 1**: This 35’ diameter concrete pond is home to all three native species of newts.  It has the largest population of great crested newts in the survey area and also supports a wide range of dragonflies, beetles, and other invertebrates.
The aim of the Mendip Ponds Project is for ponds like this to be typical, rather than exceptional, in the Mendip Hills AONB.

**Plate 2**: This is a stone-lined pond identical to the pond above, with exactly the same potential. However, its heavily silted condition renders it uninhabitable for amphibians and larger invertebrates alike. Two-thirds of the potentially viable ponds in the project area are currently in a similar ‘Poor/ V Poor’ condition.

**Plate 3**: Many of the ponds, such as the old cart pond above, have great potential, but are prevented from supporting crested newts by their poor condition.

**Plate 4**: Once restored (like the recently renovated pond shown here) the ponds are rapidly colonised by a range of wildlife including great crested newts.

## 3. The Great Crested Newt: Status and Legal Protection.

Of the three species of newts native to Britain, the great crested newt has the most stringent requirements in its choice of breeding pond and has been the species most seriously affected by the loss of ponds across the country in the recent past.

This is in part due to the behaviour of the larval stage. The larvae of both the smooth newt and the palmate newt are very secretive, spending their time hidden among the pond vegetation. By contrast, those of the crested newt are much less secretive, feeding and growing in open water. This makes them conspicuous and particularly vulnerable to predation by fish. Consequently, unlike the other two species, a crested newt population cannot usually persist in a water body shared with fish. They also require large expanses of open water, preventing them from living in very small pools, which can suit the other two species.

Crested newts, therefore cannot thrive in most large lakes and canals, many ditches or rhynes, and ponds on flood plains; which fish quickly colonise during times of flood. However, a habitat that does suit them is farm ponds of the type traditionally used to water livestock. These are usually large enough to provide sufficient open water, yet do not generally contain fish. They are also the type of ponds that have been lost at the greatest rate. The decline of the species has mirrored the decline of these ponds.

Crested newts are afforded the greatest level of protection available to an amphibian in Britain. Currently they are protected under Schedule 5 of the Wildlife and Countryside Act 1981 and Annex 2 of the European 'Habitats Directive'. Collectively these instruments protect the species from any intentional or reckless killing, injuring or disturbance; any collection or trade; and any damage or destruction of its habitat. Where notable populations occur, many have been included in SSSIs or other designated areas of conservation.

## 4. The National Context of the Project

Three recent developments are critically related to this proposal.

(1) Great crested newts have continued to decline substantially in Britain since legal protection was conferred in 1981. A complaint to the European Commission on the failure of the UK government to put in place an effective conservation strategy for the species (Langton, 2009) was subsequently upheld (European Wildlife Convention, 2012). This led to a directive in which 'The United Kingdom must immediately implement practical conservation activities to recover this species to 1982 levels and plan to take recovery from that point to recovery of historic losses'. Specific recommendations included large scale, national, survey of great crested newts, increased site protection and the restoration of 200 ponds per year in each county or district of great crested newt distribution. Of these recommendations, a start has been made on the first (see section (3) below), but little else has yet been initiated. This project fits well into the especially crucial third recommendation.

(2) The Natural Environment White Paper of 2011 entitled 'The Natural Choice', highlighted future strategies for nature conservation in Britain. It was accompanied by 'ThinkBIG: how and why landscape scale conservation benefits wildlife, people and the wider economy' published by Natural England. To quote from the latter paper: 'We can no longer focus our efforts only on preserving and maintaining individual wildlife sites, important as this is. We need to look beyond these sites at the wider environment in our towns, cities, and countryside. A landscape scale approach involves considering the whole landscape, managing it appropriately to make it more ecologically coherent and integrating a range of different land uses in a way that is sympathetic to the environment, in order to benefit both wildlife and people'. The Mendip Ponds Project is fully in line with this ideal and will provide a prime example of its implementation.

(3) An early response to the criticism from the EU described in section (1) above was the funding, by DEFRA, of a study of the use of environmental DNA (eDNA) as a tool for widespread survey of great crested newts. This method, involving testing pond water samples for the presence of crested newt DNA, has proved highly successful (Biggs et al., 2014). Subsequent to pond restoration and creation, the Mendip Project will be able to capitalise on this research to monitor with great accuracy the pattern and rate of great crested newt colonisation of new and restored ponds. Indeed, the project will provide a valuable further test of the eDNA method in a strictly conservation context.

The Mendip Ponds Project is thus well placed to accommodate all the important, national context issues described above and provide an example for more widespread application around the UK.

## 5. The Project

### 5.1: The Mendip Hills AONB

The Mendip Hills constitute a limestone ridge and plateau, running approximately east to west, on the borders of Somerset, North Somerset, and the Bath and North-East Somerset administrative areas in South-West England. An Area of Outstanding Natural Beauty (AONB), covering 198 $km^2$ of the Hills and adjacent areas, was designated in 1972 (Figure1), the management of which is coordinated by the Mendip Hills AONB Partnership supported by the AONB Unit. Since 1983, management plans for the AONB have been prepared and implemented by an AONB Partnership which includes Natural England and the Wildlife Trusts. One of the primary objectives has been 'To conserve and enhance natural beauty (including fauna and flora)'. The AONB Unit has limited funds but much experience in organising volunteer work on the hills and is an important source of general information and support. The new (2014-2019) management plan lists, under theme 3.2 (Biodiversity and Geodiversity objectives), two aspirations relevant to this proposal:
BG1: Ensure there is no net loss of characteristic habitats or species.
BG2: Promote a landscape scale approach to the conservation and expansion of coherent and resilient ecological networks within and adjoining the AONB.

### 5.2: The Project Area (See Figure 1)

We selected a region for the project, within the Mendip Hills AONB, in which extensive previous surveys identified several great crested newt breeding sites. The boundaries, as currently defined, are somewhat arbitrary and are, for the most part, related to features of the landscape, particularly roads.

The area that the project will cover stretches from the eastern side of Cheddar Gorge, south eastwards as far as Priddy and Pelting Drove, encompassing all the plateau land south of the Northing gridline number 54 and west of the road between King Down Farm and Priddy. In the west, the area includes the south west facing scarp as far down as the A371 and is bounded to the south east by Deerleap and Ebbor Lane. It does not include any of the built-up areas adjacent to the A371, or Cheddar in the northwest corner of the area. This creates a continuous area of approximately 23$km^2$, about 11% of the total AONB.

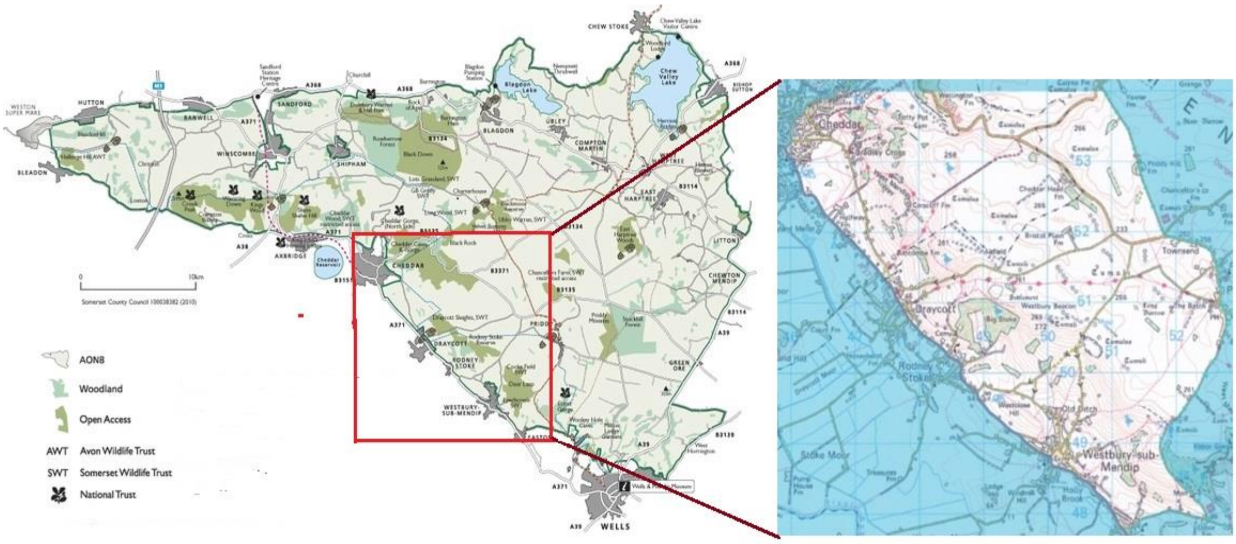


Figure 1: Map showing the area included in the Mendip Ponds Project, totalling approximately 23Km2. Mendip Hills AONB (left) and Project Area (right)

## 5.3: The Ponds

5.3 (a) Numbers, Types and Condition of the Ponds

Within the project area all features shown on both historic and current maps as ponds have been visited, many on multiple occasions, together with a number of other ponds not shown on maps and revealed simply by searching the landscape. In total the project area contains 121 ponds. (Figure 2).

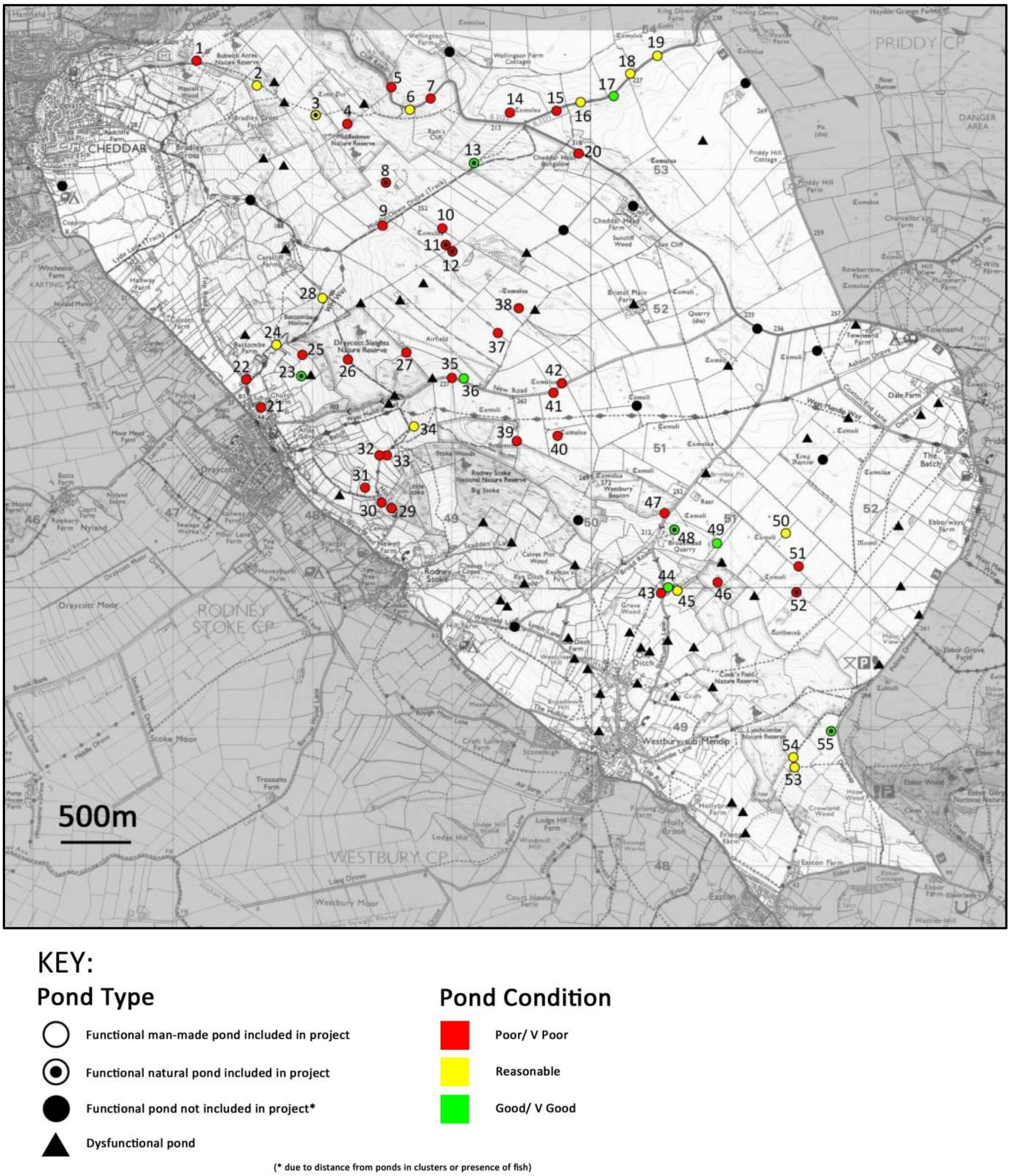



**Figure 2:** Map of project area showing condition of each pond.

Of these 121 ponds, 54 are dysfunctional. Ponds considered dysfunctional are those no longer capable of holding water. Many have been filled in and exist only as artefacts on old maps, while others are simply dry depressions or ponds with severely damaged bases. All are judged to have deteriorated beyond restoration and are therefore excluded from the project.

Additionally, a further 12 ponds have been excluded from the project because, although functional, they either lie so far from any neighbouring ponds that they are incapable of contributing to a metapopulation structure, or alternatively they are currently managed for fish.

All of the remaining 55 ponds have been surveyed and their condition assessed.

The standard method for evaluating the suitability of ponds for crested newts is the application of the Great Crested Newt Habitat Suitability Index (HSI), after Oldham et al (2000).

Application of the HSI involves scoring ten factors known to affect the suitability of a pond for crested newts. These are then converted to an overall HSI score in the range 0-1.

Ponds scoring <0.5 are considered poor, while those scoring > 0.8 are considered excellent. In south-east England it was found that the higher the score the greater the likelihood that the pond will contain great crested newts.

However, we have not found the HSI to provide a reliable indicator of pond quality for crested newts on the Mendip Hills. For example the pond illustrated in Plate 3 scored 0.79 in an HSI assessment, placing it at the top of the ‘good’ category, only just short of ‘excellent’. Like many others on the Mendips it scored highly on many individual HSI criteria, notably geographical position, low desiccation risk, reasonable invertebrate diversity, unshaded situation, absence of waterfowl and fish, 70% macrophyte cover and having several nearby ponds. However, also like most ponds on the Mendips, it scores low on size (surface area) but, most importantly, HSI takes no direct account of depth. Low desiccation risk presumably acts as a surrogate but this does not work with the relatively small, mostly stone-lined Mendip ponds. The pond in Plate 3, like many others, is very shallow because it has a combination of deep sediment and leaky peripheral walls. The HSI score fails to highlight this situation; shallow, mud-filled ponds are at risk from increasing wall deterioration and are greatly in need of restoration before they can be crested newt breeding sites.

Consequently, for the purposes of this proposal we have developed our own ‘traffic light’ system of colours to indicate the quality of project ponds taking account of depth and leakage factors.

Colour coding of ponds is defined below:

**Red**: Ponds in poor or very poor condition, although they are capable of holding water and could potentially be restored. Most are completely filled with silt and/or clogged with vegetation. The majority support little or no aquatic life, although a few still have occasional crested newts. The structure and/or the habitat condition of these ponds currently prevent, or imminently threaten the persistence of crested newt populations. Thirty four of the fifty five project ponds are classified as red, representing 62% of the total.

**Yellow**: Ponds in reasonable condition. These ponds support a limited range of plant and animal life, in some cases including crested newts. Currently, conditions are well below optimal and while neither the structure of the pond nor the quality of the habitat *immediately* threatens the persistence of crested newts, timely intervention is essential to halt and reverse clear evidence of deterioration. Thirteen of the fifty five project ponds are classified as yellow, representing 24% of the total.

**Green**: These are well maintained ponds in good or excellent condition. They support a wide range of plant and animal life, and incorporate a range of water depths including areas of clear open water. These ponds currently provide good habitat for crested newts, although some may benefit from structural repairs. Only eight of the fifty five project ponds are classified as green, representing just 14% of the total.

The current state of project area ponds is summarised in figure three.

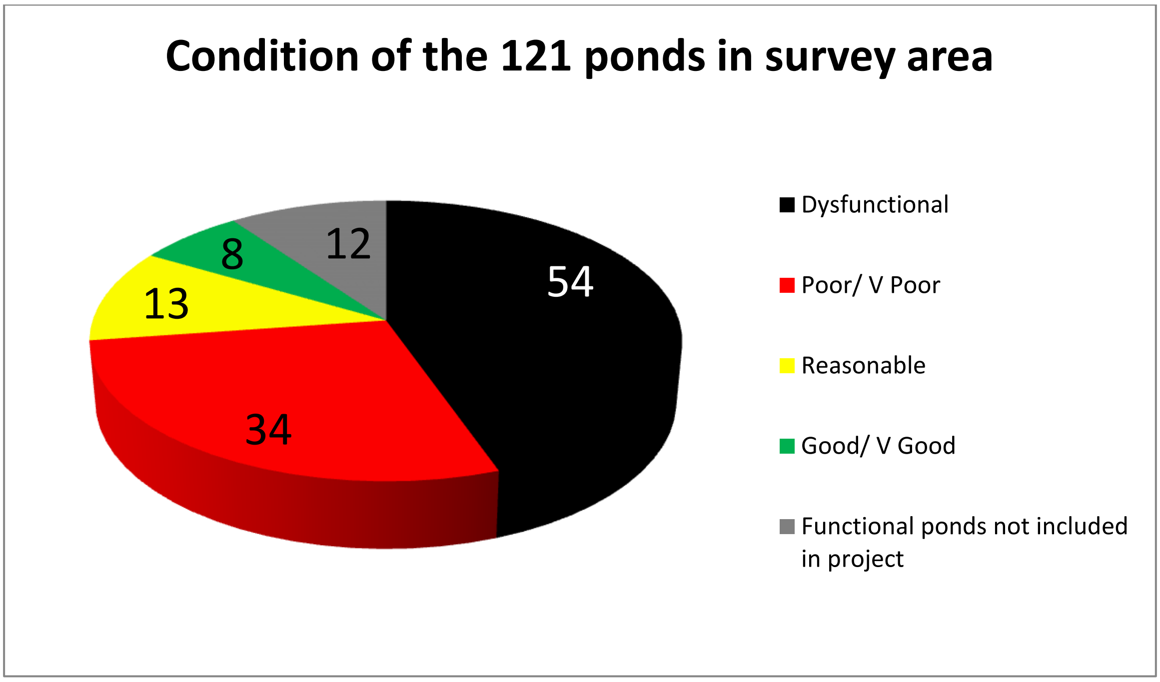



**Figure 3:** Chart showing condition in 2013/14 of the 121 ponds described above.

Among the fifty five ponds surveyed, nine are ‘natural’ or unlined, irregularly-shaped excavations. Although these ponds contribute to the overall metapopulation structure, little is known of their hydrology and attempting any restorative work may result in damage. Therefore these ‘natural’ ponds will be left alone, leaving a total of 46 ponds that the project seeks to restore.

The ponds contributing to the project consist of several different types. Historically, standing water has been a rare commodity in this limestone karst region where rivers and streams are quickly diverted underground. Therefore, the majority of the ponds are artificial and of stone or concrete constructions.

The constructed ponds are of three types:

1. Cart Ponds are long narrow excavations slightly wider than a horse and cart. They are walled on both sides and usually have a base of stone slabs or cobbles, whilst the ground at either end slopes into the pool. Built during the eighteenth and nineteenth centuries, these ponds were designed primarily for livestock to drink, but secondarily to allow a cart to be pulled straight through the water, entering at one end and exiting at the other. The wooden wheels of the carts were surrounded by an iron ring that was in contact with the ground. During dry weather the carts were pulled through these ponds to prevent the wooden wheels shrinking away from their iron surrounds. Sixteen of the ponds in the project area are ‘double-ended cart ponds’.

2. A further 14 of the ponds are ‘single-end-access ponds’. These are believed to be of similar age to the cart ponds, but their function was simply to allow access for livestock to drink. They are square-shaped excavations walled in stone on three sides, with a base of stone slabs or cobbles, although several have been overlaid with concrete during more recent restoration attempts. On the fourth side the ground slopes down into the pond, allowing livestock access. These are found predominantly, but not exclusively, in field corners and those not in a field corner may reflect historic boundary changes.

3. There are 16 circular or semi-circular ponds in the project area. These are typical dew ponds and were constructed to allow access for livestock to drink. Most consist of puddled clay bases overlaid with cobbles, although in some of the later ones the bases are constructed from concrete.

Among these 46 ponds, 30 are considered to be in ‘poor’ condition and are classified as red, 12 are yellow, and just 4 are green. (See Figure 4).

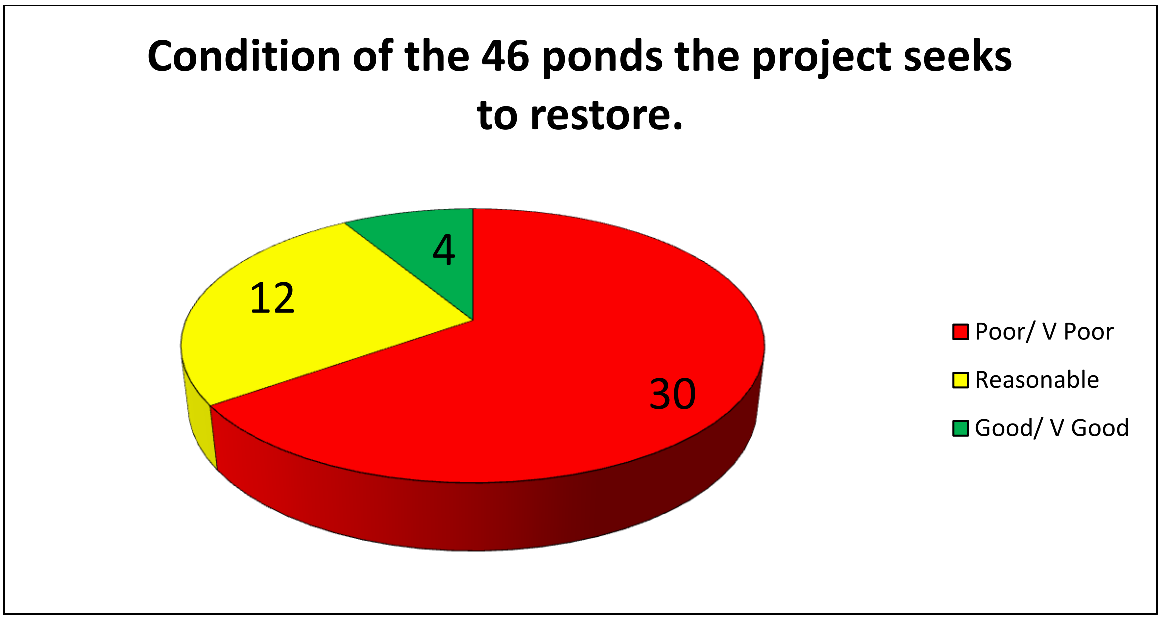



**Figure 4:** Chart showing condition in 2013/14 of the 46 ponds described above.

5.3 (b) Distribution of ponds in the landscape and their use by great crested newts.

*Dispersal.* The 'normal' dispersal distance of great crested newts is 500m. Dispersal across distances greater than 500m occurs, but rarely. Thus, in the Herpetofauna Workers Manual (2003), Bullock and Oldham state that 'Newly created ponds may be colonised (by great crested newts) rapidly, provided that established breeding sites occur within 350m of them'. Likewise, the Great Crested Newt Conservation Handbook (2001) states 'Newts have been known to colonise newly dug ponds 300m away from existing ponds in the first year. The colonisation by newts of new ponds over 1000m distant from occupied ponds may take several years'. Baker and Halliday (1999) found that great crested newts did not colonise ponds at distances greater than 400m from existing breeding ponds, while Jehle *et al* (2011) state that the maximum dispersal distance recorded for an individual crested newt was almost 1300m. However, they conclude that such long distance migrations (> 1000m) are rare and most studies indicate that much shorter distances are typical.

The assumption that 500m can be regarded as the 'normal' maximum dispersal distance is important. It determines the distance beyond which ponds within the project are considered isolated and it dictates the maximum distance ponds should be located from one another when seeking to provide connectivity between sub-populations within the proposed metapopulation network. Where ponds or clusters of ponds exceed this distance from one another by only a short margin, it is still possible that interaction between them may occur, but it is likely to be over prolonged periods of time. Fortunately, all the ponds lie within a matrix of extensive unimproved and semi-improved pasture interspersed with tracts of scrub and woodland, while field boundaries consist predominantly of dry stone walls. This mosaic of terrestrial habitats provides good foraging opportunities for newts during the summer and plentiful hibernation sites during winter, making it permeable to movement between ponds and making the Mendips particularly attractive for landscape scale conservation of amphibians.

*Current status of great crested newts.* All the ponds included in the project have been subject to preliminary survey for the presence or absence of great crested newts. Surveying involved visual searching, netting of ponds and the spotlighting of ponds after dark. On average each pond was visited 3.8 times, employing these methods, during the spring 2014 breeding season. To date no trapping of newts has been undertaken. Nevertheless, based on previous studies this level of survey is expected to result in 80% certainty that, if not detected, the species is truly absent (Sewell et al 2010).

Crested newts have been found in 19 of the ponds. However, in three of these, only single specimens have so far been recorded. Several ponds that might be expected to support crested newts have not yet been found to do so. This may in some cases be because they lie beyond the crested newts normal dispersal distance of 500m from another occupied pond, leaving them currently isolated and making them impossible for the species to colonise.

*Distribution of ponds in the project area: pond clusters.* The 19 ponds within the project area that contained great crested newts had a mean distance between them of 530m. Only seven (< 40%) are less than 500m from their nearest occupied pond, while the furthest is isolated by almost 1.5km.

The average distance between ponds occupied by crested newts and the nearest other pond of reasonable or good quality, whether occupied or not, is > 400m. The HSI considers habitat within 250m of the breeding pond to be of greatest importance, substantially less than typical inter-pond distances within the project area now. Existing inter-pond distances are therefore too high for the long-term maintenance of great crested newt metapopulations on the Mendips.

This isolation of ponds or clusters of ponds provides a useful way of perceiving the geographical pattern of ponds across the Mendip landscape.

Within the project area we have defined six separate clusters of ponds in which at least one pond within the cluster supports crested newts. Each of these clusters effectively represents a discrete population of crested newts isolated within its own cluster. However, both the number of ponds within each cluster and the number of ponds capable of supporting crested newts within each cluster varies. The clusters, numbered 1 to 6, are described below.

The priority of the project is to increase the number of suitable ponds within each cluster, thus greatly enhancing the long-term viability of the great crested newt metapopulations. In some cases this has the additional benefit of creating connectivity between the clusters, further strengthening metapopulation viability.

**Cluster 1** (Figure 4)

The most northerly cluster, centred around Bradley Cross and the Middledown Nature Reserve. The cluster is comprised of twelve ponds; five of which are occupied by great crested newts.  However, three of these (5, 10 and 12) are classified as being in ‘poor’ condition, while the other two (3 and 6) are within the ‘reasonable’ category. None are in ‘good’ condition.

Of the seven remaining ponds, six (1, 4, 7, 8, 9, and 11), are categorised as in ‘poor’ condition, while the final pond completing the cluster (2), is classified as ‘reasonable’.

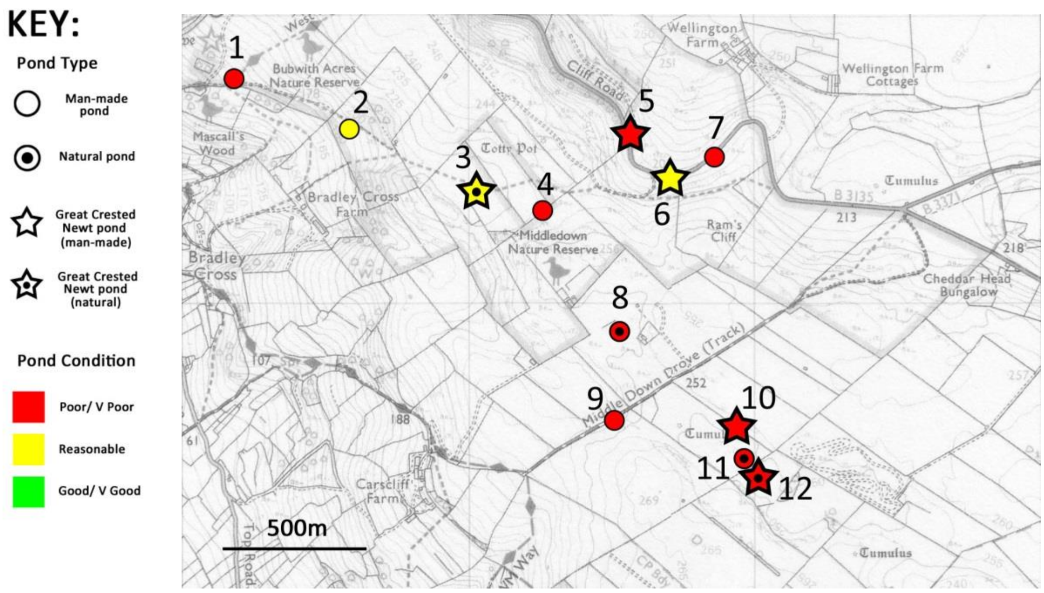


**Figure 4:** Cluster 1.

**Cluster 2** (Figure 5)

Cluster 2 is situated to the east of Cluster 1 and is comprised of eight ponds, primarily situated in a string following the course of the B3371.

Five ponds in this cluster, (13, 16, 17, 18 and 19) support crested newts. Of these, ponds 13 and 17 lie within the ‘good’ condition category, while 16, 18 and 19 are in ‘reasonable’ condition. A further three ponds (14, 15, and 20) all of which are categorised as in ‘poor’ condition, complete the cluster.

One of the occupied ponds (13) is an outlier in this cluster, lying beyond the 500m dispersal distance from any of the other occupied ponds. Its only potential connection with the rest of the cluster is via ponds numbers 14 and 15, both of which are classified as ‘poor’ and unsuitable for crested newts. Therefore, it is likely that interaction between this pond and the other occupied ponds in the cluster is very limited. Restoration of ponds numbers 14 and 15 should considerably strengthen this population.

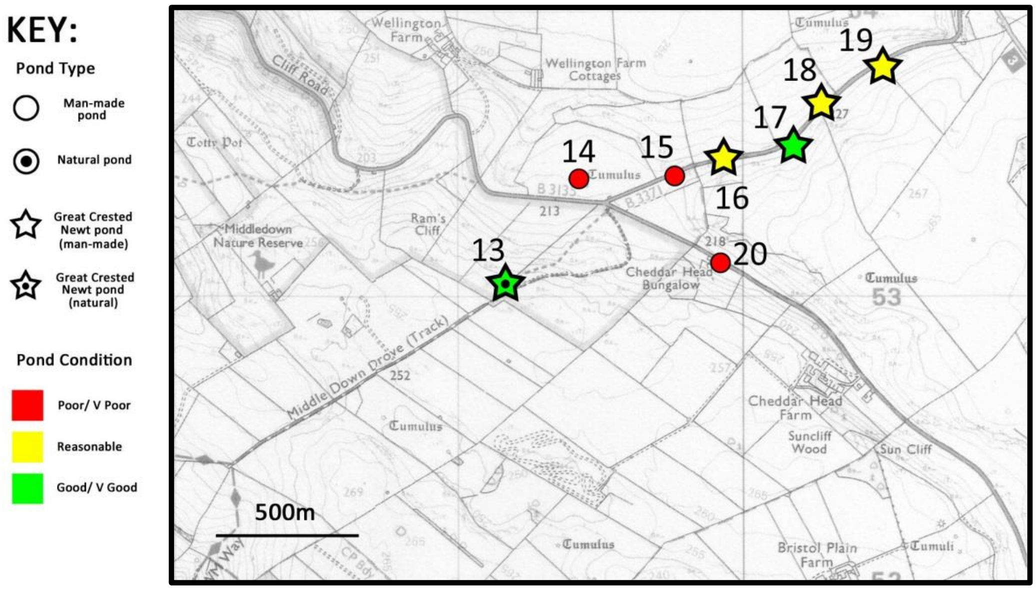



**Figure 5:** Cluster 2

**Cluster 3** (Figure 6)

This cluster is the largest within the project area, comprising eighteen ponds, of which only four contain crested newts.

It is centred around Draycott Sleights nature reserve, but comprises two assemblages of ponds, one to the west of the reserve around Batcombe, the other to the east of the reserve, strung out in a north/south direction between Hill Lane and the north of the airfield. There are only two ponds capable of bridging the gap between the two assemblages to complete the cluster and allow free movement of newts throughout.

Within the western assemblage there is a single ‘good’ pond (23). There are also two ‘reasonable’ ponds, 24 and 28, one of which (24) is the only pond within the assemblage occupied by crested newts.

A further four ponds (21, 22, 25 and 26), all classified as ‘poor’, complete the western assemblage. The position of pond 21 is atypical of the ponds included in the project, as it is now enclosed as an ornamental pond, within the confines of St. Peter’s churchyard.

Within the eastern assemblage three ponds (31, 35 and 36) have crested newts, although pond 35 has yielded only a single specimen, and numbers within the other occupied ponds in this assemblage have been low. Among the occupied ponds, only 36 is classified as ‘good’, while 31 and 35 are classified as ‘poor’. Along with these ponds, there are a further twelve making up this assemblage. One, (34) is classified as ‘reasonable’, while seven are ‘poor’ (27, 29, 30, 32, 33, 37 and 38).

There are connectivity problems within and between these assemblages making several of these ponds pivotal. Two, (26 and 27) are the only ponds that, once restored, can potentially connect the two assemblages to allow newts to move between them, while 34 is the only pond that, once restored, can provide access for newts between the southern ponds around Hill Lane and the northern ponds up on Draycott Sleights in the eastern assemblage.

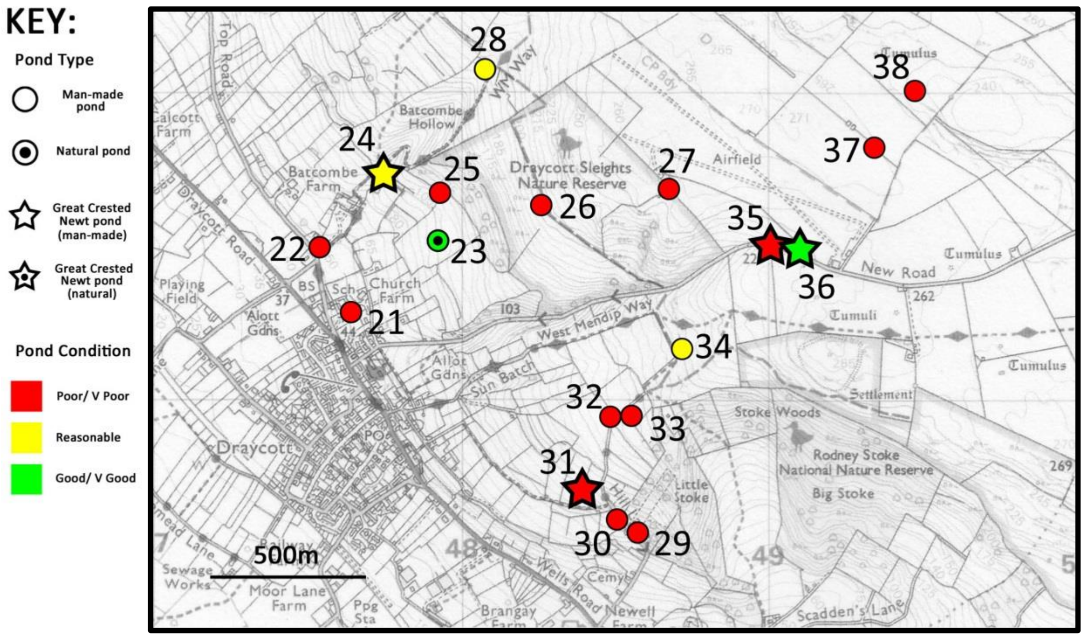



**Figure 6:** Cluster 3.

**Cluster 4** (Figure 7)

This small cluster, consisting of just four ponds is situated immediately north of Big Stoke Wood reaching north as far as New Road. All of the ponds are in 'poor' condition although during surveying for this project the northernmost pond in the cluster (42) yielded a single record of a great crested newt.

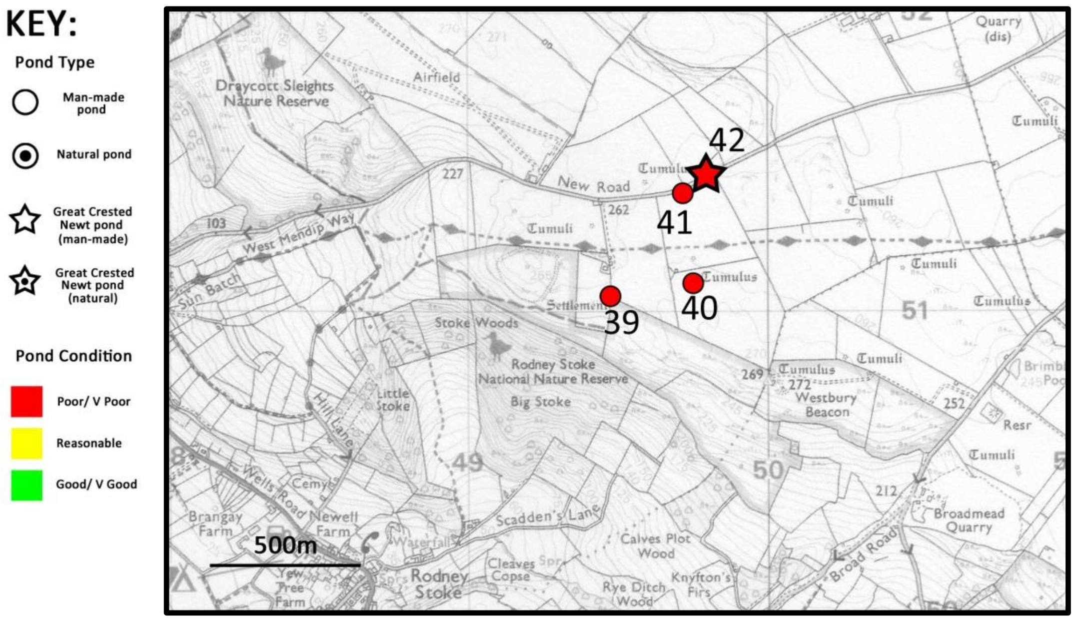


**Figure 7:** Cluster 4.

**Cluster 5** (Figure 8)

This cluster is centred on the area around Westbury Quarry and the northern reaches of Cooks Fields nature reserve, reaching south along Stancombe Lane.

The cluster consists of ten ponds, of which three are occupied by crested newts. Of the three occupied ponds, two are classified as' good' ponds. One of these, (49) lies above Westbury Quarry and contains the greatest concentration of crested newts found in the project area. The other, (48) was recently created within the quarry and has been rapidly colonised. The third occupied pond (50) is 'reasonable'. All of these ponds are at the north of the cluster. A further 'good' pond (44), for which there is no evidence of crested newt occupancy, is a little way to the south, on Stancombe Lane.

There are five ponds in the cluster categorised as 'poor', one (47) to the north of the quarry and the other four (43, 46, 51 and 52) strung out in an east/west direction to the south of the quarry.

Finally there is a further 'reasonable' pond (45) also to the south of the quarry east of Stancombe Lane.

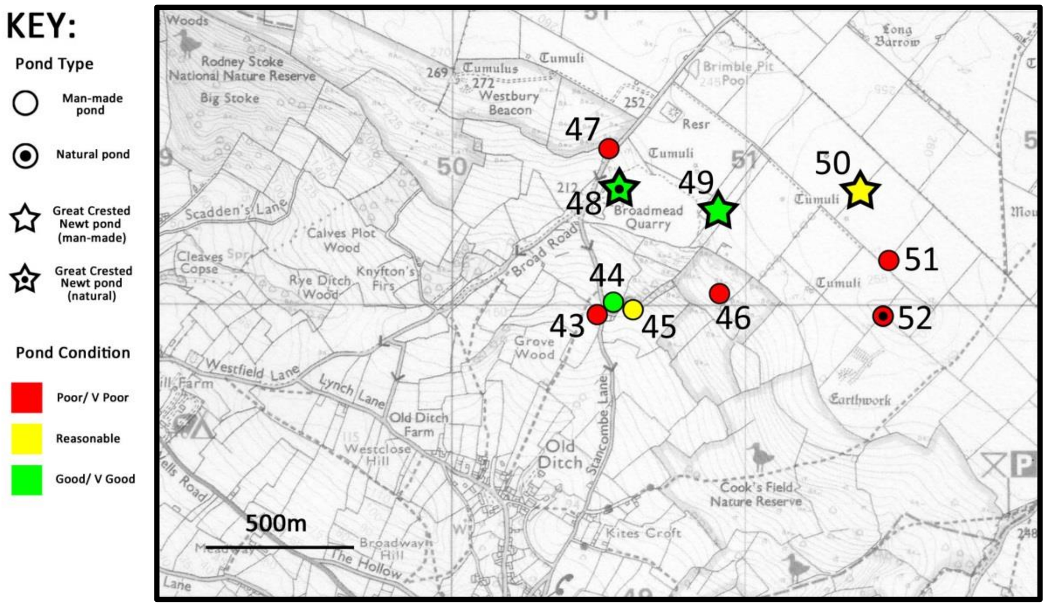



**Figure 8:** Cluster 5.

**Cluster 6** (Figure 9)

This is a small cluster of just three ponds situated to the far south east of the project area. Two of these have been subjected to considerable restoration work recently.

The northernmost pond (55), lying close to the boundary of the project area, is classified as a 'good' pond and is currently occupied by crested newts. The remaining two ponds in the cluster (53 and 54) are both classified as 'reasonable'. These two ponds are both within dispersal distance from the occupied pond but neither is yet occupied.

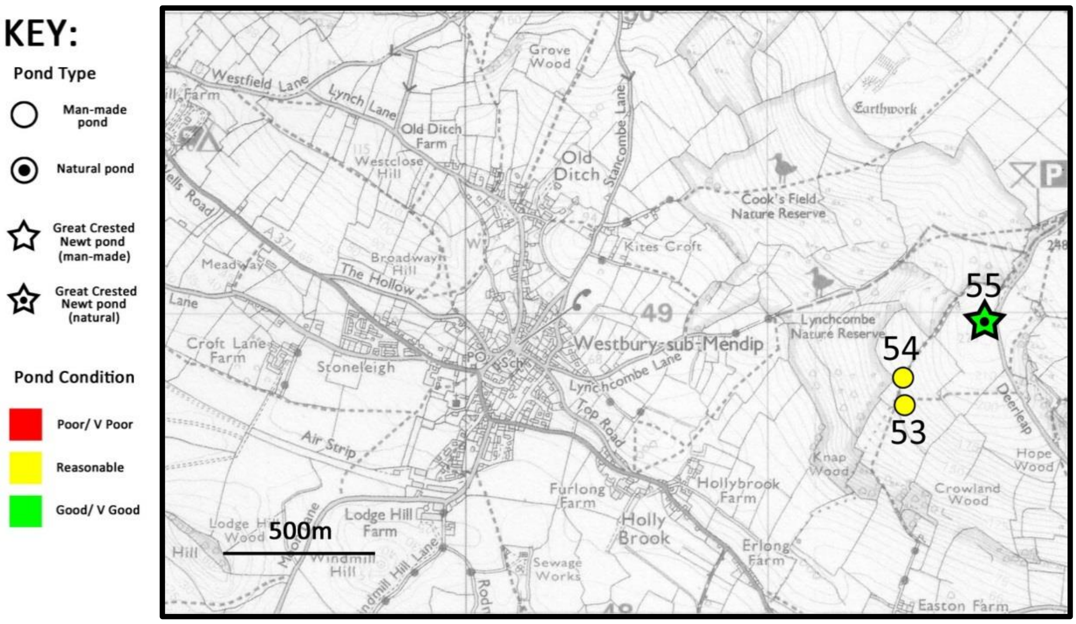



**Figure 9:** Cluster 6.

## 6. Restoration Strategy

The project aims to secure the small populations of crested newts within each of the six clusters, by improving the quality of both occupied and unoccupied ponds. This will open up additional ponds for crested newt colonisation, greatly improve metapopulation structures, and increase the prospects of long-term viability.

Once the populations within each cluster are secure, a second phase of the project may be considered to create new ponds to improve connectivity between clusters. However should this occur it will involve a separate funding round. The current project does, in itself, greatly enhance connectivity between several clusters.

A number of ponds will be left unmanaged to ensure that other aquatic flora and fauna in the area are not seriously impacted by the pond restoration work and will be available to recolonise the restored ponds. The overall plan is summarised in Figure 10, showing actual crested newt ponds (Figure 10a), and the situation as it would be after the restoration programme (Figure 10b). Circles show 250m radii around each pond; where they overlap, the requirement for less than 500m between ponds is met.

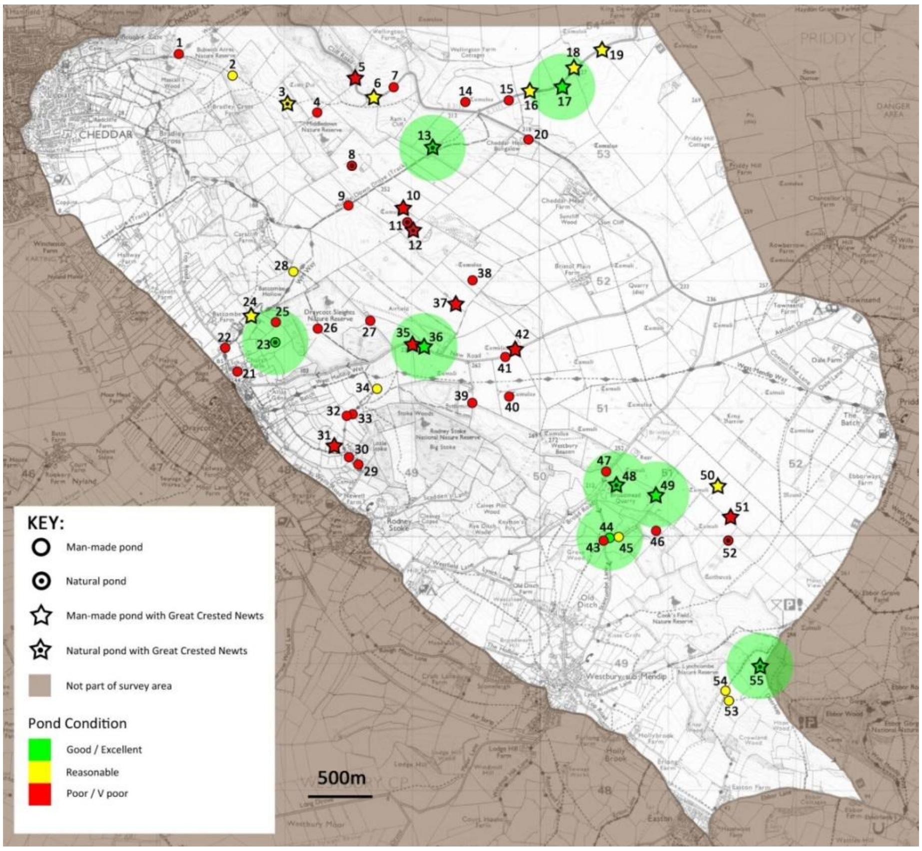
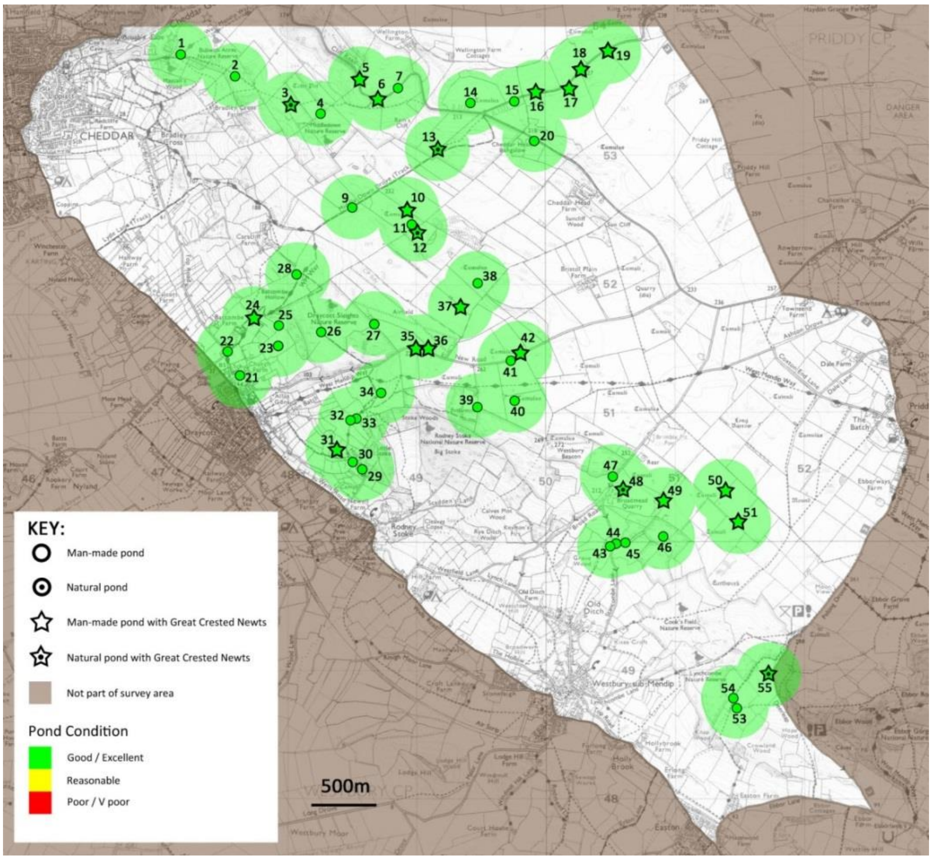



Figure 10a (above): The current situation. Figure 10b (below): The situation after restoration.



## 7. Implementation

<u>Ponds requiring intervention.</u>

Only man-made ponds that are capable of holding water have been prioritised for restoration.

The ponds are scattered widely across the project area and occur in a total of twenty-eight different land holdings. All twenty-eight landowners have been approached, of which only two declined to have their ponds included in the project. It is anticipated that as the project progresses and the benefits to landowners become clear, agreement may subsequently be reached with these remaining two. However, in the meantime their ponds (38, 40 and 50) have been excluded from the project.

With the exclusion of these three, forty-three ponds remain within the project. Of these, twelve (20, 21, 22, 24, 25, 29, 30, 31, 35, 44, 45 and 49) simply require the excavation of excess silt, while two (53 and 54) are in good overall condition and only require the installation of fencing to exclude livestock. The remaining twenty nine ponds are in need of major structural restoration.

Thus twenty 'poor' ponds need structural restoration: six in Cluster 1 (1, 4, 5, 7, 9 and 10), two in Cluster 2 (14 and 15), five in Cluster 3 (26, 27, 32, 33 and 37), three in Cluster 4 (39, 41 and 42) and four in Cluster 5 (43, 46, 47, and 51).

Additionally, there are seven 'reasonable' ponds that would benefit from structural restoration: two in Cluster 1 (2 and 6), three in Cluster 2 (16, 18 and 19), and two in Cluster 3 (28 and 34).

Finally, two 'good' ponds require structural restoration: number 17 in Cluster 2, and number 36 in Cluster 3.

Of the twenty nine ponds requiring structural restoration, nineteen are of the stone constructed type, either single or double access ponds, while ten are circular or semi-circular dew ponds.

The principle costs of the project will be for the re-setting and re-pointing of areas of cobbles that have come loose in the base of ponds and, in the case of the stone built ponds, the re-construction and re-pointing of areas of stone walls that have collapsed.

Restoration methods

The twin aims of the restoration of each pond are:

- To provide appropriate depth and area of open water to suit crested newts.
- To provide sufficient light to encourage the necessary growth of macrophytes both as a spawning substrate and to maintain water quality.

Restoration of ponds will adhere to the guidelines and methods set out in the Amphibian Habitat Management Handbook (2011). Pre-restoration surveys will seek to identify any important species using the ponds and, where these are present, restoration techniques will be modified accordingly.

Restoration of those ponds that are structurally sound will simply involve the removal of accumulated silt and the clearance of overhanging scrub. However, where ponds have suffered structural damage they will require more complex treatment.

*Silt removal.* Silt and other detritus will be removed from all the ponds using an excavator. Nigel Taylor of Westbury quarry has offered the project the use of his excavator and his operating expertise at a discounted rate. The use of an excavator carries the risk of inflicting damage on the pond base and walls and great care will be exercised to avoid any further deterioration.

Teams of volunteers will be on hand to assist during this operation to respond to unforeseen eventualities and also to clear trees and scrub from the site. Twelve of the ponds can be restored simply by teams of volunteers and an excavator. However, all the remaining ponds that need structural repairs will also need to be cleared of silt by volunteers with an excavator before contractors can move in to begin the renovation work.

In addition to RAGS, several organisations working in the Mendips including the Somerset Wildlife Trust and the Mendip Hills AONB Unit have access to small volunteer groups who can be deployed in pond restoration, allowing labour to be partitioned according to the areas in which groups are active.

*Pond repair.* Once all silt has been removed and the ponds have been pressure-washed, existing damage to the bases will be assessed in greater detail. Previous experience has shown that extensive areas of cobbles may become detached from the base, but as all the ponds selected for inclusion in the project currently hold water it is anticipated that the underlying puddled clay linings will be intact. Repair will thus entail the resetting and repointing of loose cobbles using a hydraulic lime mortar.

In the case of the circular and semi-circular ponds this is all that will be required. However, in the case of the stone built ponds, once the bases have been repaired sections of the walls that have collapsed, or that are in danger of collapse will be dismantled before being rebuilt and repointed using a hydraulic lime mortar.

This specialised work will be carried out by contractors familiar with the techniques applicable. While contractors have yet to be engaged, Philip Smith of Sticks and Stones Conservation together with Tina Bath, formerly of the Mendip AONB Unit, both have extensive experience of restoring Mendip ponds and have advised the project on the extent of works necessary for each pond.

One of the nineteen stone built ponds differs from all others. Pond 4, a double-access cart pond, shows evidence of a previous failed repair, and all stone surfaces have been clad in a thick layer of cast concrete. In this case we have sought advice from the Peak District National Park and Derbyshire ARG. These organisations have previous experience of restoring concrete ponds in Derbyshire and found that the most successful method of restoration was the use of resin, a method routinely used to re-line and repair swimming pools. The resin is applied to the entire inner surface of the pond to create a robust, flexible seal. David Roberts of DRFS fibreglass specialists confirmed that the method would be appropriate for this pond.

<u>Community engagement</u>

We will involve local people in the pond restoration project by several means:

(1) Volunteers will be needed to carry out some of the restoration work. In addition to those already committed from RAGS we will encourage participation by the *Mendip Hills Volunteer Task Group* and the *Somerset Wildlife Trust Volunteers*. All of these people will learn about wildlife associated with the ponds as well as how to restore them.

(2) We will restore at least one pond specifically for education purposes, so that guided visits by schoolchildren will be available in which they can discover animals and plants by supervised pond-dipping.

(3) We will circulate an information leaflet to schools in and around the project area (in Priddy, Westbury-sub-Mendip, Draycott and Cheddar) which will include information about pondlife, how and why the ponds were restored and advice about visiting the 'education' pond.

(4) We will offer illustrated talks about the project to local clubs and societies (such as the Westbury Society).

(5) Throughout the project, information about it will be posted and updated on various websites including those of *RAGS, Amphibian & Reptile Conservation, The Somerset Wildlife Trust* and the *Mendip AONB unit*.

Timing

Ponds that support populations of amphibians can only be restored during the winter months when the animals are in hibernation away from the ponds, so practical pond work is traditionally a winter activity. However, some ponds have deteriorated so far as to have become wholly unsuitable for any aquatic life. Therefore, these will be restored during the summer months. Our surveys have determined these groups on a pond by pond basis.

The restoration programme would take about three years and detailed plans are shown in Appendix 1.

## 8. Post Project Work

It will be important both to assess the success of the project and ensure that its effects are long-lasting.

(1) *Subsequent surveys*. RAGS volunteers will monitor all the project area ponds after the project finishes to record colonisation by great crested newts and thus how the cluster metapopulations are establishing. This will be achieved by: (i) standard newt survey techniques using torches after dark, and live trapping; and (ii) by taking water samples for environmental DNA (eDNA) analysis. This relatively new method has proved very reliable in preliminary trials (Biggs *et al*., 2014) and the Mendip Ponds Project will provide an excellent opportunity to test its value in a conservation management context. Separate funding will be sought for this aspect of the monitoring programme. This programme will, like the *National Amphibian and Reptile Recording Scheme* (NARRS), follow a six-year cycle such that several ponds are monitored each year and every pond will be surveyed within each six-year period.

(2) *Pond maintenance*. Once stone ponds are fully restored they are expected to survive in good physical condition for several decades. Occasional clearance of silt and vegetation will be desirable but probably not more than once a decade, and this will be carried out as necessary by RAGS volunteers. Landowners are already committed to the project and will be encouraged to help with pond upkeep and, in particular, to enter countryside stewardship agreements with explicit clauses for crested newt pond conservation. A high proportion of Mendip landowners are already in one of the existing stewardship schemes.

## 9. Project Costs

Based on his extensive experience in repairing such ponds, Philip Smith of *Sticks and Stones Conservation* was commissioned to estimate the cost of repairs to all the stone constructed ponds (cart ponds and single access corner ponds). All but one can be restored by stone work, the exception being pond number four where a previous attempt at restoration left all the surfaces of the pond cast in concrete. Restoration of this pond will entail the relining of the pond in fibreglass resin and that cost was estimated separately by Dave Roberts of DRFS fibreglass specialists.

To estimate the cost of repairs to circular and semi-circular dewponds we calculated the area of the base in each pond either below the spring water level or to a depth of 1m, whichever is the greater. For the purposes of crested newts, there is little need to maintain a depth greater than this. We then assumed, based on previous experience, that on average about 30% of the cobbles will need re-setting and repointing. We sought an estimate for the work per $m^2$ and applied that to 30% of the total area of the base of each pond.

A summary of estimated costs for this project is shown in Appendix 2.

RAGS does not have significant funds available to contribute to the project. However the organisation does have access to volunteer time and the necessary expertise to deliver the project which it is willing to contribute as funding in kind. Indeed, RAGS have already contributed many man-hours and resources to the surveying of all the ponds in the project area and the preparation of this proposal at no cost. Our advice is that volunteer time can be valued at a rate of £50.00 per day for unskilled labour and £150.00 per day for skilled.

A fundamental task that will need to be completed by RAGS volunteer teams is the preparation of each pond before contractors can begin work. This will involve the draining of the ponds and the removal of many tons of excess silt and rubble. We estimate that each pond will take approximately half a day, or four hours, to clear out using an excavator operated by a skilled volunteer at a cost of £150.00 per day and would also necessarily involve up to six volunteers on the ground at a cost of £50.00 per day each, which would equate to £75.00 for the operator and £25.00 x 6 for the labour, totalling £225.00 per pond.

As can be seen from Appendix 1, this will apply to all the ponds except numbers 53 and 54 for which only fencing will be necessary. Therefore a total of forty one ponds, each at £225.00, will give a total value of £9,225.00 that RAGS is willing to contribute as funding in kind.

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# APPENDIX 1: Pond Restoration Sequence and Timing.

| | Season | Pond No | Requirement | Duration | Cost | Total Duration | Total Cost of Season |
|---|---|---|---|---|---|---|---|
| Year 1 | Autumn/ Winter | **7** | Structural Repairs | 4 wks | £858.00 | 18 weeks | £9,152.00 |
| | | **16** | Structural repairs | 4 wks | £3328.00 | | |
| | | **17** | Structural Repairs | 3 wks | £985.00 | | |
| | | **18** | Structural Repairs | 3 wks | £2116.00 | | |
| | | **19** | Structural Repairs | 4 wks | £1415.00 | | |
| | | **21** | Digger and Volunteers Only | <1 wk | £150.00 | | |
| | | **25** | Digger and Volunteers only | <1 wk | £150.00 | | |
| | | **29** | Digger and Volunteers only | <1 wk | £150.00 | | |
| | Spring/ Summer | **1** | Structural Repairs | 4 wks | £2939.67 | 22 weeks | £18,026.59 |
| | | **4** | Fibreglass Coating | 4 wks | £6432.00 | | |
| | | **9** | Structural Repairs | 3 wks | £1398.27 | | |
| | | **15** | Structural Repairs | 6 wks | £2137.00 | | |
| | | **26** | Structural Repairs | 6 wks | £3137.85 | | |
| | | **27** | Structural Repairs | 3 wks | £1981.80 | | |
| | | **53** | Fencing only | <1 wk | £ | | |
| | | **54** | Fencing only | <1 wk | £ | | |
| Year 2 | Autumn/ Winter | **5** | Structural Repairs | 2 wks | £1729.50 | 17 weeks | £9,246.80 |
| | | **6** | Structural Repairs | 6 wks | £2670.50 | | |
| | | **10** | Structural Repairs | 6 wks | £2415.00 | | |
| | | **14** | Structural Repairs | 3 wks | £1981.80 | | |
| | | **20** | Digger and Volunteers only | <1 wk | £150.00 | | |
| | | **22** | Digger and Volunteers only | <1 wk | £150.00 | | |
| | | **24** | Digger and Volunteers only | <1 wk | £150.00 | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Spring/Summer | **32** | Structural Repairs | 4 wks | £1500.00 | 24 weeks | £11,178.90 |
| | | **34** | Structural Repairs | 6 wks | £2152.35 | | |
| | | **39** | Structural repairs | 4 wks | £2807.55 | | |
| | | **43** | Structural Repairs | 6 wks | £2817.00 | | |
| | | **46** | Structural Repairs | 4 wks | £1902.00 | | |
| Year 3 | Autumn/ Winter | **33** | Structural Repairs | 4 wks | £1331.00 | 18 weeks | £14,785.60 |
| | | **37** | Structural Repairs | 6 wks | £3439.00 | | |
| | | **47** | Structural Repairs | 1 wk | £2770.00 | | |
| | | **51** | Structural Repairs | 5 wks | £2832.00 | | |
| | | **36** | Structural Repairs | 2 wks | £3963.60 | | |
| | | **30** | Digger and Volunteers only | <1 wk | £150.00 | | |
| | | **31** | Digger and Volunteers only | <1 wk | £150.00 | | |
| | | **35** | Digger and Volunteers only | <1 wk | £150.00 | | |
| Year 4 | Autumn/ Winter | **41** | Structural Repairs | 6 wks | £3300.00 | 15 weeks | £10,675.28 |
| | | **42** | Structural repairs | 3 wks | £2934.16 | | |
| | | **28** | Structural Repairs | 3 wks | £2108.41 | | |
| | | **2** | Structural Repairs | 3 wks | £1882.71 | | |
| | | **44** | Digger and Volunteers only | <1 wk | £150.00 | | |
| | | **45** | Digger and Volunteers only | <1 wk | £150.00 | | |
| | | **49** | Digger and Volunteers only | <1 wk | £150.00 | | |

Autumn/Winter runs from 1st October to 31st January a total of 18 weeks

Spring/Summer runs from 1st February to 30th September a total of 34 weeks

# APPENDIX 2: Project Costs

| Specification | Estimate £ | Assumptions | Comments | |
|---|---|---|---|---|
| Stone built ponds | 39,697.35 | | Quote from Phil Smith | |
| Circular and semi-circular ponds | 25,135.82 | | Based on 30% of cobbles dislodged | |
| Pond No 4 | 6,432.00 | | Quote from Dave Roberts. DRFS, fibreglass lining specialists. | |
| Stone | 7,200.00 | 40 tons @ £150.00 + VAT = £180 per ton | May be able to recycle stone from on site? | |
| Excavator | 4,350.00 | £150 per day.<br>1 day per pond =29 days? | Quote from Nigel Taylor | |
| Transport of materials | 2025.00 | £25 per hour. 3 hours per pond =81 hours | Quote from Harry Duddan | |
| Cement mixer (petrol) | 650.00 | | Quote from Phil Smith | |
| Bowser | 675.00 | | We can probably borrow from Nigel Taylor or Harry Duddan | |
| Petrol engine + associated fixings (Water pump and Pressure washer) | 520.00 | | Quote from Jasper Casey | |
| Assorted hand tools | 150.00 | | Quote from Jasper Casey | |
| Hessian coverings | 250.00 | | Quote from Phil Smith | |
| Shelters etc | 500.00 | | Quote from Phil Smith | |
| Preparation of estimates | 500.00 | | Quote from Phil Smith | |
| **Total** | **88,085.17** | | | |