Species Surveys & Assessment 2018-19

Southwood Country Park (SANG)

Sarah Jackson and Dr Ben Rushbrook

July 2019

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Executive Summary

Arcadian Ecology & Consulting Ltd (Arcadian Ecology) were appointed by Rushmoor Borough Council to undertake a species survey and assessment of the proposed Suitable Alternative Natural Greenspace (SANG) at Southwood Golf Course, Farnborough, to be known at Southwood Country Park.

This report provides an assessment of the current ecological value of Southwood Golf Course based on the information collected, to inform the future management and monitoring of the site. It includes an analysis of the findings and recommendations on how the target species/assemblages can be conserved and enhanced when the site becomes a SANG.

The site is located on the western edge of the town of Farnborough in Hampshire (SU 85277 54856) and covers approximately 54 hectares.

Surveys for aquatic/wetland invertebrates, amphibians, badger, bats, breeding birds, habitat suitability for great crested newt, reptiles, water vole and otter have been undertaken from September 2018 to July 2019.

An assessment of the potential impacts of the creation of the SANG, and recommendations for conservation and enhancement for each of the species/assemblages has been made utilising the survey data and existing information and reports.

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1. INTRODUCTION

1.1. Background

Arcadian Ecology & Consulting Ltd (Arcadian Ecology) were appointed by Rushmoor Borough Council to undertake a species survey and assessment of the proposed Suitable Alternative Natural Greenspace (SANG) at Southwood Golf Course, Farnborough, to be known at Southwood Country Park.

1.2. Site Description

The site is located on the western edge of the town of Farnborough in Hampshire (SU 85277 54856) and covers approximately 54 hectares (Map 1). It comprises amenity grassland, marshy grassland, semi-improved rough grassland, marginal vegetation, scrub, woodland and waterbodies including ponds, ditches and the Cove brook which flows along the eastern boundary of the site.

The wider countryside comprises extensive commercial and residential properties, Farnborough airport, woodland and heathland.

1.3. Scheme of Works

Rushmoor Borough Council updated their Special Protection Area (SPA) avoidance and mitigation strategy in 2018, identifying four SANGs within or adjacent to the borough. Three of these are nearing capacity and the fourth is shared with Hart District Council. Therefore, a further site needed to be identified.

Southwood Golf Course was identified as a suitable site, and was closed in December 2018 to enable conversion into a SANG. A draft management plan was commissioned from Footprint Ecology in 2018, which makes recommendations regarding habitat creation, and linkages to the adjacent Southwood Woodland SANG and Site of Importance for Nature Conservation (SINC). However, in order to ensure that the habitat creation recommendations are appropriate to maximise the current and potential future ecological value of the site, it is intended that the findings of this species survey and assessment study will inform the final management plan.

1.4. Remit and Scope of the Report

This report provides an assessment of the current ecological value of Southwood Golf Course based on the information collected from September 2018 to July 2019, to inform the future management and monitoring of the site. It includes an analysis of the findings and recommendations on how the target species/assemblages can be conserved and enhanced when the site becomes a SANG.

2. METHODOLOGY

2.1. Personnel

Sarah Jackson, Senior Ecologist (MCIEEM) led the amphibian, badger, great crested newt, water vole and otter surveys. She is an experienced ecologist with over 12 years' experience in survey, monitoring and assessment. She holds a Natural England bat class licence (level 2) number 2015-10695-CLS-CLS as well as a Natural England great crested newt licence number 2018-33929-SCI-SCI.

Dr Ben Rushbrook, Senior Ecologist (MCIEEM) led the aquatic macroinvertebrate surveys. He is an experienced freshwater ecologist with over nine years' experience in the collection, identification and assessment of aquatic macroinvertebrate samples, and is accredited by the Freshwater Biological Association in the identification of aquatic macroinvertebrates to family level for use in biotic assessment (IF01).

Carmen Green, Ecologist (GradCIEEM) led the bat, breeding bird and reptile surveys. She has over three years' experience in ecological consultancy and holds a Natural England great crested newt class licence (level 1) number 2016-26847-CLS-CLS.

Graeme Lyons, Invertebrate Specialist, led the wetland invertebrate survey. Graeme has 30 years of biological recording experience and has been carrying out invertebrate surveys for ten of those years. He is also county recorder for spiders and Heteroptera in Sussex.

2.2. Amphibians

2.2.1. Amphibian Presence - Absence Surveys

Presence – absence surveys were led by Sarah Jackson (MCIEEM; GCN class licence ref: 2018-33929-SCI-SCI) with assistance from Carmen Green (GradCIEEM; GCN class licence ref: 2016-26847-CLS-CLS), Kate Gwynn and Agatha Thompson of Arcadian Ecology & Consulting Ltd.

Surveys were conducted to assess the presence or likely absence of amphibians within the waterbodies found across the site (Map 2), utilising egg searching, evening torch survey and netting techniques.

Egg searching was conducted to establish if the waterbodies were being used for breeding by amphibians. Egg searches involve looking for spawn clumps of frogs, spawn strings for toads or folded leaves for newts. When leaves were found they were opened and the egg inside identified as either great crested newt or small newt species. Once positive ID was made no further leaves were opened as the number of eggs does not give an indication of the number of newts in the pond. Futhermore, once the leaves have been opened the eggs are no longer viable as exposure to UV light damages the egg, and they are also more vulnerable to predation.

Evening torch surveys involve surveyors walking the entire circumference or length of the waterbody (if safe and possible to do so) whilst shining a powerful torch (1 million candle power) into the waterbody recording any amphibians seen. Incidental sightings of other species were also recorded. Female smooth and palmate newts were recorded as small newts, as it is difficult to accurately identify them during torch surveys.

Netting was conducted at a rate of 15 minutes of netting per 50m of waterbody shoreline. Netting is quite destructive, pulling up vegetation and disturbing the pond, and was therefore only used when the water was too turbid or vegetated to conduct torch surveys.

A full breakdown of the weather conditions for the surveys are provided in Table 1. Surveys were not conducted if the air temperature was below 5°C as newts are less active at colder temperatures and may go undetected (Langton *et al.* 2001).

Table 1. Weather conditions by date

Visit Number	Date	Air Temperature (°C)	Wind (Beaufort scale)	Cloud (Oktas)	General Conditions
1	11.03.2019	8.6	2	8	Blustery but bright day, calmer evening
2	17.04.2019	12.6	1	1	Bright, sunny and warm day. Hazy evening
3	07.05.2019	11.4	2	8	Sunny spells during day, overcast evening

2.2.2. Great Crested Newt HSI

A habitat suitability index (HSI) of appropriate water bodies (Map 3) was conducted by Sarah Jackson (CIEEM; GCN licence ref: 2018-33929-SCI-SCI) and Carmen Green (GradCIEEM; GCN class licence ref: 2016-26847-CLS-CLS) of Arcadian Ecology on 19th September 2018 using the technique developed by Oldham *et al.* (2000) to assess ponds for their suitability for great crested newts.

2.3. Badger

A badger walkover survey was conducted by Sarah Jackson (MCIEEM) and Carmen Green (GradCIEEM) of Arcadian Ecology on 19th September 2018. Surveys comprise walking over the entire site, where safe and accessible to do so, looking for signs of badgers. These principally comprise of setts, latrines, runs and foraging signs. A grid reference was taken of all signs using a GPS and marked on a map.

When a sett is found, it is classified based on its level of use: main, annexe, subsidiary or outlier. Each sett is recorded on a separate form. Further details are also be recorded including number of entrances (and extent of use), status (active, dormant or unsure), and any signs of activity such as latrines, paths or spoil.

Sett classification is based on that described in 'Surveying badgers' (Harris, S *et al.* 1989), as follows:

- **Main sett:** large number of holes, conspicuous spoil heaps, looks active, well used paths to and from the sett and between sett entrances.
- **Annexe sett:** close to main sett, normally less than 150m away. Connected to main sett by one or more obvious paths. Usually have several holes, but may not be in use all the time.
- **Subsidiary sett:** often only a few holes (typically three to five), at least 50m from main sett, with no obvious connecting path. Not continuously active.
- **Outlier sett:** Typically one or two holes, with little spoil, no obvious path and only used sporadically. May be used by other animals, e.g. foxes and rabbits, when not in use by badgers.

2.4. Bats

2.4.1. Activity surveys

Bat activity surveys establish species and use of a site, to provide recommendations for conserving and enhancing bat foraging routes, by walking a pre-determined transect route around a site (Map 4).

The transect route is walked at a slow steady pace, with the direction of travel alternated on each visit. Along the route, listening points are identified where surveyors stop for 3 minutes to record activity, particularly for quieter species such as long-eared bat which may be missed whilst walking around. Activity surveys are conducted on evenings when there is no rain, little to no wind and when the temperature is above 8°C.

The survey starts at sunset and continues for up to 3 hours after sunset. Surveys were conducted using a time expansion bat detector (Pettersson d240x) and digital recorder (Zoom H2n), so recordings can therefore be made for later analysis using sound analysis software (SonoBat /Kaleidoscope). All activity is recorded on a standard recording form, and observed activity and/or location on transect are recorded on a map and GPS.

Four bat activity surveys were conducted across the season on 17th September 2018, 20th March 2019, 16th May 2019 and 15th July 2019. Surveys were led by Carmen Green (GradCIEEM) with

assistance from Sarah Jackson (MCIEEM; NE Bat Class Licence (level 2) Number 2015-10695-CLS-CLS), Agatha Thompson, David Howes and Kate Gwynn of Arcadian Ecology.

Table 2 gives a breakdown of the survey times and surveyors and Table 3 provides the weather conditions for each survey.

Table 2. Survey times and surveyors

Date	Sunset Time	Survey Start Time	Survey End Time	Surveyors
19.09.2018	19:14	19:14	21:28	Carmen Green David Howes
20.03.2019	18:16	18:16	20:13	Carmen Green Sarah Jackson
16.05.2019	20:48	20:48	22:43	Carmen Green Agatha Thompson
15.07.2019	21:13	21:13	22:59	Carmen Green Kate Gwynn

Table 3. Survey weather conditions

Date	Air Temperature (°C)	Wind (Beaufort scale)	Cloud (Oktas)	General conditions
19.09.2018	17	1	0	Clear and warm
20.03.2019	14.2	2	8	Cool, dry and overcast
16.05.2019	11	2	2	Cool and dry. Sunny earlier in day
15.07.2019	17.2	1	2	Warm and dry, following sunny day

2.4.2. Static bat detector

A static bat detector was deployed at Southwood to support the information collected during the bat activity survey. The detector was located on the west side of the golf course, SU 8484 5483, and shown on Map 4. The detector was deployed from 27th September to 8th October 2018, and programmed to start recording 30 minutes before sunset and finish 30 minutes after sunrise.

2.5. Breeding Bird Survey

Two breeding bird surveys were undertaken by Carmen Green (GradCIEEM) of Arcadian Ecology on 12th April and 22nd May 2019.

The British Trust for Ornithology (BTO) breeding bird survey methodology was followed. Two transects were created that traversed the site (Map 5), of 2.4km on the western side and 2.3km on the eastern side. The surveyor slowly but continuously walked along each transect to minimise counting birds more than once.

The BTO breeding bird survey field recording sheets were used to record birds heard or seen within distance bands of 25 metres, 25 to 100 metres and more than 100 metres. If a bird was seen in flight only, it was marked using an arrow on the recording form. The standard two-letter BTO species codes were used for the survey.

The two visits were conducted within the recommended guidance of early April to mid-May for the early visit and mid-May to late June for the late visit; within the recommended time period, to start between 6am and 7am and no later than 9am; and during suitable weather condition (not heavy persistent rain, very poor visibility or strong wind) as detailed in Table 4.

Table 4. Survey timings and weather Conditions

Date	Start Time	End Time	Cloud Cover	Rain	Wind	Visibility	Temperature (°C)
12.04.2019	06:48	08:50	0 – 33% (1)	None (1)	Calm (1)	Good (1)	0
22.05.2019	06:40	08:32	0 – 33% (1)	None (1)	Calm (1)	Good (1)	9

2.6. Invertebrates

2.6.1. Aquatic Invertebrates

Aquatic macroinvertebrate surveys were conducted on 28th September and 1st October 2018 by Dr Ben Rushbrook (MCIEEM) with assistance from Carmen Green (GradCIEEM) or Mariko Whyte, all of Arcadian Ecology.

Thirteen potential locations for the collection of aquatic macroinvertebrate samples (Map 6) were identified based on the findings of a Phase 1 habitat survey conducted by the Hampshire Biodiversity Information Centre (HBIC). These locations included a representative subset of the watercourses (e.g. Cove Brook, ditches, etc.) and water bodies (e.g. ponds) present on the site, with locations selected to correspond to areas identified within the HBIC report as being the "most potentially interesting" (Miller 2017).

Each potential sample location was visited and an assessment of the habitat quality and suitability for sample collection conducted. Aquatic macroinvertebrate samples were only collected at locations which both supported a sufficient amount of water at the time of survey, and where the stream/pond bed conditions allowed for effective sample collection. A summary of these assessments and habitat descriptions of the sampling locations is provided in Table 5.

It is emphasised that samples were collected from areas of submerged and marginal habitat (including wet vegetated and muddy margins), but not from within bank side or top habitat. Sample collection for watercourses supporting flowing water (i.e. the Cove Brook and flowing ditches) was based on methodologies employed by the Environment Agency (2014a) for macroinvertebrate sampling in rivers. Sample collection for ponds and other stillwaters was based on the methodologies recommended for macroinvertebrate samples in *A guide to the methods of the National Pond Survey* (Briggs *et al*. 1998). Due to time constraints identified in the tender documents, samples were only collected within the 'autumn' sample collection period of each methodology.

All samples were transferred to the Trust's Ecology and Research Laboratory on the day of collection where the samples were preserved in denatured alcohol. Each sample was subsequently analysed using a methodology adapted from standard Environment Agency (2014b) operational instructions. Prior to identification, samples were separated into three fractions for ease of processing using a set of three sieves with a mesh size of 4mm, 1mm and 500µm respectively.

Each fraction was then carefully sorted by way of successive separation of a small sub-sample and the removal of all aquatic macroinvertebrates encountered (with the exception set out below). All macroinvertebrates were then identified to family level, or other appropriate level of classification, as determined by the Walley Hawkes Paisley Trigg (WHPT) river macroinvertebrate index (but applicable to all water bodies; Chadd, 2010), and the abundance of individuals within each family/taxonomic group was recorded.

Table 5. Summary of habitats including their quality and suitability for sample collection across the thirteen potential macroinvertebrate sample locations

Sample Location	Waterbody Type	Habitat Description	Sample Collection
1	Pond/Ditch	Closed/blind end of a small ditch, which has effectively expanded out into a small pond. This waterbody is dominated by a mixture of areas of coarse grass and sedge tussocks, rushes and saplings of a number of tree species developing into scrub and open water with submerged pondweed in the centre.	Yes
2	Ditch	Narrow incised channel with barely perceptible flow. Dominated by rushes at the edge and within the channel in the lower third of the survey reach, becoming more open upstream. A thick layer of leaf litter dominates the ditch bed.	Yes
3	Pond	Largely shaded around edge but with a dense band of marginal branched bur-reed and sedge where light penetrates, and a mix of open water over mud, and submerged starwort in the central areas. Pipe observed discharging into pond for approximately 2 minutes during survey.	Yes
4	Ditch	Located within an area of tall trees resulting in little marginal or banktop vegetation. The channel is concrete lined, with slow to negligible flow, and a deep layer of silt and leaf litter on the stream bed.	Yes
5	Ditch	Scrub and ruderal vegetation dominated ditch banks, with some shading from alder trees in potential survey reach, and heavier shading upstream and downstream. A pipe enters the watercourse from the adjacent housing estate. Channel with slow to negligible flow and bed comprised of a very deep layer of silt and leaf litter.	No – very deep layer of silt and leaf litter
6	Ditch	Channel tree-lined on both banks with only limited submerged pondweed evident. Channel with slow to negligible flow and bed comprised of a very deep layer of silt and leaf litter.	No – very deep layer of silt and leaf litter
7	Ditch	Unshaded channel dominated by dense in-channel vegetation, primarily consisting of branched bur-reed with water-mint and sedges dominating the bank sides. Channel with slow flow evident throughout, and characterised by silt substrate of variable depth.	Yes
8	Stream	Densely vegetated channel (including branched bur-reed, water mint and common reed), with some shading from bank top trees. The channel is relatively deep in some areas and the stream bed characterised by a very deep layer of silt and leaf litter.	No – very deep layer of silt and leaf litter
9	Stream (Cove Brook)	Channel open but shaded by surrounding trees set back from the bank top. Slow flow, with small woody debris creating areas of impoundment. Channel bed dominated by a thick layer of silt.	Yes
10	Stream (Cove Brook)	Survey area unshaded in the middle, with heavy shading at the up- and downstream ends. Channel has a natural bank and bed, with slow flow in the upper and lower reaches, but increased flow through the centre due to the narrowing effect of the in-channel vegetation present. Channel bed dominated by a thick layer of silt and leaf litter.	Yes
11	Stream (Cove Brook)	Canalised channel with concrete slabs lining the true left bankside and bed, but not the true right bank. Largely unshaded with some in-channel vegetation. Slow flowing with some sections of silt or gravel substrate, though elsewhere characterised by an algal covered concrete bed.	Yes
12	Stream (Cove Brook)	Heavily shaded, canalised section of channel lined on the bed and sides by concrete. Channel supports a slow flow, and dominated by a silt substrate with concrete slabs and other debris including metal piping and glass bottles. Himalayan balsam present on bank top.	Yes
13	Pond	Channel choked by vegetation, with very little open and/or depth of water evident. Furthermore, the vegetation is largely dominated by the invasive non-native New Zealand pygmy weed (*Crassula helmsii*).	No – extensive *Crassula helmsii* coverage

The total number of individuals removed across the three fractions of each sample was the measure of abundance used for all groups recorded, with the exception of Gammaridae (freshwater shrimp) and Asellidae (freshwater hoglouse). In these instances, abundance was calculated using estimated values collected from the successive separation of the small sub-samples. In addition, 50 Gammaridae individuals were removed from across the three fractions of these samples to check for the potential misidentification of Crangonyctidae (another freshwater amphipod).

It is emphasised that this methodology determined the ecological value of the macroinvertebrate community/assemblage present within each sample, rather than specifically identifying protected, rare or notable invertebrate species – though these were recorded where feasible. Data across all samples were then analysed to identify the location and distribution of watercourses/water bodies of high ecological value with regards to macroinvertebrates.

2.6.2. Wetland and Terrestrial Invertebrates

Wetland invertebrate surveys, with a focus on diptera and other hygrophilous species, were conducted by Graeme Lyons on 10th May and 22nd June 2019. Further surveys are due to be conducted to sample across seasons.

The site was divided into four recording compartments: Golf West (GW), Woodland (WO), Golf East (GE) and Mire (MI). These were selected to reflect the nature of the site and /or any management approaches/issues that need informing. Each block was recorded for the same amount of time on each of the three visits from April to September. Sweeping, beating, sieving, suction-sampling and active searching were used to produce a site list for each block and an overall site list. This data was then run through a resource database where it's possible to make comparisons on where the best places are for species of interest or with particular habitat requirements such as rare species, nectar loving species and hygrophilous species.

The completed analysis of the invertebrate data will be provided in a separate report, as survey and analysis will not be completed until later in 2019.

2.7. Reptiles

Seven reptile surveys were conducted between 24th September 2018 and 3rd May 2019 by Arcadian Ecology and Rushmoor Borough Council Volunteers. Reptile surveys were conducted using artificial refugia (roofing felt) located in areas of suitable reptile habitat (Map 7). Surveys were undertaken on days with partial cloud cover, little wind and temperatures between 11°C and 18°C, as detailed in Table 6.

Table 6. Reptile survey dates and weather conditions

Visit	Date	Start Time	End Time	Air Temp (°C)	Wind (Beaufort scale)	Cloud (Oktas)	General conditions	Surveyors
1	24.09. 2018	11:15	14:15	12.8	1	4	Cool, dry and sunny. Heavy rain on previous day	Carmen Green David Howes
2	08.10. 2018	10:50	13:10	14	3	8	Cool and cloudy. Some parts of the course waterlogged.	Mariko Whyte David Howes
3	26.10. 2018	10:30	12:50	11	2	6	Cool and cloudy with patchy sun	Mariko Whyte David Howes
4	12.04. 2019	09:50	12:00	7.7	3	1	Cool, dry and sunny. Forest earlier in day	Carmen Green Rushmoor Borough Council Volunteers

5	23.04. 2019	10:45	12:15	19	1	1	Warm, dry and sunny	Carmen Green Agatha Thompson Kate Gwynn
6	03.05. 2019	10:30	12:30	11.8	1	8	Cool, dry and overcast	Carmen Green Agatha Thompson Kate Gwynn
7	03.06. 2019	10:10	12:25	20	2	4	Warm and mostly sunny with some cloud	Carmen Green Agatha Thompson Kate Gwynn

2.8. Water Vole and Otter

A water vole and otter survey was conducted on 27th September 2018 by Sarah Jackson (MCIEEM) and Carmen Green (GradCIEEM) of Arcadian Ecology.

A detailed survey of the banks of all water bodies and ditches on site (Map 8), including Cove Valley, Southern Grassland SINC, Cove Brook Grassland SINC and Cove Brook, was undertaken by hand, extending from the water's edge to two metres back from the bank, where possible to do so, during the period when water voles are most active (April to October). Water voles generally require sloping banks in which to burrow and well-developed bankside vegetation to provide shelter and food (Ryland & Kemp, 2009).

All water voles and signs of their presence (burrows, latrines, feeding stations and footprints), and otters and signs of their presence (spraints, slides and runs) were recorded on a map. Surveys were not conducted after heavy rain when water levels are likely to have risen and washed signs away.
An assessment of the water bodies for the suitability to support water voles was also undertaken using a method developed by Harris *et al.* 2009 with features scoring 1 if present and 0 if not. An example recording form is provided in Appendix 1.

2.9. Constraints to Survey

The effectiveness of the collection of aquatic macroinvertebrate samples was inhibited by deep layers of silt substrate and/or leaf litter at a number of sample locations, and resulted in the exclusion of four of the potential thirteen sample locations identified (Table 2).

2.10. Data Analysis

All data analysis was performed using Microsoft® Excel 2010.

Each collected sample was analysed using the WHPT index of river macroinvertebrate quality. WHPT was introduced by the Environment Agency as the basis for river macroinvertebrate status classification throughout the UK under the Water Framework Directive from the second River Basin Management Plans published in 2015 (Environment Agency, 2014c), and is also considered appropriate to use for the biotic assessment of still waterbodies (Chadd 2010). It replaced the Biological Monitoring Working Party (BMWP) indices that had been used since the 1980 National River Quality Survey and can be expressed as a score (the sum of values for each scoring taxon in a sample) or as an Average Score Per Taxon (ASPT).

$ASPT_{(WHPT)}$ responds to the same environmental pressures as $ASPT_{(BMWP)}$ including organic discharges, industrial discharges, reductions in flow, habitat degradation and eutrophication. However, unlike $ASPT_{(BMWP)}$, $ASPT_{(WHPT)}$ will respond to activities that affect the abundance of different macroinvertebrates, which should improve its ability to distinguish moderate degradation in quality.

In addition to family/taxa richness (i.e. the number of taxa recorded), other measures of diversity were then calculated for all collected samples. Two commonly recognised categories of diversity indices exist: Type I indices are most sensitive to changes in the rare family/taxa in the community sample, whereas Type II indices respond most strongly to changes in the proportional abundance of the most common family/taxa (Peet 1974, referenced in Nagendra, 2002). The Shannon-Wiener index is an example of a Type I index, with higher Shannon-Wiener index values indicating greater family/taxa diversity. Conversely, the Simpson's index of diversity is an example of a Type II index, with a range

between 0 (low diversity) and almost 1. Although not all the strict statistical assumptions required for the accurate application of these indices were met within the data collected, and also acknowledging that the diversity calculated was at the family/taxa and not species level, it was considered that their calculation could provide a valuable insight into the macroinvertebrate community structure present at each sample site.

This assessment of family/taxa diversity was supplemented by the calculation of the Berger-Parker dominance index. This index expresses the numerical importance of the most abundant taxa (i.e. family/WHPT group in this study) by calculating the proportion of the sample that was comprised by the most abundant taxa. It therefore has a range between 0 and 1, with higher scores reflecting a sample that is dominated by single taxa.

3. RESULTS

3.1. Amphibian Survey

3.1.1. Presence - Absence Surveys

Low numbers of palmate newt and common frog, including evidence of breeding for common frog, were found across the site, as detailed in Table 7. A number of small female newts were observed, these were not classified as smooth or palmate as it is not always possible to make confident identification during torch surveys, as both species are known to be on site (smooth newts have been found during the reptile surveys).

Table 7. Amphibian presence-absence survey summary

Water Body Ref	Visit 1 11.03.2019	Visit 2 17.04.2019	Visit 3 07.05.2019
Pond 2		1 male palmate newt 1 female small newt	1 small newt
Pond 1	1 female small newt	*Limited visibility as fenced off*	
Pond 3	1 female small newt		
Ditch 1	*Not surveyed – too much flow*		
Ditch 2	*Not surveyed – too much flow*		
Ditch 3	7 male palmate newts 3 female small newts	7 male palmate newts Vole swimming in ditch	
Ditch 4	Frog spawn		1 female small newt 1 common frog
Ditch 5	*Not surveyed – too much flow*		
Ditch 6		2 male palmate newts 1 female small newt	1 male palmate newt 1 female small newt
Ditch 7	1 male palmate newt	2 female small newts 1 common frog	3 female small newts 3 adult and 1 juvenile common frog
Ditch 8		1 common frog	
Ditch 9	Frog spawn	3 frog tadpoles	
Ditch 10	4 male palmate newts 2 female small newts		1 male palmate newt 1 female small newt
Ditch 11			
Ditch 12		8 male palmate newts	2 male palmate newts 1 common frog

3.1.2. Great Crested Newt

Habitat suitability index scores for great crested newt indicated that waterbodies on site were of average to excellent potential to support great crested newts. A summary is provided in Table 8 with a detailed breakdown in Appendix 3.

Table 8. Summary GCN HSI scores

Location	Grid Reference	Score	
Ditch 1	SU85345485	0.82	Excellent
Ditch 2	SU85465479	0.83	Excellent
Ditch 3	SU84935467	0.74	Good
Ditch 4	SU84725482	0.69	Average
Pond 1	SU85395512	0.78	Good
Pond 2	SU84735494	0.75	Good
Pond 3	SU84825473	0.67	Average

3.2. Badger

One outlier sett was recorded in the south east corner of the site (Map 9), but appears to be currently occupied by fox *Vulpes vulpes*. The sett comprises two entrances: one well used (Figure 3), the other part-used with a thistle growing across it, in an earth bank with old spoil and a path leading from the north hole. A badger hair was found in the entrance to the north hole, but there was a strong smell of fox coming from the sett at the time of survey.

In addition, other signs of badger activity, namely latrines, were located at three locations across the site, as detailed in Table 9 and shown on Map 9.

Table 9. Badger signs

Sign	Location (grid reference)
Digging	SU8537554815
Latrine	SU8554554690
Latrine x 2	SU8503954874
Latrine	SU8484154882

Figure 3. Used entrance to outlier badger sett in south east corner of site

3.3. Bats

3.3.1. Activity survey

Four species of bat were recorded on the bat activity surveys. These were noctule *Nyctalus noctula*, soprano pipistrelle *Pipistrellus pygmaeus,* common pipistrelle *Pipistrellus pipistrellus* and a *Myotis* species. Bat activity was distributed across the site; however, activity tends to follow the boundary features of trees and woodlands which provide good foraging habitat and commuting routes. A breakdown of species and recorded activity by date is given in Tables 10 to 13 and shown on Maps 10 to 13, with all activity shown on Map 14.

Table 10. Bat activity survey results – 17th September 2018

Time	Species	No. of Bats	Activity	Target Note
19:32	Noctule	1	Heard not seen at listening point	1
19:35	Soprano pipistrelle	1	Foraging just after listening point	2
19:42	Common pipistrelle	1	Hleard not seen	3
19:43	Common pipistrelle	1	Foraging over track	3
19:46	Common pipistrelle	1	Foraging over track, heard again at listening point	4
19:51	Common pipistrelle	1	Heard not seen	5
19:54	Common pipistrelle	1	Foraging over track	6
19:57	Common pipistrelle	1	Foraging over track	7
20:12	Common pipistrelle	1	Heard not seen	5
20:18	Common pipistrelle	1	Heard not seen	8
20:21	Common pipistrelle	1	Heard not seen at listening point	9
20:29	Common pipistrelle	1	Heard not seen	10
20:41	Common pipistrelle	1	Heard not seen at listening point	11
20:46	Common pipistrelle	1	Heard not seen	12

20:49	Soprano pipistrelle	1	Heard not seen	13
20:54	Soprano pipistrelle	1	Heard not seen	14
20:58	Common pipistrelle	1	Heard not seen	15
21:15	Common pipistrelle	1	Heard not seen	16
21:20	Soprano pipistrelle	2	Foraging	17
21:24	Common pipistrelle	1	Heard not seen at listening point	18

Table 11. Bat activity survey results – 20th March 2019

Time	Species	No. of Bats	Activity	Target Note
18:24	Common pipistrelle	1	Seen foraging over trees and golf course but not heard	1
18:37	Common pipistrelle	1	Foraging and feeding in loops over trees	2
18:47	Common pipistrelle	1	Heard foraging and social calls but not seen	3
18:50	Common pipistrelle	1	Heard foraging and social calls but not seen	3
18:56	Common pipistrelle	2	Heard foraging and social calls but not seen	4
19:21	Common pipistrelle	1	Heard foraging but not seen	5
19:28	Common pipistrelle	1	Foraging along track	6
19:31	Common pipistrelle	2	Foraging and social calling over track and bridge	7
19:37	Common pipistrelle	1	Foraging up and down along path	5
19:41	Common pipistrelle	1	Foraging along path heading south to north	8
19:48	Common pipistrelle	1	Heard foraging but not seen	9
19:56	Common pipistrelle	1	Heard foraging but not seen	10
20:04	Common pipistrelle	1	Heard foraging but not seen	11
20:08	Common pipistrelle	1	Heard foraging but not seen	12

Table 12. Bat activity survey results – 16th May 2019

Time	Species	No. of Bats	Activity	Target Note
21:12	Common pipistrelle	1	Heard but not seen	1
21:14	Common pipistrelle	2	Foraging along tree line and feeding	2
21:15	Soprano pipistrelle	1	Foraging over track	3
21:22	Common pipistrelle	1	Foraging over track	4
21:25	Common pipistrelle	1	Foraging over track	5
21:28	Common pipistrelle	1	Heard but not seen	6
21:30	Common pipistrelle	1	Heard but not seen	7
21:34	Common pipistrelle	1	Heard but not seen	8
21:35	Common pipistrelle	1	Foraging along trees	9
21:39	Common pipistrelle	1	Heard foraging but not seen	10
21:57	Pipistrelle species	1	Heard in distance but not seen	11
21:59	Soprano pipistrelle	1	Heard but not seen	12
22:00	Noctule	1	Heard but not seen	13
22:00	Common pipistrelle	1	Heard foraging but not seen	13
22:06	Common pipistrelle	1	Heard but not seen	14
22:07	Soprano pipistrelle	1	Briefly heard but not seen	14
22:09	Common pipistrelle	1	Heard but not seen	15
22:12	Common pipistrelle	1	Heard but not seen	16
22:14	Common pipistrelle	1	Heard but not seen	17
22:18	Common pipistrelle	1	Heard but not seen	18
22:25	Common pipistrelle	1	Foraging	19
22:25	Myotis species	1	Briefly heard but not seen	19
22:29	Common pipistrelle	1	Heard but not seen	20
22:35	Common pipistrelle	1	Heard foraging but not seen	21

Table 13. Bat activity survey results – 15th July 2019

Time	Species	No. of Bats	Activity	Target Note
21:16	Soprano pipistrelle	1	Heard not seen	1
21:25	Common pipistrelle	1	Heard not seen	2
21:34	Common pipistrelle	1	Foraging over meadow	3
21:39	Common pipistrelle	1	Flying over grassland	4
21:46	Common pipistrelle	1	Foraging. Heard not seen	5
21:46	Soprano pipistrelle	1	Foraging. Heard not seen	5
21:50	Common pipistrelle	1	Foraging. Heard not seen	6
21:56	Common pipistrelle	1	Foraging at edge of site	7
21:56	Soprano pipistrelle	1	Foraging at edge of site	7
21:59	Common pipistrelle	1	Heard not seen	8
22:02	Common pipistrelle	1	Foraging over centre golf course	9
22:05	Common pipistrelle	1	Foraging from southern boundary into golf course	10
22:07	Soprano pipistrelle	1	Foraging over road	11
22:08	Soprano pipistrelle	1	Foraging. Heard not seen	12
22:11	Soprano pipistrelle	1	Foraging over stream	13
22:17	Soprano pipistrelle	1	Heard not seen	14
22:18	Common pipistrelle	1	Heard not seen	14
22:22	Common pipistrelle	1	Heard not seen	15
22:27	Common pipistrelle	1	Heard not seen	16
22:35	Common pipistrelle	1	Foraging. Heard not seen	17
22:38	Soprano pipistrelle	1	Foraging along track	18
22:40	Common pipistrelle	1	Heard not seen	19
22:45	Common pipistrelle	1	Heard not seen	20
22:56	Common pipistrelle	1	Heard not seen	21

3.3.2. Static bat detector

The static bat detector recorded 231 bat passes/registrations over eleven nights of recording, as summarised in Table 14.

Table 14. Static detector bat passes

Common name	Scientific name	Number of passes
Common pipistrelle	*Pipistrellus pipistrellus*	30
Soprano pipistrelle	*Pipistrellus pygmaeus*	2
Daubenton's bat	*Myotis daubetonii*	16
Myotis species	*Myotis* sp.	182
Noctule	*Nyctalus noctula*	1
Total number of bat passes		**231**

At least four species of bat have been recorded on site: common pipistrelle, soprano pipistrelle, Daubenton's bat *Myotis daubentonii* and noctule. Unidentified *Myotis* species were also recorded.

A full breakdown of bat passes is provided in Appendix 2.

3.4. Breeding Birds

Thirty-five species of bird were seen across the two visits, with 27 species recorded on the early visit and 26 species recorded on the late visit. Of these, nine species of conservation concern were observed. A total of 496 individuals were seen, with a peak count of 253 being recorded on an individual visit, as detailed in Table 15.

Activity was distributed across the site, but typically associated with tress within the site or around the boundary, as shown on Maps 15 to 17.

Table 15. Breeding bird survey results

BTO Code	Common Name	Latin Name	Visit		Totals			Protected and/or notable
			Early visit	Late visit	Early visit	Late visit	All	
B.	Blackbird	*Turdus merula*	Y	Y	14	16	30	
BC	Blackcap	*Sylvia atricapilla*	Y	Y	1	7	8	
BT	Blue tit	*Cyanistes caeruleus*	Y	Y	21	24	45	
BF	Bullfinch	*Pyrrhula pyrrhula*	-	Y	0	1	1	BOCC - Amber
C.	Carrion crow	*Corvus corone*	Y	Y	6	8	14	
CH	Chaffinch	*Fringilla coelebs*	Y	Y	1	2	3	
CC	Chiffchaff	*Phylloscopus collybita*	Y	-	4	0	4	
CT	Coal tit	*Periparus ater*	Y	Y	3	3	6	
CD	Collared dove	*Streptopelia decaocto*	Y	-	1	0	1	
D.	Dunnock	*Prunella modularis*	Y	-	3	0	3	
GC	Goldcrest	*Regulus regulus*	Y	Y	5	6	11	
GO	Goldfinch	*Carduelis carduelis*	Y	Y	6	4	10	
GS	Great spotted woodpecker	*Dendrocopos major*	-	Y	0	3	3	
GT	Great tit	*Parus major*	Y	Y	36	25	61	
GR	Greenfinch	*Chloris chloris*	Y	-	1	0	1	
H.	Grey heron	*Ardea cinerea*	Y	-	1	0	1	
HS	House sparrow	*Passer domesticus*	-	Y	0	2	2	BOCC - Red
J	Jay	*Garrulus glandarius*	Y	Y	5	3	8	
LT	Long-tailed tit	*Aegithalos caudatus*	Y	-	4	0	4	
MG	Magpie	*Pica pica*	Y	Y	22	24	46	
MA	Mallard	*Anas platyrhynchos*	-	Y	0	3	3	BOCC - Amber
MT	Marsh tit	*Poecile palustris*	Y	-	2	0	2	BOCC - Red
M.	Mistle thrush	*Turdus viscivorus*	Y	Y	5	2	7	BOCC - Red
MH	Moorhen	*Gallinula chloropus*	Y	-	1	0	1	
NH	Nuthatch	*Sitta europaea*	Y	Y	1	4	5	
PW	Pied wagtail	*Motacilla alba*	Y	-	2	0	2	
KT	Red kite	*Milvus milvus*	-	Y	0	1	1	
RB	Reed bunting	*Emberiza schoeniclus*	-	Y	0	2	2	BOCC - Amber
R.	Robin	*Erithacus rubecula*	Y	Y	18	16	34	
ST	Song thrush	*Turdus philomelos*	Y	Y	2	2	4	BOCC - Red
SG	Starling	*Sturnus vulgaris*	Y	Y	23	16	39	BOCC - Red
WH	Whitethroat	*Sylvia*	-	Y	0	1	1	

		communis						
WW	Willow warbler	*Phylloscopus trochilus*	-	Y	0	1	1	BOCC - Amber
WP	Woodpigeon	*Columba palumbus*	Y	Y	42	33	75	
WR	Wren	*Troglodytes troglodytes*	Y	Y	23	34	57	

3.5. Invertebrates

3.5.1. Aquatic Invertebrates

Biotic assessment of aquatic macroinvertebrates

In total, 47 family/taxa groups comprising approximately 5700 individuals were collected and identified across the nine sample locations (Appendix 4). Freshwater shrimp (Gammaridae) was the most abundant family and, along with non-biting midge larvae (Chironomidae), returned considerably higher numbers than all other families/taxa groups (Appendix 4). Diving beetles (Dytiscidae), mud snails (Hydrobiidae) and pea mussels were the next most abundant families. Freshwater hoglouse (Asellidae), alderfly larvae (Sialidae) and non-biting midge larvae were the most widespread families, recorded in all nine samples, with freshwater shrimp and worms (Oligochaeta) recorded in eight of the nine sampling locations (Appendix 4).

Abundance (number of individuals) and family/taxa group richness (number of taxa) was variable across the nine sample locations (Table 16), and there was no apparent trend between these measures. For example, sample location 3 recorded the highest richness but the second lowest abundance, whereas sample location 7 recorded the third highest abundance but second lowest riches. The high abundances recorded at sample locations 11, 2 and 7 is largely a consequence of the high abundance of one or two families within those samples (Appendix 4), and is reflected by the low Berger-Parker dominance value recorded at the latter two sites (Table 16).

Table 16. Summary of biotic and diversity index scores returned for the nine sample locations.

Sample Location	No. Individuals	No. Taxa	WHPT	$ASPT_{(WHPT)}$	Simpson's Index of Diversity	Shannon-Wiener	Berger–Parker dominance
1	247	17	73.5	4.32	**0.84**	**2.10**	**0.25**
2	**834**	18	75.2	4.18	0.62	1.27	0.47
3	427	**22**	80.3	3.65	**0.85**	**2.25**	**0.27**
4	676	14	41.1	2.94	0.58	1.19	0.59
7	**814**	16	65.5	4.09	0.71	1.62	0.41
9	465	16	74.4	4.65	0.51	1.22	0.69
10	500	**20**	**95.5**	**4.78**	0.73	**1.91**	0.50
11	**1190**	**20**	**93.1**	**4.66**	0.60	1.47	0.61
12	530	19	**90.6**	**4.77**	**0.77**	**1.91**	**0.35**

There is also notable variation in the diversity indices returned, and in the degree to which the sample locations appeared to be subject to moderate/high levels of environment pressure ($ASPT_{(WHPT)}$). Sample 3 was collected at the pond in the north/north east of the site, and returned the highest richness, highest diversity and lowest dominance values across all sites (Table 16). Furthermore, sample location 1, which was effectively considered to be a pond (Table 5), returned the second

highest diversity and lowest dominance values. However, these sample locations returned relatively low **ASPT$_{(WHPT)}$** values, indicating that they supported a number of moderate value families/taxa groups, in particular a number of different beetles and true bugs (Appendix 4).

In contrast, sample locations on the Cove Brook returned the four highest ASPT$_{(WHPT)}$ values, but, with the exception of sample location 12, largely relatively moderate to poor values of diversity and dominance (Table 16). Though these samples included primarily moderate to low WHPT value families/taxa groups, they also supported a small number of relatively higher scoring families that were largely absent from the other samples, in particular demoiselle (Calopterygidae) and various caddisfly (Trichoptera) larvae (Appendix 4). However, these samples also included a high number of one or two groups, which is reflected in the generally poorer diversity and dominance scores returned at sample location 9 and 11.

Finally, the values returned from the biotic assessment of sample location 4 are of particular note (Table 16). The location returned the lowest or second lowest values for family/taxa richness, WHPT, ASPT$_{(WHPT)}$ and the two diversity indices. The sample collected at this location was dominated by non-biting midge large, pea mussels and, to a lesser degree, freshwater hoglouse. This may be a reflection of absence of flow and presence of a deep layer of silt and leaf litter on the stream bed.

Ad-hoc species of note recorded during aquatic macroinvertebrate surveys

A number of other species of note were recorded across the nine sample locations (Appendix 5).

Three invasive non-native species listed on Schedule 9 of the Wildlife and Countryside Act 1981 (as amended) were observed at Southwood Golf Course. This included two plants: New Zealand pygmyweed *Crassula helmsii* and Himalayan balsam *Impatiens glandulifera* recorded at sample locations 13 and 12, respectively (Table 5; Appendix 5). In addition, North American signal crayfish *Pacifastacus leniusculus* was found at two sample locations (Appendix 5); one juvenile signal crayfish in the small stream at sample location 7 and a large adult male (Figure 1) on the Cove Brook at sample location 11.

A number of fish species were also recorded during macroinvertebrate sample collections on the Cove Brook and associated small stream (Appendix 5), including stone loach *Barbatula barbatula*, threespine stickleback *Gasterosteus aculeatus* and common minnow *Phoxinus phoxinus*.

In addition, an adult raft spider *Dolomedes fimbriatus* (Figure 2) was recorded on the Cove Brook at sample location 7. This species was listed as Nationally Scarce during a recent review of the status of Great British spider species (Harvey *et al*. 2017).

Figure 1. Adult male signal crayfish recorded on the Cove Brook (sample location 11)

Figure 2. Raft spider recorded on the Cove Brook (sample location 9)

3.5.2. Wetland and Terrestrial Invertebrates

A provisional list of species of conservation status, and the compartment they were found in (Golf West (GW), Woodland (WO), Golf East (GE) and Mire (MI) has been provided in Table 17. More detailed analysis will be undertaken following completion of the surveys and presented in a separate report.

Table 17. Provisional list of invertebrates of conservation status

Species	Status	Compartments	Further Information
Raft Spider *Dolomedes fimbriatus*	Nationally Scarce	All	Abundant across the site. Found in all four compartments but particularly in the Mire.
Evarcha arcuata	Nationally Scarce	MI, GE	This jumping spider is often associated with heathland but also occasionally mire and bogs. It was abundant in the Mire and occasional in the eastern golf course.
Xysticus acerbus	Nationally Rare	MI	Single specimens of this large and dark crab spider were recorded in the Mire on both May and June visits. Although rare, the species seems to be expanding in range.
Trematocephalus cristatus	Nationally Scarce	WO	A small black and red jumping spider that although scarce, is abundant in the south east on trees in early summer.
Marpissa muscosa	Nationally Scarce	GW	A single adult of our largest jumping spider was found under bark to the west of the comp.
Thanatus striatus	Nationally Scarce	MI	A single adult of this crab spider was recorded in the mire in June.
Cassida prasina	Nationally Scarce	GE	A single specimen of this Yarrow-feeding tortoise beetle was recorded by suction sampler to the north of the compartment.
Alder Leaf Beetle	Nationally Rare, Data Deficient	GW	Several adults were found to the west of the compartment. This beetle is particularly abundant in Hampshire on Alder and is expanding in range.
Adonis Ladybird	Nationally scarce b	GE	A single specimen was found of this now quite frequently encountered ladybird.
Rhinocyllus conicus	Nationally Scarce	GE	This weevil feeds on thistles and though once scarce is now often abundant where the food plant is present.
Cryptocephalus parvulus	Nationally Scarce	GW	A single adult was swept from trees to the west of the compartment. Feeds on a range of trees but mainly birch.
Variimorda villosa	Nationally Scarce	GE	Found on Hogweed in a rough area of the compartment. A tumbling flower beetle.
Notaris scirpi	Nationally scarce b	MI	This weevil is fairly predictable in good wetland sites.
Zacladus exiguus	Nationally scarce b	GW	Found by suction sampler on the food plants, crane's-bills.
Tapeinotus sellatus	Nationally scarce a	MI	A single specimen recorded by suction sampler to the north of the mire. A genuinely scarce species that

			the author has not encountered before. Feeds on Yellow Loosestrife.
Dichrooscytus gustavi	Nationally scarce b	GE, GW	This bug was beaten from leylandii in both compartments. It was formerly only on Juniper but has spread to ornamental evergreen and is now less scarce, it is however the first time the author has encountered the species.
Small Heath	Near Threatened, Section 41	SE, MI	A familiar butterfly found in shorter grasslands.
Slender-horned Leatherbug *Ceraleptus lividus*	Nationally Scarce	GW	A single adult recorded by suction sampler to the far east of the compartment. The species likes warm areas with bare ground.
Empicoris baerensprungi	Nationally scarce a	GW	A strange and tiny assassin bug which is genuinely scarce and the only time the author has seen this species.
Tawny Cockroach	Nationally Scarce	MI	
Dusky Cockroach	Nationally Scarce	GW	

3.6. Reptiles

A peak count of eleven common lizard *Zootoca vivipara* and 20 slow worm *Anguis fragilis* have been recorded under the refugia at Southwood Golf Course, as detailed in Table 18. Common lizard was found on the eastern side of the site, on the bank of rough grassland to the south of the pond and in the south east corner of the site. Slow worms are present on both sides of the site, on the eastern side in the same locations as the common lizard, and on the western side to the north of the site, around the area of the pond, as shown in Map 18.

Table 18. Summary of reptile survey results

Date	Adder	Common lizard	Slow worm	Grass snake	Other
24.09.2018	0	5 (2 adults & 3 juveniles)	0	0	None
08.10.2018	0	7 (all adults)	0	0	Common frog Smooth newt Vole
26.10.2018	0	0	0	0	None
12.04.2019	0	7 (6 adults & 1 juvenile)	0	0	None
23.04.2019	0	2 (adults)	5 (3 adults & 2 juveniles)	0	Common frog
03.05.2019	0	11 (5 adults & 6 juveniles)	1 (adult)	0	Common frog
03.06.2019	0	3 (adults)	20 (10 adults & 10 juveniles)	0	Common frog

In addition, common frog *Rana temporaria*, smooth newt *Lissotriton vulgaris* and a vole have also been recorded utilising the refugia.

3.7. Water Vole and Otter

No evidence of otter or water vole was found during the survey. Assessment of the habitats for their suitability to support water vole indicate that they are currently unsuitable (no potential for enhancement) or sub-optimal (potential for enhancement). Total scores are detailed in Table 19 with a full breakdown in Appendix 6.

Table 19. Summary of water vole habitat suitability assessment

Location	Total	
	True left bank	True right bank
Ditch 1	3	3
Ditch 2	4	4
Ditch 3	5	1
Ditch 4	1	1
Ditch 5	5	2
Ditch 6	2	2
Ditch 7	5	2
Ditch 8	1	1
Ditch 9	3	1
Ditch 10	1	5
Ditch 11	1	1
Ditch 12	0	0
Ditch 13	5	2
Ditch 14	2	5
Pond 1	1	n/a
Pond 2	4	n/a

<3: unsuitable (no potential for enhancement); 3-5: sub-optimal (potential for enhancement); >5: optimal

4. ASSESSMENT AND RECOMMENDATIONS

This section details the assessment and recommendations as to how the target species groups/assemblages can be conserved and enhanced when the site becomes a SANG. The assessment and recommendations are made using the information gathered, in conjunction with information from existing surveys and reports, including the hydrological survey and management plan for the site, and a background data search provided by Hampshire Biodiversity Information Centre through Rushmoor Borough Council's existing service level agreement.

4.1. Amphibians

4.1.1. Summary

Evidence of amphibians, palmate newt, small newt (smooth or palmate females) and common frog, was found across the site in waterbodies with still to minimal flow during presence – absence surveys. Opportunities for breeding are limited on site; frog spawn was located in two of the ditches, but by the final visit, many of the ditches were drying or had dried out, making them unsuitable for breeding for newts.

The habitat suitability index assessment of waterbodies on site indicates their potential suitability for great crested newts. Although, the Habitat Suitability Index scores were of average to excellent potential to supporting great crested newts, this assessment is not precise enough to conclude that a high scoring pond will definitely support great crested newts. All the waterbodies on site are of poor water quality with few invertebrates and submerged plants, therefore limiting their ability to support great crested newt. No great crested newts or their eggs were located during the presence – absence surveys.

In addition, the background data search only returned one record of great crested newt located 1km to the north west of the site, separated from the site by major roads and a railway line.

4.1.2. Evaluation of potential impacts

As great crested newt are considered to be absent from the site, the proposed works will not impact this species.

However common frog, palmate newt and smooth newt are known to be present on site. Therefore if possible, works should be undertaken outside of the hibernation period, and where this is not possible, should avoid disturbing potential hibernacula. A hand search by a suitably qualified ecologist is also recommended prior to works in any areas of suitable habitat such as long grassland and around waterbodies.

Common frog, common toad, palmate newt and smooth newt are protected against sale and trade under Section 9(5) the Wildlife & Countryside Act 1981 (as amended).

4.1.3. Conservation and enhancement recommendations

As several of the waterbodies on site contain amphibians, as many as possible should be retained and where possible enhanced. Enhancements should include the re-profiling of banks to create shallower, vegetated banks, and ponds with submerged aquatic vegetation which retain water for a more extended period of time, providing opportunities for newts to breed. For those lost as part of the development of the site, alternative wildlife ponds should be created.

A complex of ponds should be created, as this is more robust (e.g. from pollution events) and allows colinisation for those species, such as great crested newt, that form metapopulations.

Ponds should have well connected surrounding terrestrial habitat for foraging, shelter and hibernation, including rough grassland, scrub and woodland. Brash and log piles should be interspersed throughout this habitat in suitable areas away from potential interference and damage by visitors, and risk of flooding during winter, to provide additional hibernation sites.

4.2. Aquatic Invertebrates

4.2.1. Summary

The waterbodies and watercourse on the site are considered to support aquatic macroinvertebrate communities/assemblages of moderate to low ecological value. They comprise a moderate diversity, often dominated by one or two families/taxa. The Cove Brook and pond in the north/north east are considered to be of highest value on site (but still at moderate ecological value), whereas the ditch in the west of the sites (sample locations 4 and 5 on Map 6) is considered to be of lowest ecological value.

These findings are considered to be a reflection of the moderate to low quality of the habitats present within these waterbodies/watercourses. In particular, the dominance of a thick layer of silt and leaf litter over the pond, ditch and stream beds, and the slow and sluggish flows present in the latter two. Furthermore, the presence of concrete lining to the sides and bed of multiple watercourses, and the observation of an unknown discharge into at least one pond, is likely to be further adversely impacting the ecological value of these habitats and the aquatic macroinvertebrate communities/assemblages they support.

4.2.2. Evaluation of potential impacts

It is considered that the current limited evidence of sympathetic management and/or lack of remedial capital works, and a continuation of this in the future, is a considerable risk to the ecological value of the aquatic macroinvertebrate communities/assemblages on site. Specifically, without more active, sympathetic management and habitat enhancement works, it is considered likely that these ponds will at best continue to support aquatic macroinvertebrate communities/assemblages of moderate to low ecological value, but are in fact likely to reduce in value further.

It is likely that nutrients contained within the thick layer of silt and/or accumulated leaf litter present across these habitats, may be mobilised during capital works and therefore pose a pollution risk to the aquatic macroinvertebrate communities/assemblages. Furthermore, the use of machinery by aquatic habitats, and any introduction of organic and inorganic material as part of future enhancement works, poses a further pollution risk to aquatic macroinvertebrate communities/assemblages.

It is therefore recommended that advice from the Environment Agency, other relevant statutory bodies, and specialist contractors is sought early in the design process of any proposed future enhancement works on these habitats.

4.2.3. Conservation and enhancement recommendations

As outlined above, it is recommended that detailed designs for a programme of habitat enhancement works, including plans for their subsequent management, is drawn up in consultation with the relevant statutory bodies and with specialist advice. In brief, it is recommended that measures to be should include, but not necessarily be limited to:

- Removal of the concrete lining in sections of the Cove Brook
- Naturalisation of watercourses through the introduction of sinuosity into currently canalised or artificially straightened sections of channel
    - This could be achieved through channel realignment, soft engineering of the banksides and margins, or the introduction of organic/inorganic material into the channel
- Targeted removal/pruning of trees alongside/adjacent to watercourses and waterbodies to facilitate vegetation growth and reduce the leaf litter load entering these systems
- Marginal vegetation planting
- De-silting/removal of deep leaf litter deposits from stillwater waterbodies
- Investigation of and, if necessary, addressing the current intermittent discharge of water of unknown origin into one or more waterbody and watercourse
- Address non-native invasive species (see Section 4.8).

4.3. Badger

4.3.1. Summary

Evidence of badger was found on site, including an outlier sett in the south east corner of the site and latrines in areas of rough grassland on both the east and west sides of the site. The rough grassland and woodland offer suitable foraging habitat for badger, whilst the earth bank and sloping areas of the site within the woodland and rough grassland offer limited sett building opportunities. Records of badger are also detailed within the 1km search area of the HBIC data search.

4.3.2. Evaluation of potential impacts

Any proposed work within the vicinity of the badger sett would need to be planned to avoid damage, disturbance or destruction of the sett if it is in use.

In England, badgers are primarily afforded protection under the Protection of Badgers Act 1992. Under this legislation, any activities that wilfully kill, injure, take, possess or cruelly ill-treat a badger, or attempt to do so, or intentionally or recklessly interfere with a sett, will constitute an offence unless conducted under licence. Sett interference includes disturbing badgers whilst they are occupying a sett, as well as damaging or destroying a sett or obstructing access to it.

In addition, Schedule 6 of the Wildlife and Countryside Act 1981 also prevents badgers from being killed or taken by certain methods, while the Protection of Animals Act 1911 protects badgers from being caused unnecessary suffering.

Additionally, the location/proximity of the path to the sett should be considered, as there is the potential for interference by dogs to the sett.

4.3.3. Conservation and enhancement recommendations

The design should include the provision of extensive foraging habitat, including rough grassland, tree-lines and copses that are well connected, allowing easy movement around the site.

Areas should be retained on site that are more inaccessible i.e. no paths and scrub/rough grassland to limit disturbance by visitors, particularly by dogs off leads.

4.4. Bats

4.4.1. Summary

The woodland, tree lines and rough grassland areas provide excellent foraging and commuting habitat for bats, and are currently being used by common and widespread species of bat. There are extensive records of bats within the 1km HBIC data search area, for at least six species.

4.4.2. Evaluation of potential impacts

The proposed scheme of works will not impact features used by commuting and foraging bats. No works are proposed to remove trees, however if this changes, a ground level tree survey for bats and Phase 2 (evening emergence and dawn re-entry surveys), as appropriate, will be required prior to works.

All bat species are listed on Schedule 5 of the Wildlife & Countryside Act 1981, and protected under Part 1 Section 9, meaning it is an offence to:

- Intentionally or recklessly kill, injure or take a bat
- Intentionally or recklessly damage or destroy any structure or place used for shelter or protection
- Disturb a bat while it is occupying a structure or place which it uses for shelter or protection
- Obstruct access to any structure or place used for shelter or protection
- Possess or control any live or dead bat, or any part of, or anything derived from a bat

In addition, all bat species are listed under Schedule 2 of the Conservation of Habitats & Species Regulations 2017, meaning it is an offence to:

- Deliberately capture, injure or kill a bat

- Deliberately disturb a bat; in particular that is likely to impair their ability:
  (i) To survive, to breed or reproduce, or to rear or nurture their young; or
  (ii) In the case of hibernating or migratory species, to hibernate or migrate;
- To affect significantly the local distribution or abundance of the species to which they belong
- Damage or destroy a breeding site or resting place of a bat
- Be in possession of, or to control a bat
- Transport, sell, exchange, or offer for sale or exchange, any live or dead bat, or part of.

All bat roosting sites receive legal protection, even when bats are not present.

4.4.3. Conservation and enhancement recommendations

A habitat mosaic incorporating copses, wooded corridors, rough grassland and wet grassland habitats, that have edge and transitionary habitats to maximise potential food sources and create sheltered areas with microclimates to attract insects should be implemented. Links to adjacent suitable habitat should be retained and enhanced.

If any lighting is planned for the site, it should be designed to minimise spill and duration:

- Lights will be directed downwards and away from features of interest (hedgerows and trees);
- have cowls or hoods (where required) to direct light downwards and restrict the area to be lit;
- be on timers so only work at the appropriate time of day, ensuring dark periods, and be triggered by motion sensors;
- use narrow spectrum light sources that emit minimal UV light, peak higher than 55nm and be of a warm/neutral colour temperature <4,200 kelvin (BCT 2014);
- low pressure sodium and warm white LED lighting (Stone 2013).

4.5. Breeding Birds

4.5.1. Summary

The site supports 35 species of bird, including nine notables. They are found across the site, utilising the various habitats including the trees, scrub, rough grassland, wet grassland and reedbed, for foraging and shelter. The HBIC data search returned records for 104 protected and/or notable species within 1km of the site.

There are also five possible and confirmed swift *Apus apus* breeding sites within 1km of the site (sourced by HBIC from the interest group known as 'Hampshire Swifts').

4.5.2. Evaluation of potential impacts

The landscaping associated with the creation of the SANG has the potential to cause the loss of scrub habitat and trees.

In England, common species of bird, their eggs and nests are provided partial protection under the Wildlife & Countryside Act 1981 (as amended). Under this legislation any activities that result in the intentional death, injury, or taking or any wild bird, their eggs or nests will constitute an offence unless conducted using suitable avoidance measures such as not undertaking works during the breeding bird season (March to August inclusive). Special penalties are available for offences related to birds listed on Schedule 1, for which there are additional offences for disturbing these birds at their nests, or their dependent young.

4.5.3. Conservation and enhancement recommendations

It is recommended that works should avoid the bird nesting season (March – August inclusive). If this is not feasible, a suitably experienced ecologist should be employed immediately preceding the works to carefully check for the presence of breeding birds and/or their nests at the proposed site, and works may commence if none are found. If birds' nests are found prior to or during the works, then these will need to be protected until after the young have fledged, and it will be the responsibility of the ecologist to determine whether works can safely continue around these.

Scrub and trees are important habitats for a number of birds on the site including protected and/or notable species recorded on site such as song thrush and house sparrow. Managing scrub and trees with breeding birds in mind is recommended and could include maintaining understorey vegetation

and varied age and structure, to ensure continued shelter and food sources. Ideally, any management activities should be carried out in January and February; this avoids the bird breeding season (February to August inclusive) and allows birds to take advantage of berries in the autumn.

The rough and wet grassland areas provide foraging habitat for a range of species, whilst the reedbeds provide nesting and sheltering opportunities for notable species such as reed bunting, which are found on site. The development of the site should retain this habitat mosaic to conserve and enhance the bird assemblage currently supported at the site.

4.6. Reptiles

4.6.1. Summary

Common lizards and slow worms have been recorded on site, and the area also has the potential to support grass snake. In addition, the HBIC background data search returned records for all four widespread reptile species (adder, common lizard, grass snake and slow worm) within the 1km search area.

4.6.2. Evaluation of potential impacts

The proposed scheme of works will result in the loss of some of the suitable reptile habitat, particularly from the extension and creation of woodland. Works have the potential to injure or kill widespread reptile species when undertaken in areas of suitable habitat if suitable precautions are not taken.

In England, widespread reptile species (i.e. common lizard, grass snake, slow-worm and adder) are provided partial protection under the Wildlife and Countryside Act 1981 (as amended) through their inclusion on Schedule 5 (killing, injury and sale only). Under this legislation, any activities that result in the death or injury of individual reptiles will constitute an offence; therefore, works would need to be undertaken under a method statement.

4.6.3. Conservation and enhancement recommendations

Depending on the nature and extent of works, the following measures should be taken in any areas where reptiles are known to be present or support suitable habitat, namely rough grassland or potential hibernacula. For any short-term and/or small-scale works, works should be undertaken following a hand search by a suitably qualified ecologist. Disuassion techniques can also be employed to reduce the likelihood of reptiles being present in the works area. This comprises a graded cut under the supervision of a suitably qualified ecologist. The ecologist will undertake a handsearch before the first cut down to 20cm, a second handsearch will then be conducted and the vegetation cut to 5cm, a final search by the ecologist will then be undertaken before the vegetation is cut to ground level.

For larger scale works and/or habitat loss, exclusion fencing around the works area will be erected prior to works commencing, and a period of translocation within the works area will be undertaken to ensure any reptiles present have been removed. The translocation will be undertaken for a minimum of 15 days, in suitable weather conditions (no rain and above 11°C) and at an appropriate time of year, April to October, when reptiles are still active. Five clear days (no catches) at the end of the translocation period are required before works begin.

Following 15 suitable days of translocation, a graded cut using a strimmer will be undertaken under the supervision of a suitably qualified ecologist. The ecologist will undertake a handsearch before the first cut down to 20cm, a second handsearch will then be conducted and the vegetation cut to 5cm, a final search by the ecologist will then be undertaken before the vegetation is cut to ground level. Any reptiles found will be moved to other suitable areas of habitat outside of the exclusion fencing, namely the rough grassland on the site where works are not occurring.

Areas of rough grassland should be retained and extended wherever possible to create a more extensive acid grassland habitat that is able to support widespread reptile species (as well as amphibians), with suitable areas for foraging and basking. These should be connected to areas of scrub and woodland edges with hibernation potential.

Hibernacula in the form of log piles should be created within the edge habitat, located in areas where they will not be disturbed by visitors to the site or at risk of being flooded over winter.

4.7. Water Vole and Otter

4.7.1. Summary

No evidence of water vole or otter was found during the survey. Many of the water bodies on site were unsuitable for water vole, however, some were sub-optimal with the potential to be enhanced to increase their suitability for water vole. The HBIC background data search returned no records for otter or water vole on or within 1km of the site.

4.7.2. Evaluation of potential impacts

As otter and water vole are considered absent from the site, no specific recommendations for either of these species are provided.

4.7.3. Conservation and enhancement recommendations

Whilst otter and water vole are not present on site, enhancements can be made to the existing waterbodies, namely Cove Brook, which would benefit otter and water vole, as well as a range of other species.

Cove Brook should be naturalised and opened up, to reduce shading and leaf litter accumulation, which will allow bankside vegetation growth. Banks should be cut to create a steeper side suitable for burrowing and a shallower bank more suitable for vegetation growth. This will also benefit other small mammals, birds and invertebrates.

4.8. Invasive Non-native Species

4.8.1. Summary

North American signal crayfish were recorded in the Cove Brook and a small ditch in the south/south east of the site during aquatic macroinvertebrate and otter/water vole surveys. Furthermore, New Zealand pygmyweed dominates the pond in the north/north east of the site, and Himalayan balsam was recorded near the downstream extent of the Cove Brook. They have also been observed in other locations on site by other parties. These species are listed under Schedule 9 of the Wildlife and Countryside Act 1981 (as amended).

4.8.2. Evaluation of potential impacts

It is an offence under the Wildlife and Countryside Act 1981 to cause any species listed on Schedule 9 to spread into the wild. Therefore, these should be controlled so not to cause them to spread on this site or other sites.

There is a considerable risk that the distribution of these species could be spread both within, and beyond the site boundary, through future management practices (active and/or passive), habitat enhancement works, and the increased recreational use of the site associated with its proposed designation as a SANG. Specifically, there is the risk that the disease ‘crayfish plague’ carried by signal crayfish could be transferred onto equipment used by practioners and/or recreational users, and on the kit and machinery utilised in any future habitat enhancement works.

New Zealand pygmyweed can readily be transferred by similar vectors, with only very small fragments of the plant required to establish a new outbreak.

The nature of seed dispersal in Himalayan balsam, and its presence on the banks of the lower extent (within the site) of a flowing waterbody, represents a high likelihood of this species being spread both within and beyond the site boundary, with or without anthropogenic intervention.

4.8.3. Recommendations

It is strongly recommended that immediate action is taken to prevent the further spread of New Zealand pygmyweed across the site. Where practical, this should include (but may not be limited to) a survey of all waterbodies/watercourses to determine the full distribution of this species on site, the exclusion of access (both people and animals such as dogs or livestock) to all areas where this

species is/has been recorded, and (if feasible) the appointment of a specialist contractor to treat all locations currently supporting this species.

Action should be taken as soon as possible to prevent the further spread of Himalayan balsam within and beyond the site boundary. A survey should be conducted in early summer of all waterbodies/watercourses determine the distribution of this species on site. Subsequently, efforts should be made to remove this plant, potentially through the creation or use of an existing volunteer conservation group, to manually remove all individual plants through focused actions in late June to August/September. This species should be continually monitored and activity may need to be repeated across multiple summers, particularly if similar activities are not been undertaken elsewhere in the catchment. Where possible, this should be co-ordinated with landowners up- and downstream to deliver a targeted and concerted effort to control Himalayan balsam in the area.

Given the presence of signal crayfish on this site, any proposed/future habitat enhancement works that directly contact/affect the beds or banks of the waterbodies/watercourses present at the site, will require the implementation of stringent biosecurity safeguards. This will minimise the risk of transferring signal crayfish, or the disease crayfish plague, within or from the site and avoid an offence being committed.

Particular risks include the movement of personnel, equipment and machinery to and from the site, and the disposal of spoil or in-channel/bankside vegetation that may harbour signal crayfish or crayfish plague.

It is strongly recommended that a stringent biosecurity protocol is agreed between all the relevant statutory bodies and stakeholders as early in the pre-works planning process as is possible. It is recommended that measures should include, but not necessarily be limited to:

- All site staff must be briefed with regards to the presence of signal crayfish on the site and must be familiar with the recommendations set out within this section.
- No crayfish, either live or dead, should be removed from the site; emphasise to all staff that it is illegal to trap any species of crayfish without a licence from the Environment Agency, and it is illegal to move any species of crayfish to a new site without written permission from Natural England.
- It is highly likely that any bank side/bed material removed as part of the proposed scheme options will contain (potentially a large number of) signal crayfish, and therefore careful consideration must be given to the control and disposal of this material.
- Furthermore, guidance should be sought from the statutory bodies with regards to -
    - (Natural England/Environment Agency) the necessity and recommended measures required to dispose of potentially a large number of signal crayfish; and
    - (Environment Agency) where relevant the proximity to the watercourse that the material can be deposited to ensure that any undetected signal crayfish may return to the existing population (rather than spread outwards), whilst adhering to any other regulatory conditions (e.g. through the Environment Permitting process).
- Where practicable, staff should not move between sites; if this is not feasible, staff must thoroughly clean, disinfect/treat with hot water and dry their equipment (e.g. waders, wellington boots, etc.) before entering the site and before moving to a new site.
- All large equipment and machinery should be cleaned with hot water/disinfected where feasible, and allowed to dry prior to arriving on site and before being transferred to a new site.
- If stocking with aquatic plants or incorporating inorganic material, do not use material or stockists from watercourses that are known to support non-native crayfish.

Finally, it is strongly recommended that accessible, targeted signage is strategically deployed across the site providing information on the presence of the invasive non-native species present at the site, the risks they pose to our native flora, fauna and habitats, and the biosecurity measures that they can do to minimise the risk of the spread of these species. The advice provided should be consistent with that provided on GB Invasive Non-native Species Secretariat's website (http://www.nonnativespecies.org) including the 'Check-Clean-Dry' and 'Be Plant Wise' campaigns.

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MAPS

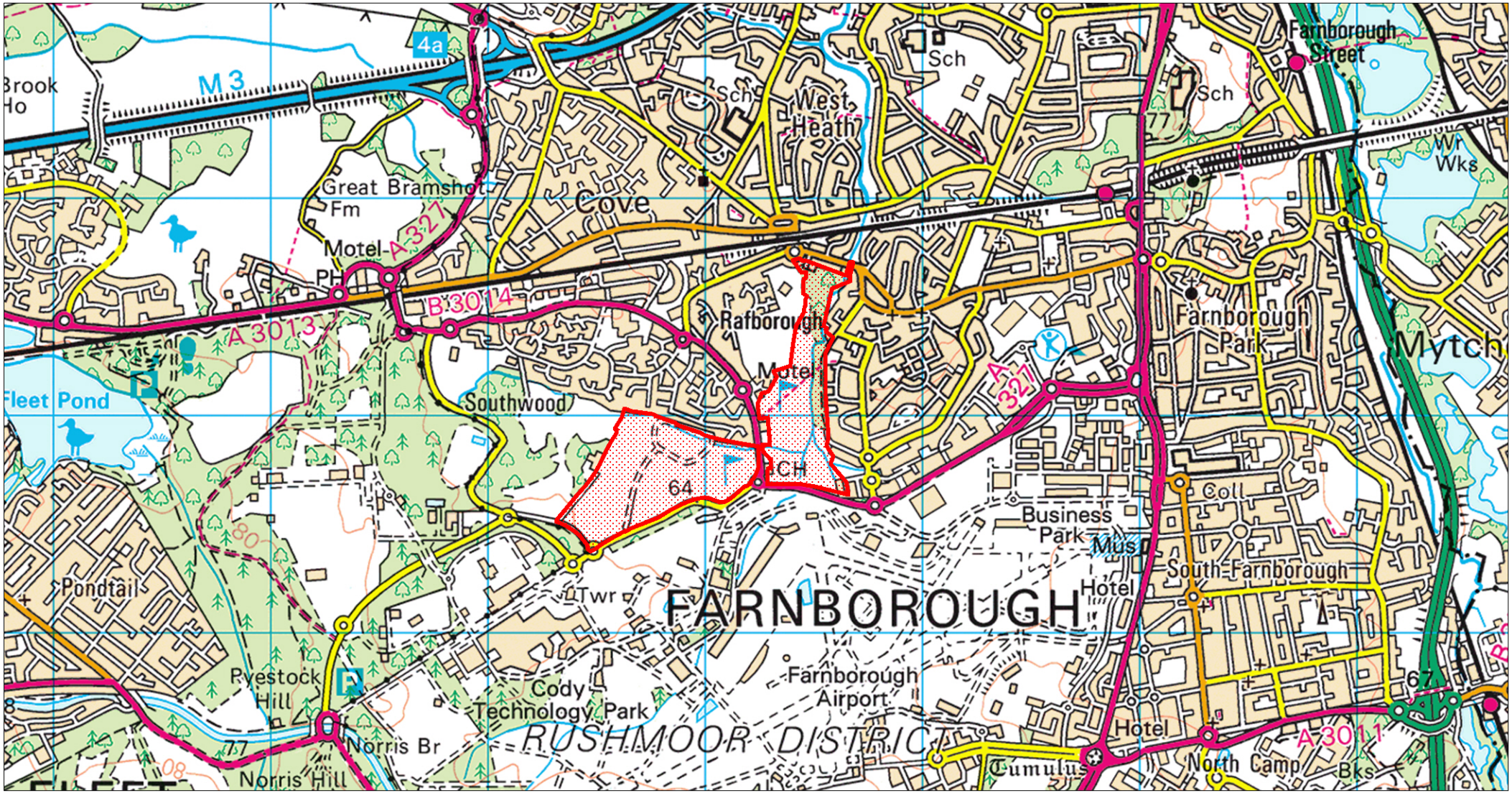
Location within county:

Map 1. Site Location

Southwood Country Park

Scale 1:25000

Site boundary



Produced on 3 July 2019 by Sarah Jackson For enquiries relating to GIS data contact Catherine McGuire, email Catherine.McGuire@hiwwt.org.uk, tel: 01489 774455.

Location within county:

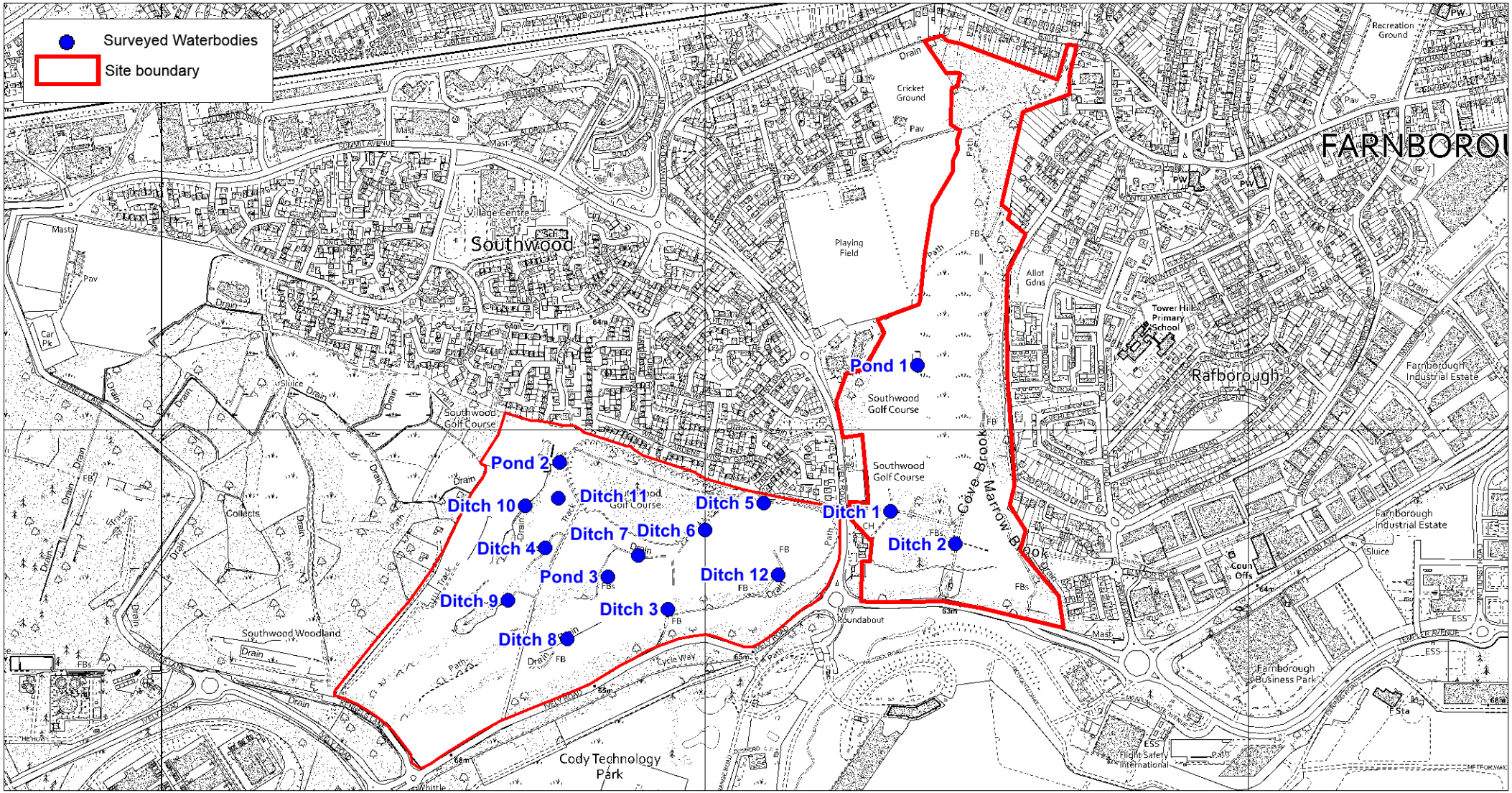
Map 2. Amphibian Survey Locations

Southwood Country Park

Scale 1:10000

Arcadian

The Wildlife Trusts
Hampshire & Isle of Wight Wildlife Trust



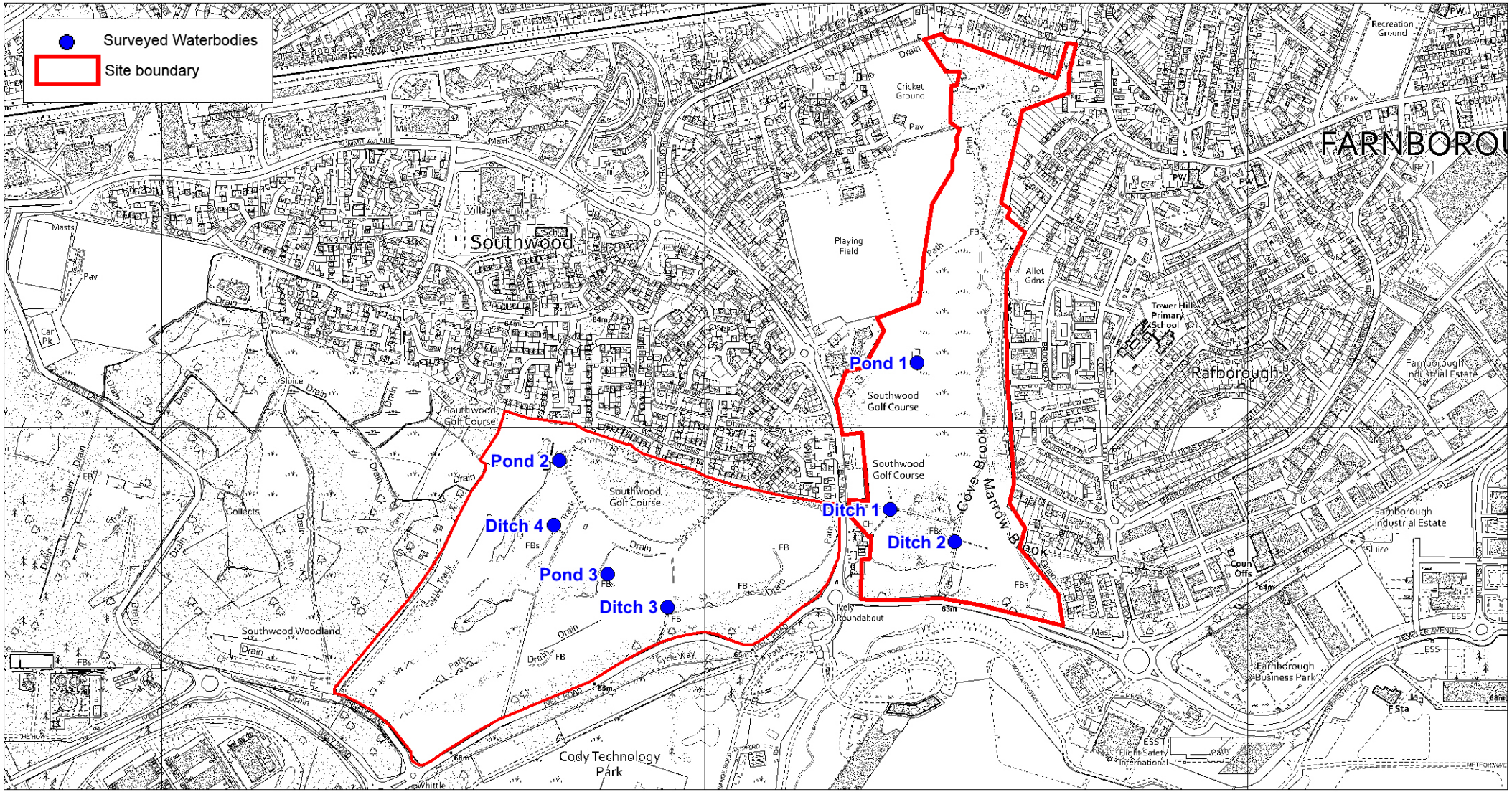
Produced on 18 July 2019 by Sarah Jackson For enquiries relating to GIS data contact Catherine McGuire, email Catherine.McGuire@hiwwt.org.uk, tel: 01489 774455.

Location within county:

Map 3. Waterbodies in HSI Assessment

Southwood Country Park

Scale 1:10000



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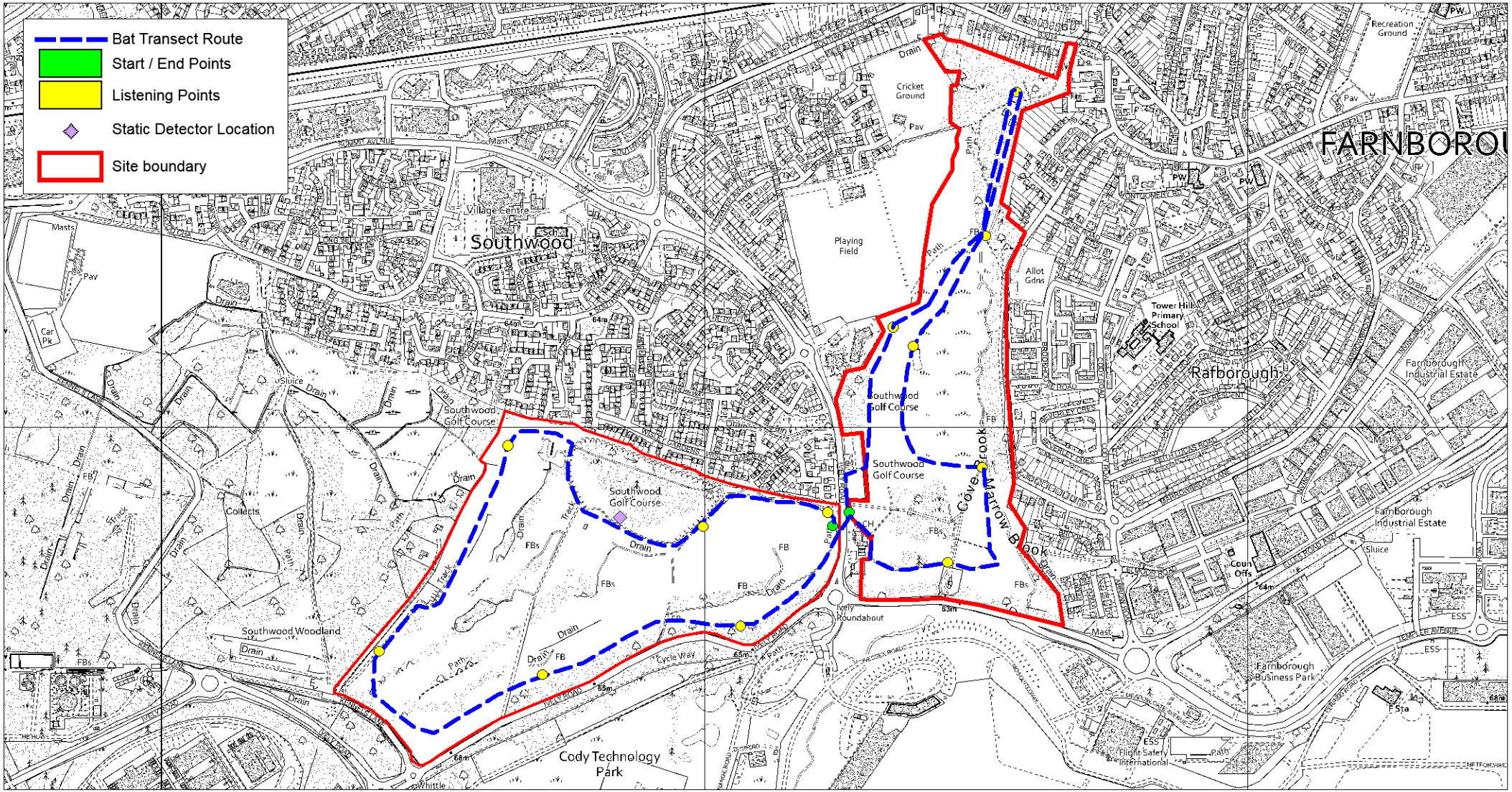
Location within county:

Map 4. Bat Transect Route and Static Bat Detector Location

Southwood Country Park

Scale 1:10000



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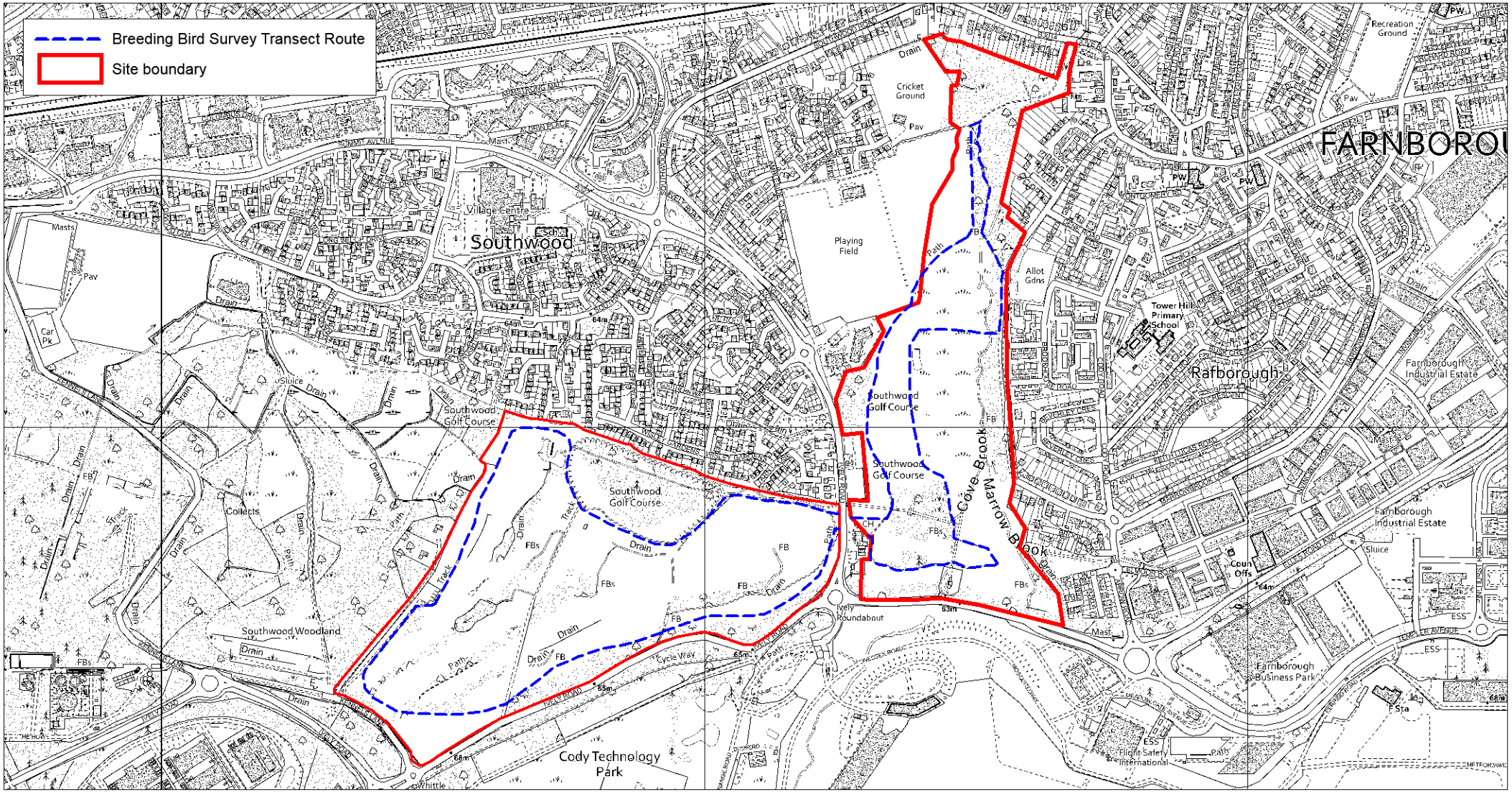
Location within county:

Map 5. Breeding Bird Survey Transect Route

Southwood Country Park

Scale 1:10000



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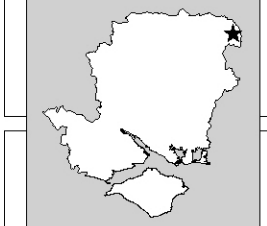
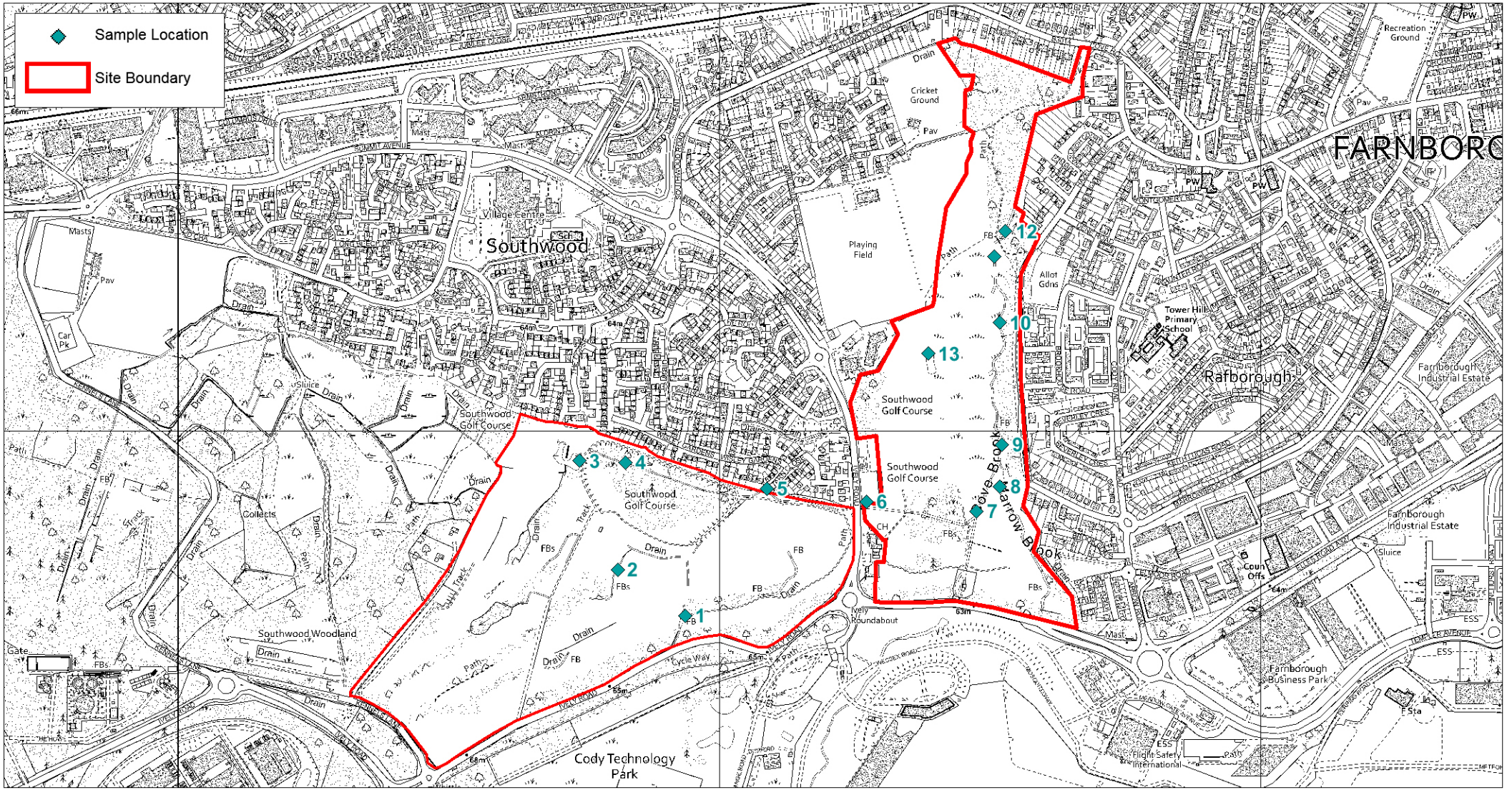
Location within county:



Map 6. Aquatic Macroinvertebrate Sample Locations

Southwood Country Park

Scale 1:10000



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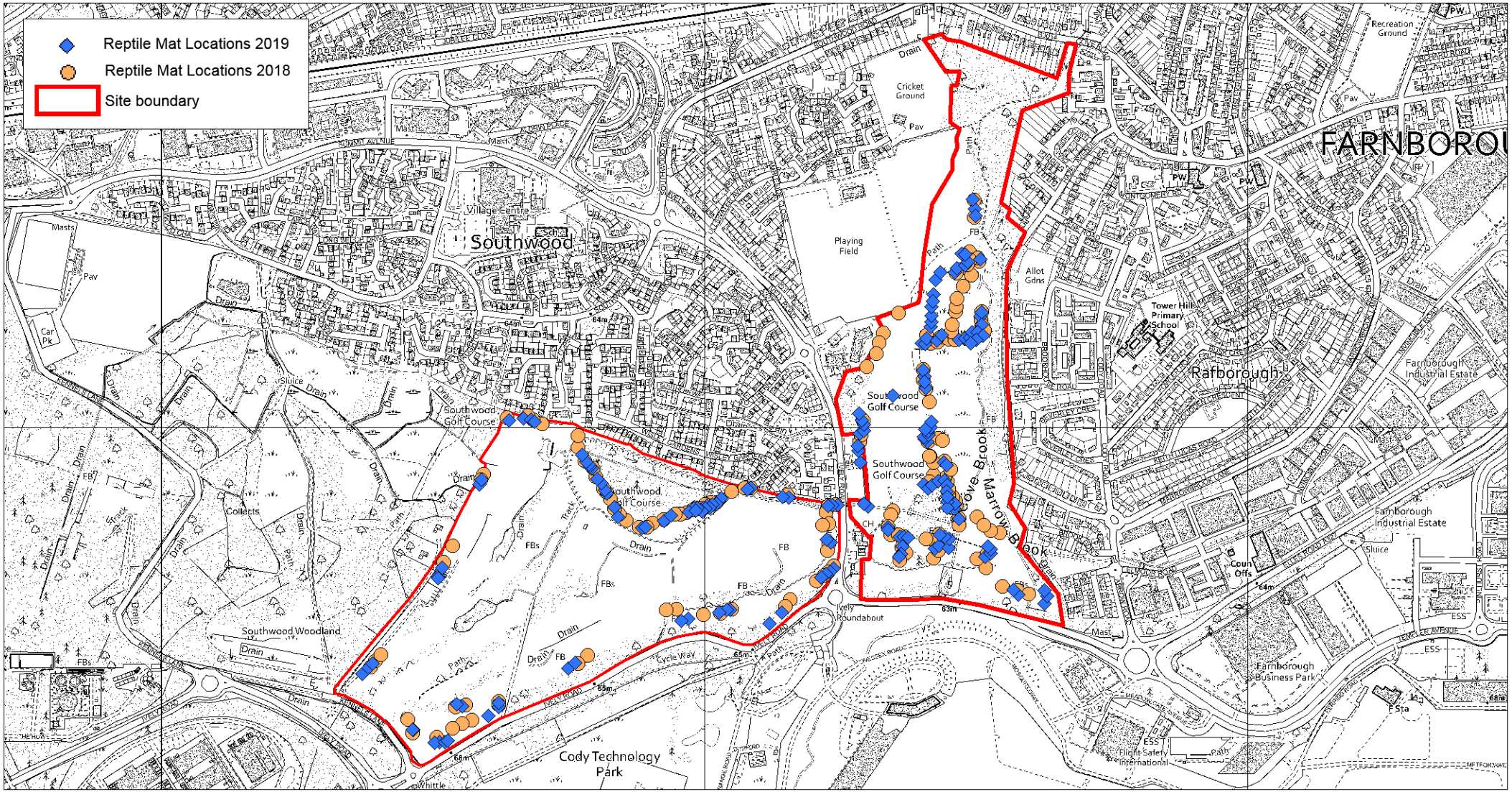
Location within county:

Map 7. Reptile Refugia Locations

Southwood Country Park

Scale 1:10000



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Location within county:

Map 8. Water Vole and Otter Survey Locations

Southwood Country Park

Scale 1:10000

Arcadian

The Wildlife Trusts
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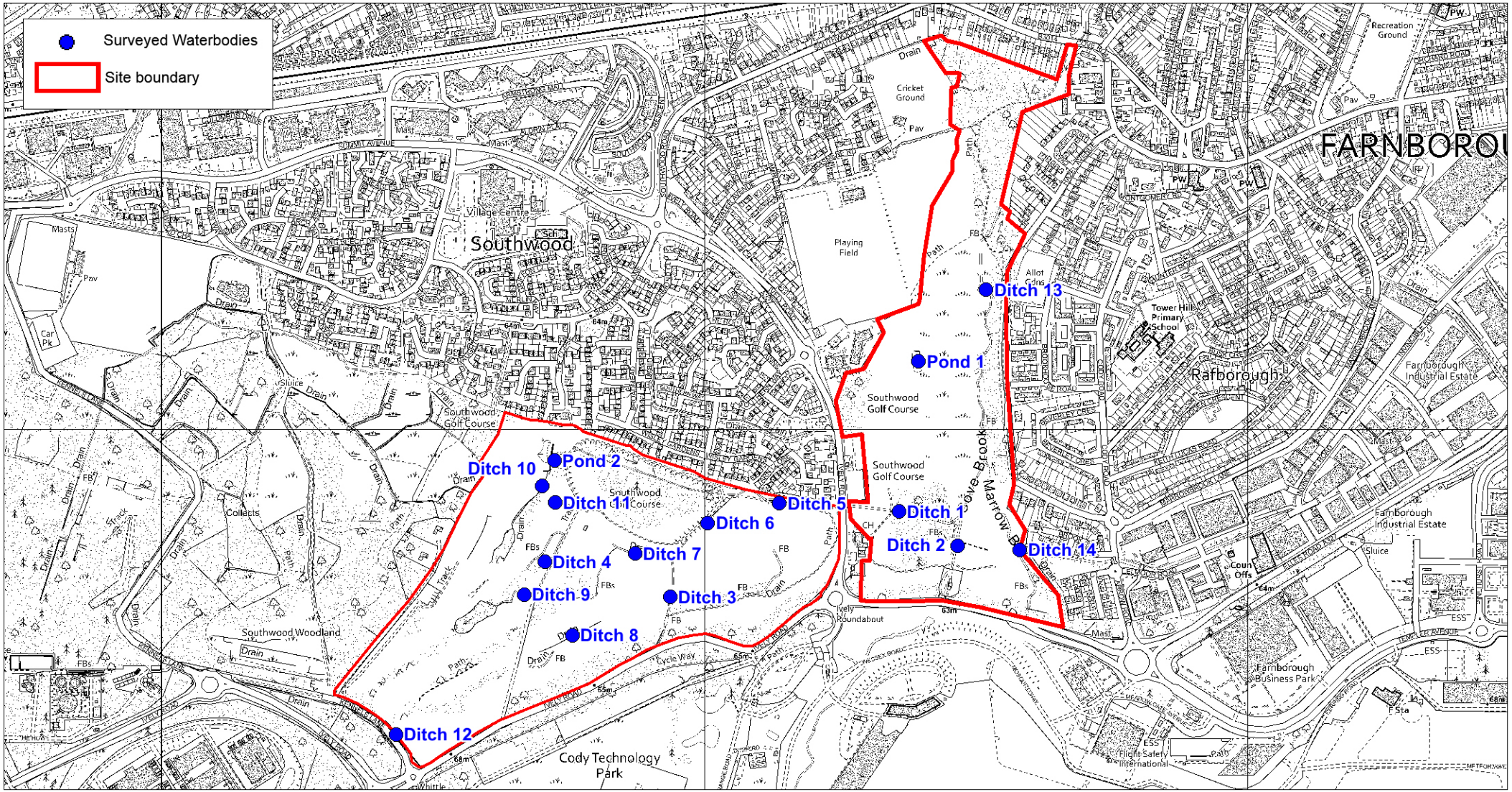

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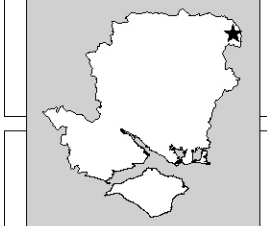
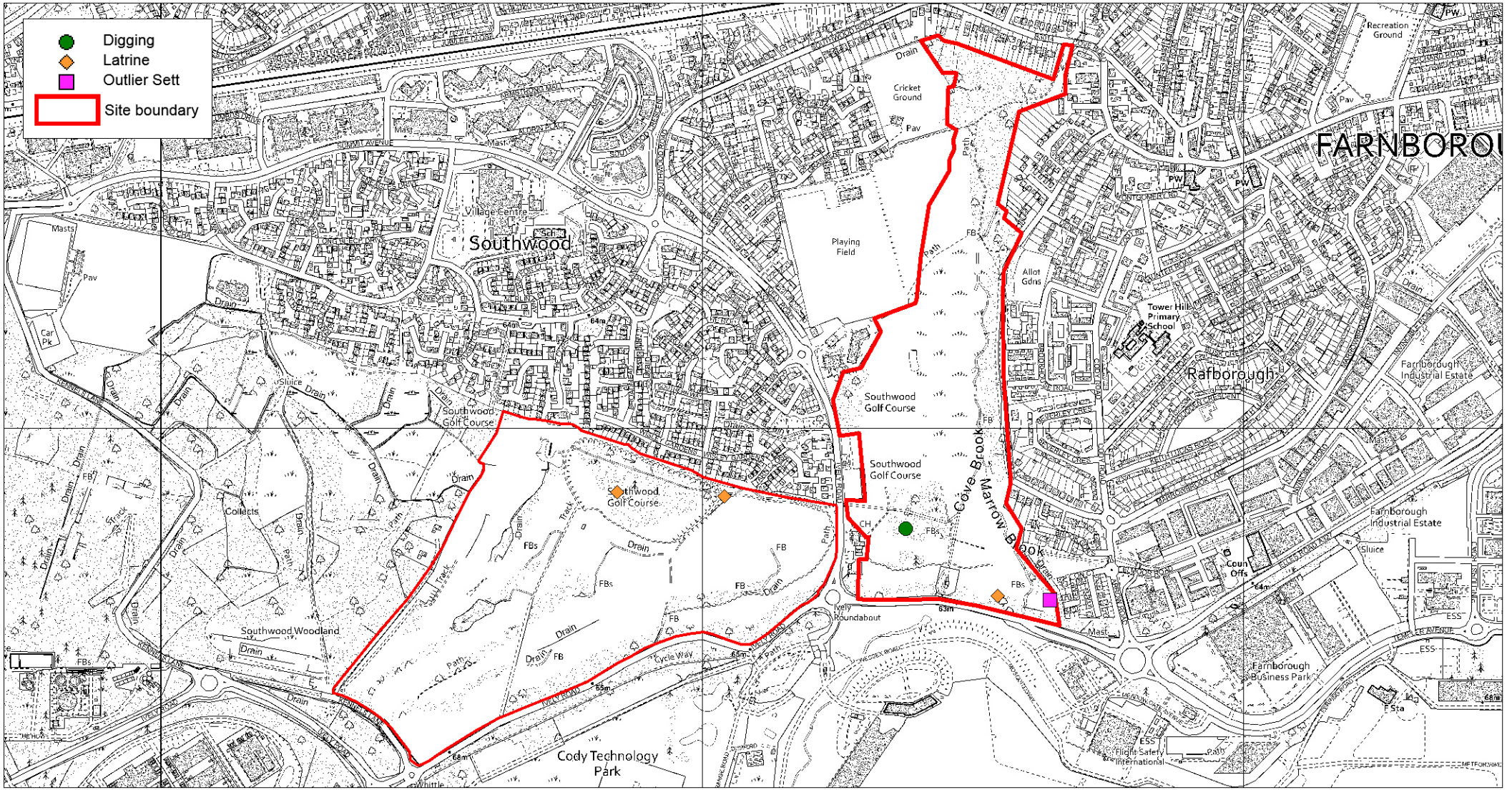
Location within county:



Map 9. Badger Signs

Southwood Country Park

Scale 1:10000



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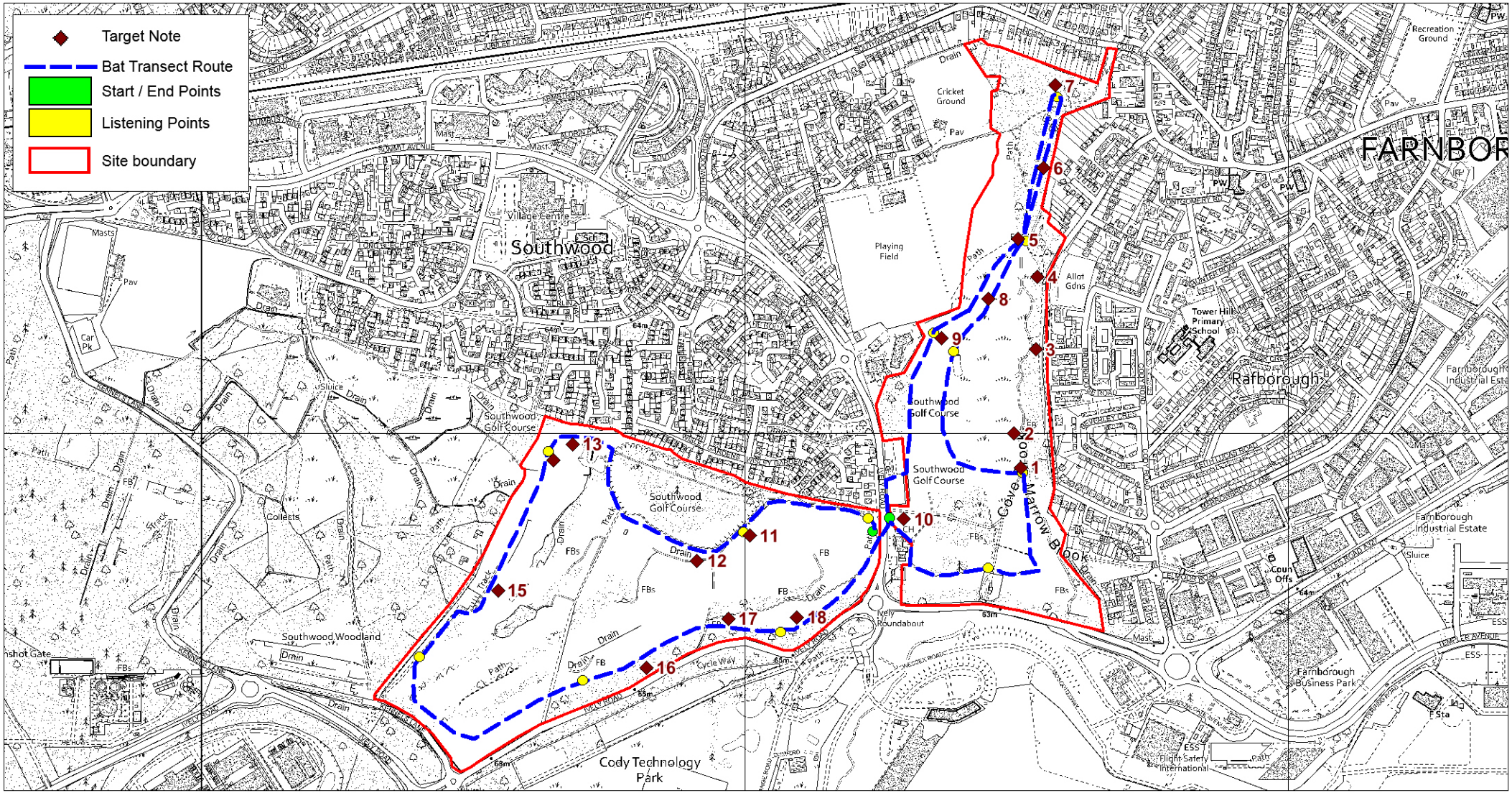
Location within county:

Map 10. Bat Activity Survey: 17 September 2018

Southwood Country Park

Scale 1:10000



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Location within county:

Map 11: Bat Activity Survey: 20 March 2019

Southwood Country Park

Scale 1:10000

Arcadian

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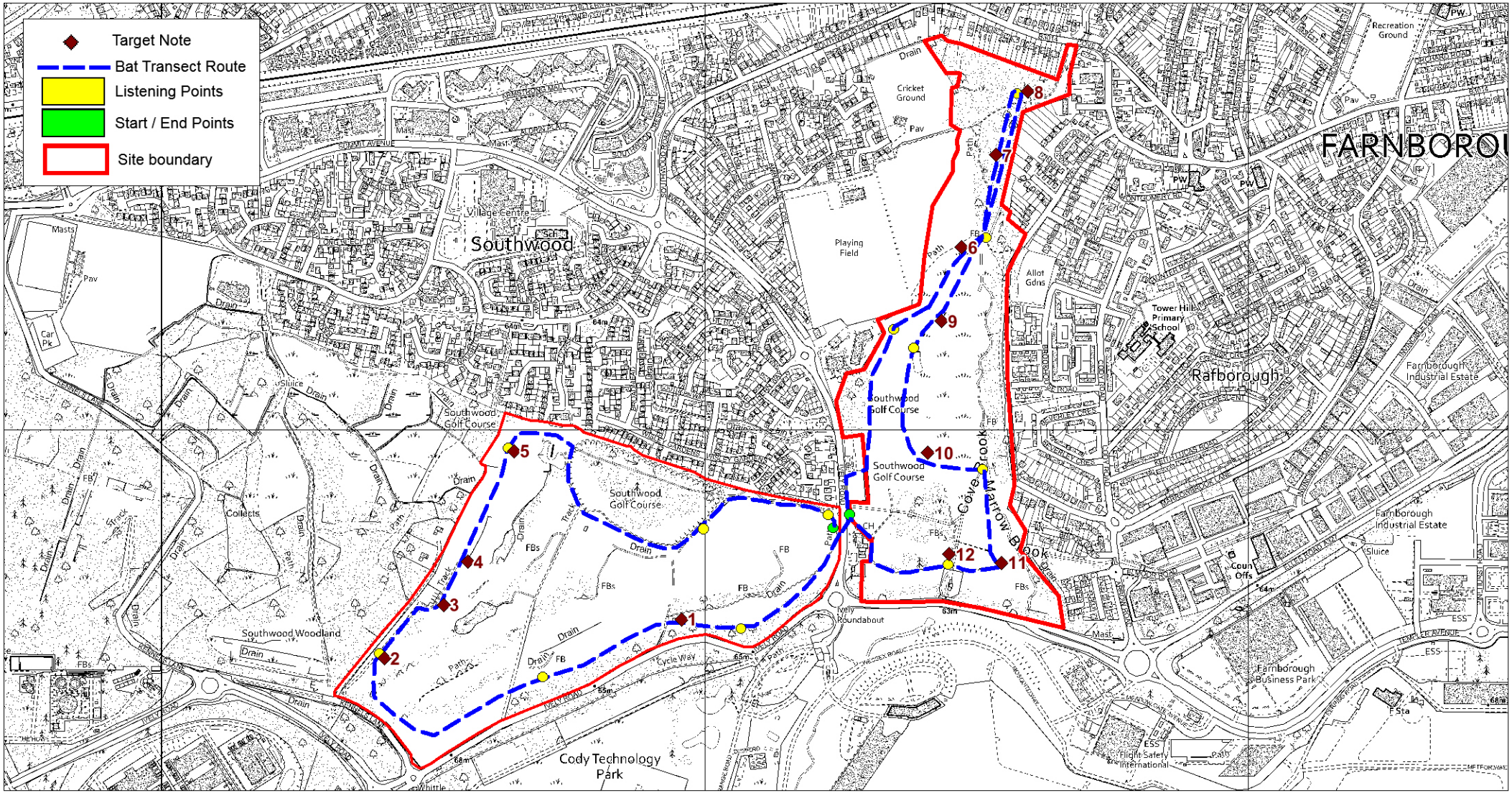

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Location within county:

Map 12: Bat Activity Survey: 16 May 2019

Southwood Country Park

Scale 1:10000

Arcadian

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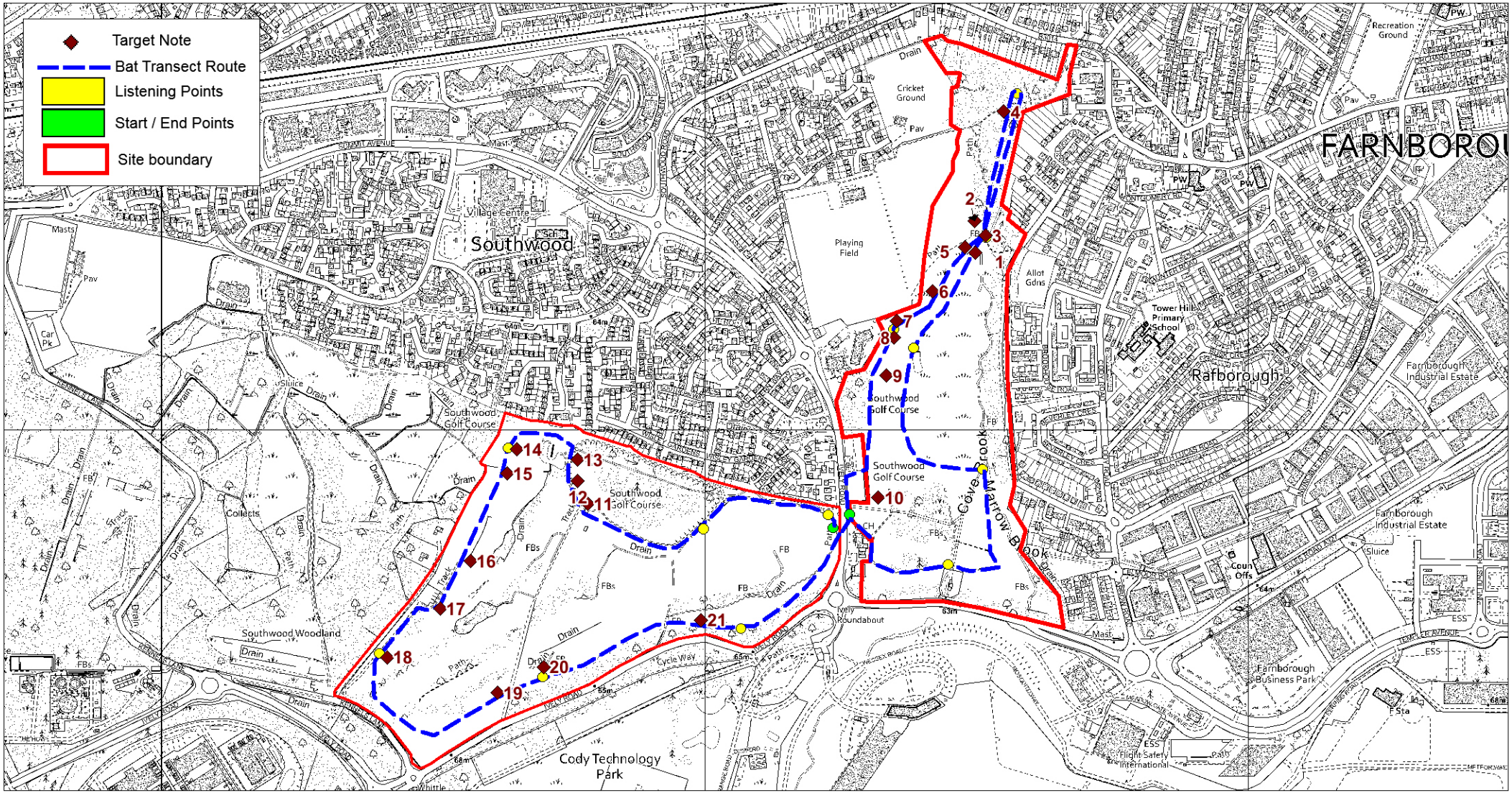

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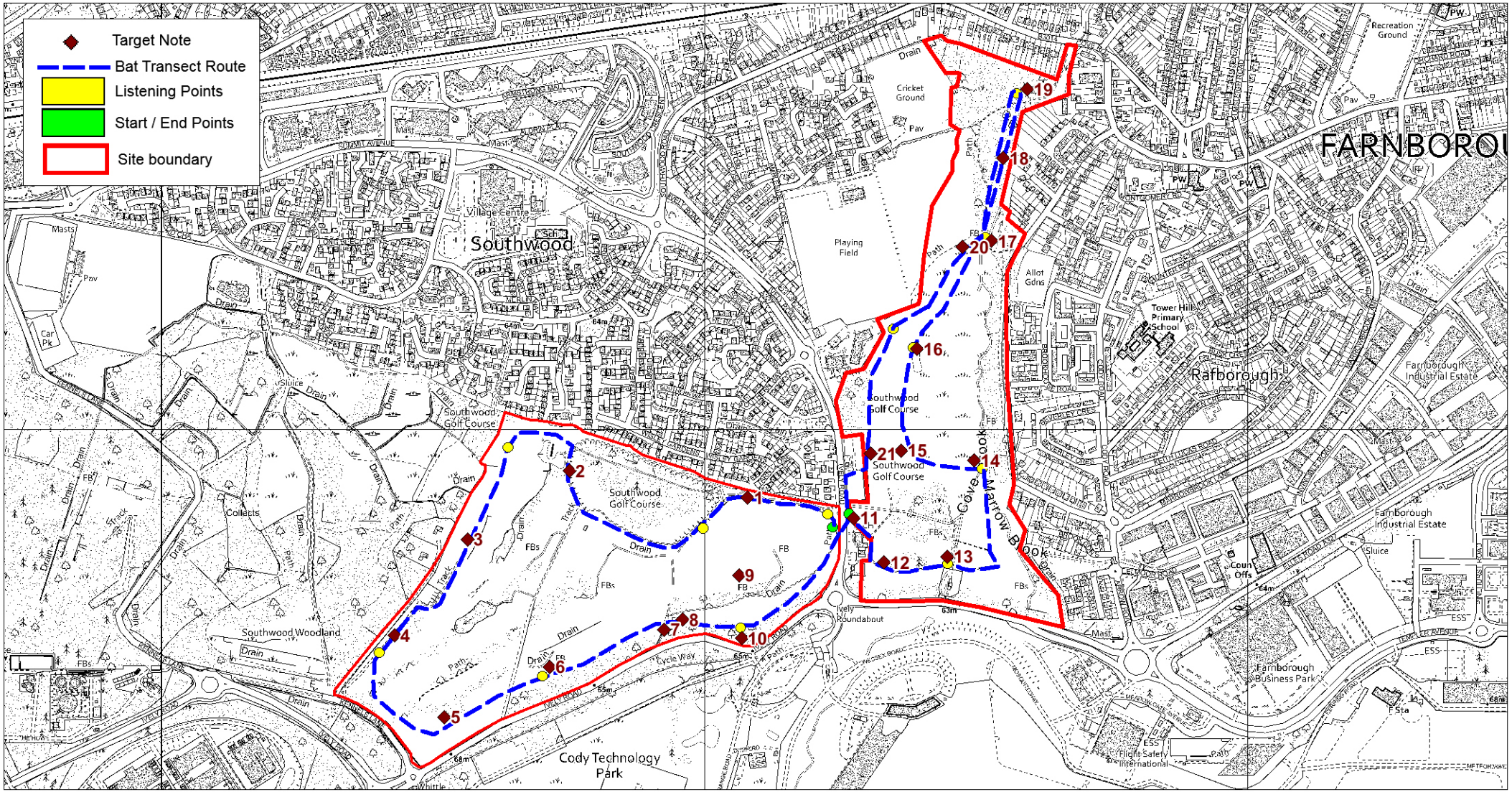
Location within county:

Map 13: Bat Activity Survey: 15 July 2019

Southwood Country Park

Scale 1:10000



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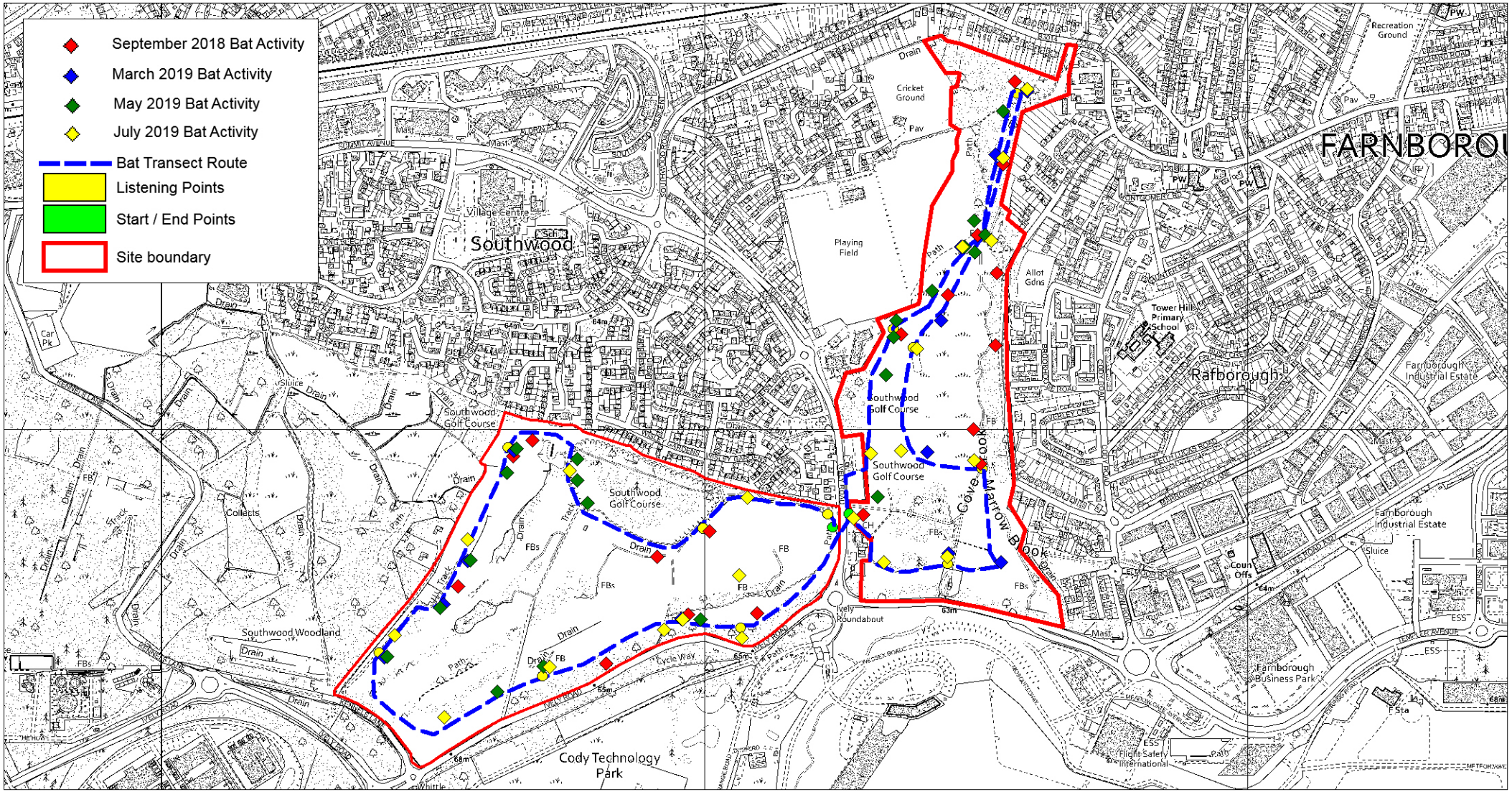
Location within county:

Map 14: Bat Activity Survey: All Visits

Southwood Country Park

Scale 1:10000



Produced on 18 July 2019 by Sarah Jackson For enquiries relating to GIS data contact Catherine McGuire, email Catherine.McGuire@hiwwt.org.uk, tel: 01489 774455.

Location within county:

Map 15. Breeding Bird Survey Results: Early Visit

Southwood Country Park

Scale 1:10000

Arcadian

The Wildlife Trusts
Hampshire & Isle of Wight Wildlife Trust

Behaviour

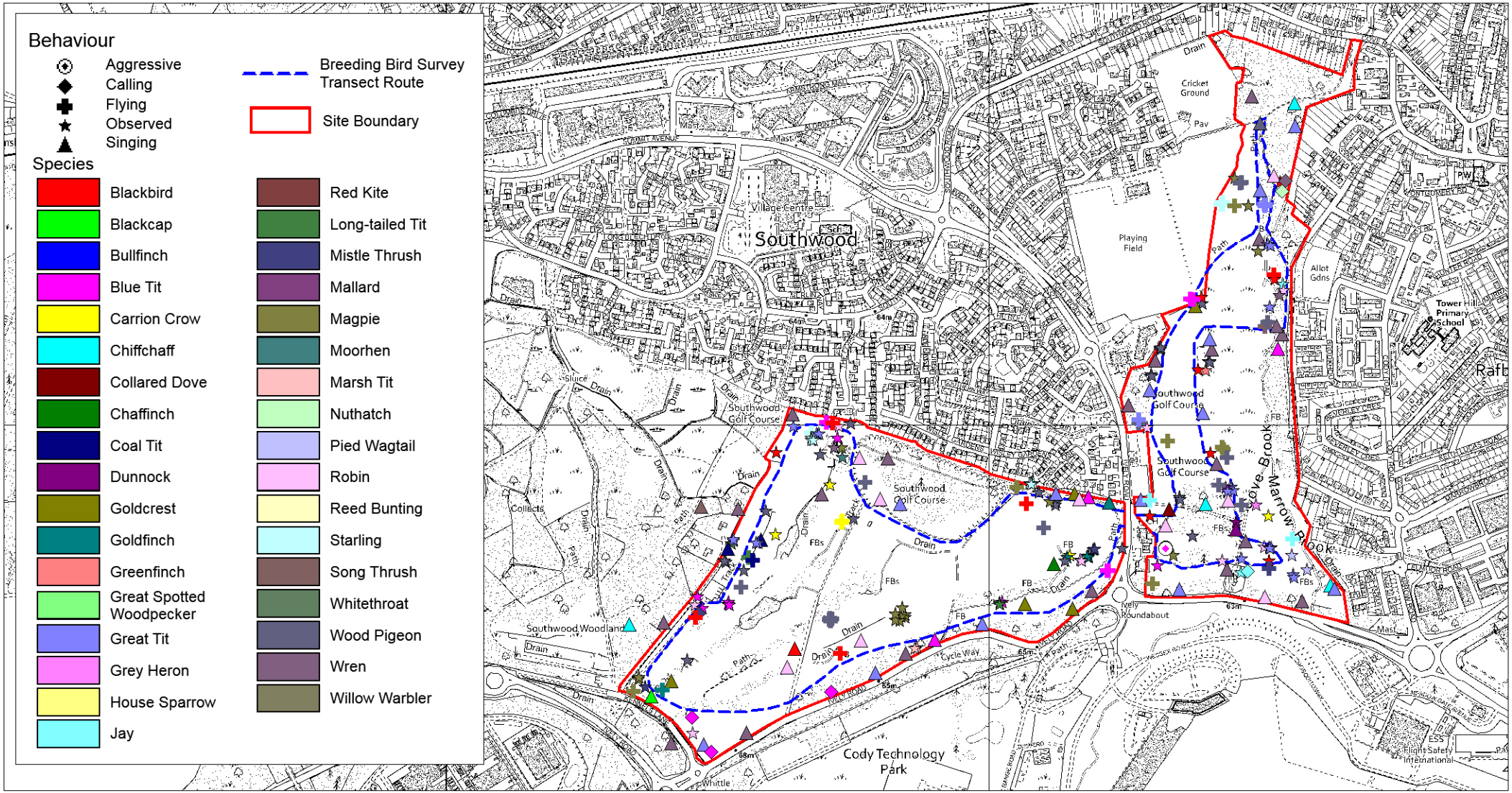
- Aggressive
- Calling
- Flying
- Observed
- Singing

Breeding Bird Survey Transect Route

Site Boundary

Species

- Blackbird
- Blackcap
- Bullfinch
- Blue Tit
- Carrion Crow
- Chiffchaff
- Collared Dove
- Chaffinch
- Coal Tit
- Dunnock
- Goldcrest
- Goldfinch
- Greenfinch
- Great Spotted Woodpecker
- Great Tit
- Grey Heron
- House Sparrow
- Jay
- Red Kite
- Long-tailed Tit
- Mistle Thrush
- Mallard
- Magpie
- Moorhen
- Marsh Tit
- Nuthatch
- Pied Wagtail
- Robin
- Reed Bunting
- Starling
- Song Thrush
- Whitethroat
- Wood Pigeon
- Wren
- Willow Warbler



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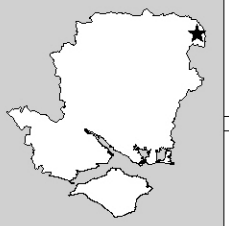
Produced on 23 July 2019 by Sarah Jackson For enquiries relating to GIS data contact Catherine McGuire, email Catherine.McGuire@hiwwt.org.uk, tel: 01489 774455.

Location within county:



Map 16. Breeding Bird Survey Results: Late Visit

Southwood Country Park

Scale 1:10000

Arcadian

The Wildlife Trusts
Hampshire & Isle of Wight Wildlife Trust

Behaviour

- Aggressive
- Calling
- Flying
- Observed
- Singing

- Breeding Bird Survey Transect Route
- Site Boundary

Species

- Blackbird
- Blackcap
- Bullfinch
- Blue Tit
- Carrion Crow
- Chiffchaff
- Collared Dove
- Chaffinch
- Coal Tit
- Dunnock
- Goldcrest
- Goldfinch
- Greenfinch
- Great Spotted Woodpecker
- Great Tit
- Grey Heron
- House Sparrow
- Jay
- Red Kite
- Long-tailed Tit
- Mistle Thrush
- Mallard
- Magpie
- Moorhen
- Marsh Tit
- Nuthatch
- Pied Wagtail
- Robin
- Reed Bunting
- Starling
- Song Thrush
- Whitethroat
- Wood Pigeon
- Wren
- Willow Warbler

Produced on 23 July 2019 by Sarah Jackson For enquiries relating to GIS data contact Catherine McGuire, email Catherine.McGuire@hiwwt.org.uk, tel: 01489 774455.

Location within county:

Map 17. Breeding Bird Survey Results: Combined

Southwood Country Park

Scale 1:10000

Arcadian

The Wildlife Trusts Hampshire & Isle of Wight Wildlife Trust

Behaviour

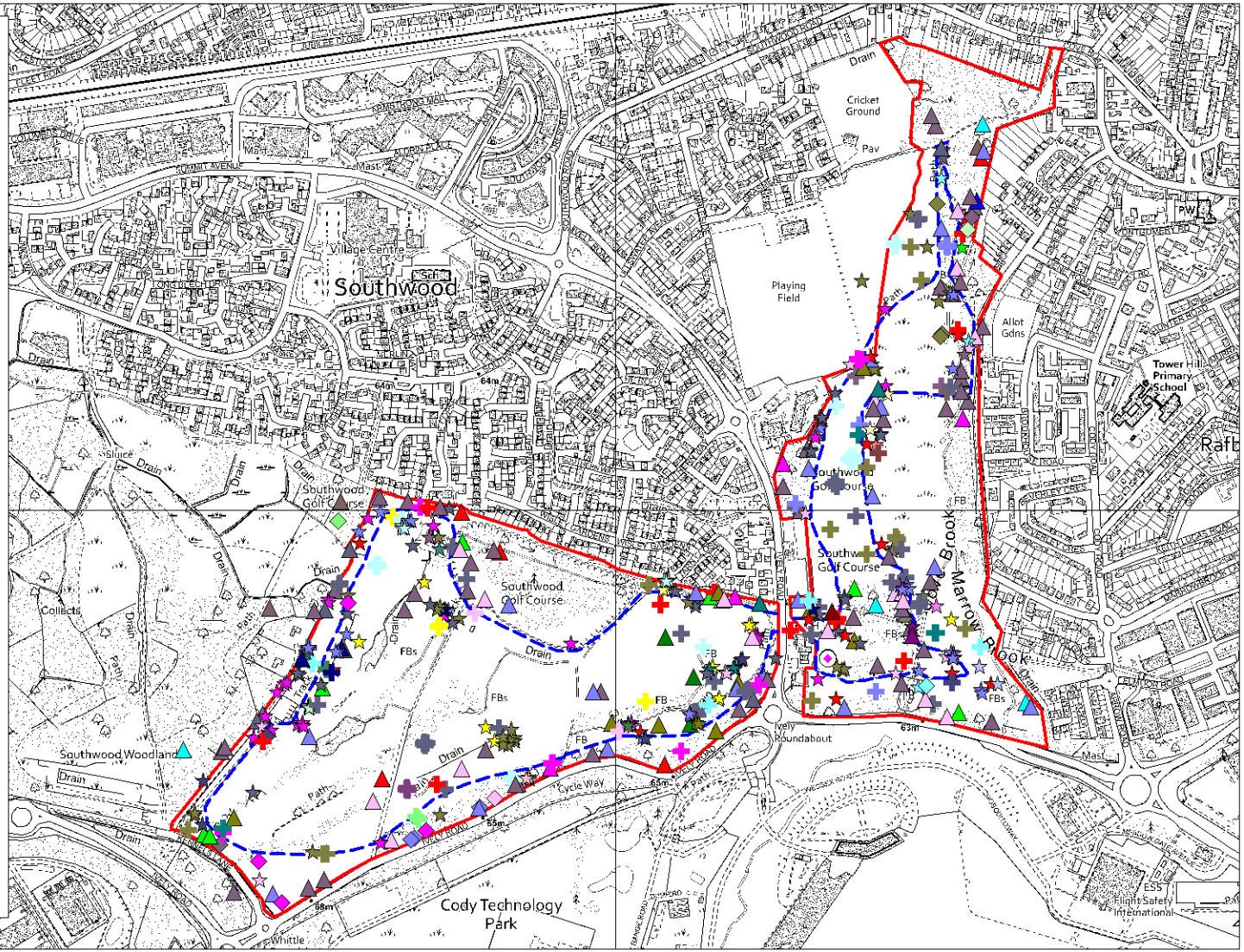
- Aggressive
- Calling
- Flying
- Observed
- Singing

Breeding Bird Survey Transect Route

Site Boundary

Species

- Blackbird
- Blackcap
- Bullfinch
- Blue Tit
- Carrion Crow
- Chiffchaff
- Collared Dove
- Chaffinch
- Coal Tit
- Dunnock
- Goldcrest
- Goldfinch
- Greenfinch
- Great Spotted Woodpecker
- Great Tit
- Grey Heron
- House Sparrow
- Jay
- Red Kite
- Long-tailed Tit
- Mistle Thrush
- Mallard
- Magpie
- Moorhen
- Marsh Tit
- Nuthatch
- Pied Wagtail
- Robin
- Reed Bunting
- Starling
- Song Thrush
- Whitethroat
- Wood Pigeon
- Wren
- Willow Warbler



N

Produced on 23 July 2019 by Sarah Jackson For enquiries relating to GIS data contact Catherine McGuire, email Catherine.McGuire@hiwwt.org.uk, tel: 01489 774455.

Location within county:

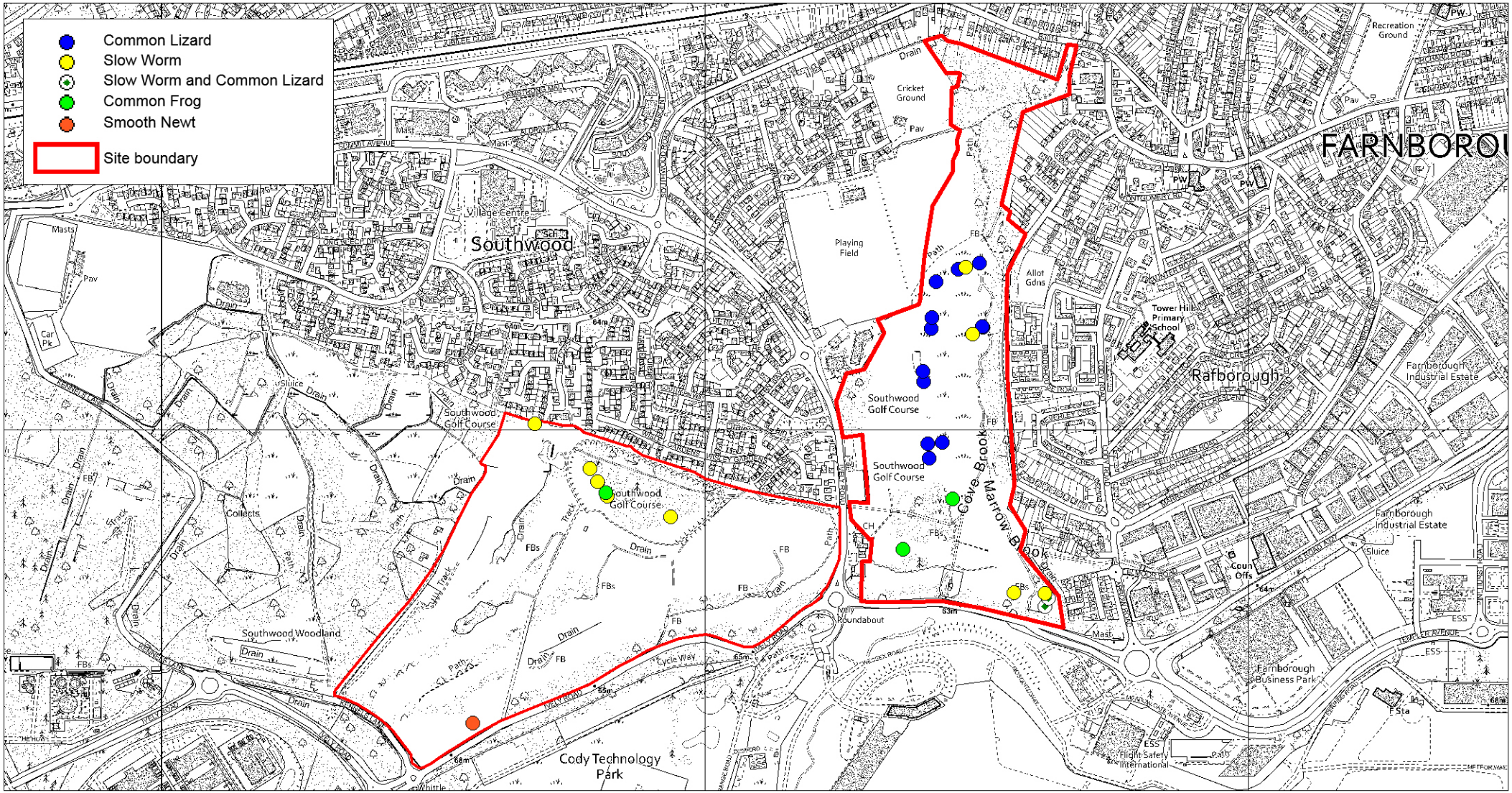
Map 18. Reptile Survey Results

Southwood Country Park

Scale 1:10000

Arcadian

The Wildlife Trusts
Hampshire & Isle of Wight Wildlife Trust



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Produced on 18 July 2019 by Sarah Jackson For enquiries relating to GIS data contact Catherine McGuire, email Catherine.McGuire@hiwwt.org.uk, tel: 01489 774455.

APPENDICES

Appendix 1:
Example water vole habitat suitability assessment form

Water Vole Habitat Suitability Assessment

Date	
Site	
Surveyor	

	Score 1 if present	
	True L	**True R**
Well-developed (>60%) bankside and emergent vegetation[a] (Discount if excessive shading from overhanging branches)		
Year round availability of food sources[b]		
Suitable refuge areas above extremities in water levels[c]		
Steep banks suitable for burrowing (Discount if solid/manmade banks)		
Permanent open water[d] (Discount if Estuarine/Brackish water)		
Presence of a berm (a ledge at water level)[e]		
Lack of disturbance (poaching, grazing +/- recent management)		
Nest building opportunities in vegetation above water level[f]		
TOTAL		

Score

<3	Unsuitable (no potential for enhancement)
3-5	Sub-optimal (potential for enhancement)
>5	Optimal

Survey Notes

Guidance Notes

a Take into account time of year. Will vegetation survive when shaded? All stinging nettles?

b Is there a hedgerow nearby? Food for all seasons? - vegetation, berries, nuts, tubors

c Higher ground above water levels?

d i.e. not a winterbourne

e 50% or more

f Grasses, bushes, brambles etc

Appendix 2:
GCN HSI assessment results

Appendix 2. GCN HSI assessment results

	Ditch 1 (Grid Ref SU8534 5485)		Ditch 2 (Grid Ref SU8546 5479)		Ditch 3 (Grid Ref SU8493 5467)		Ditch 4 (Grid Ref SU8472 5482)	
	Field Score	**SI**	**Field Score**	**SI**	**Field Score**	**SI**	**Field Score**	**SI**
Location	A	1	A	1	A	1	A	1
Pond Area	770m^2	0.98	460m^2	0.9	580m^2	1	200m^2	0.4
Pond Drying	Rarely	1	Rarely	1	Sometimes	0.5	Rarely	1
Water Quality	Poor	0.33	Poor	0.33	Poor	0.33	Poor	0.33
Shade	70%	0.7	5%	1	20%	1	0%	1
Fowl	Absent	1	Absent	1	Absent	1	Absent	1
Fish	Absent	1	Absent	1	Absent	1	Absent	1
Ponds	10	0.95	9	0.9	14	1	14	1
Terrestrial Habitat	Moderate	0.67	Moderate	0.67	Poor	0.33	Poor	0.33
Macrophytes	60%	0.9	90%	0.85	90%	0.85	20%	0.55
Score =	**0.82 - Excellent**		**0.83 - Excellent**		**0.74 - Good**		**0.69 - Average**	

	Pond 1 (Grid Ref SU8539 5512)		Pond 2 (Grid Ref SU8473 5494)		Pond 3 (Grid Ref SU8482 5473)	
	Field Score	**SI**	**Field Score**	**SI**	**Field Score**	**SI**
Location	A	1	A	1	A	1
Pond Area	515m^2	1	1020m^2	0.96	400m^2	0.8
Pond Drying	Sometimes	0.5	Rarely	1	Sometimes	0.5
Water Quality	Poor	0.33	Poor	0.33	Poor	0.33
Shade	5%	1	80%	0.5	10%	1
Fowl	Absent	1	Absent	1	Absent	1
Fish	Absent	1	Absent	1	Absent	1
Ponds	9	0.9	14	1	14	1
Terrestrial Habitat	Moderate	0.67	Moderate	0.67	Poor	0.33
Macrophytes	90%	0.85	20%	0.55	10%	0.45
Score =	**0.78 - Good**		**0.75 - Good**		**0.67 - Average**	

Appendix 3:
Static bat detector results

Appendix 3. Static bat detector results

Date	Time	Species
27/09/2018	19:37:57	*Myotis* sp.
27/09/2018	19:57:59	Common pipistrelle
27/09/2018	20:01:29	*Myotis* sp.
27/09/2018	20:01:49	Daubenton's bat
27/09/2018	20:44:12	Daubenton's bat
27/09/2018	22:26:28	*Myotis* sp.
27/09/2018	23:09:38	*Myotis* sp.
27/09/2018	01:14:51	*Myotis* sp.
28/09/2018	06:26:54	Noctule
28/09/2018	06:27:31	Common pipistrelle
28/09/2018	19:52:03	*Myotis* sp.
28/09/2018	19:57:12	*Myotis* sp.
28/09/2018	20:17:07	*Myotis* sp.
28/09/2018	21:27:29	Daubenton's bat
29/09/2018	22:54:32	Common pipistrelle
29/09/2018	19:37:36	*Myotis* sp.
29/09/2018	20:56:17	*Myotis* sp.
29/09/2018	21:09:47	*Myotis* sp.
29/09/2018	21:16:03	Common pipistrelle
29/09/2018	22:17:02	*Myotis* sp.
30/09/2018	19:28:45	*Myotis* sp.
30/09/2018	19:35:14	Daubenton's bat
30/09/2018	19:35:24	*Myotis* sp.
30/09/2018	19:35:41	*Myotis* sp.
30/09/2018	19:48:57	*Myotis* sp.
30/09/2018	19:49:15	Daubenton's bat
30/09/2018	19:49:31	Daubenton's bat
30/09/2018	19:49:39	Daubenton's bat
30/09/2018	19:49:52	Daubenton's bat
30/09/2018	19:57:09	Common pipistrelle
30/09/2018	20:14:43	*Myotis* sp.
30/09/2018	20:17:47	*Myotis* sp.
30/09/2018	20:18:04	*Myotis* sp.
30/09/2018	20:18:12	*Myotis* sp.
30/09/2018	20:18:20	*Myotis* sp.
30/09/2018	20:19:40	*Myotis* sp.
30/09/2018	20:19:40	*Myotis* sp.
30/09/2018	20:19:56	*Myotis* sp.
30/09/2018	20:21:12	*Myotis* sp.
30/09/2018	20:22:29	*Myotis* sp.
30/09/2018	20:23:14	*Myotis* sp.
30/09/2018	20:51:21	*Myotis* sp.
30/09/2018	21:30:15	*Myotis* sp.
30/09/2018	21:40:47	*Myotis* sp.
30/09/2018	21:40:56	*Myotis* sp.
30/09/2018	21:41:05	*Myotis* sp.
30/09/2018	21:41:17	Daubenton's bat
30/09/2018	21:46:06	*Myotis* sp.
30/09/2018	21:48:20	Common pipistrelle
30/09/2018	22:31:56	Common pipistrelle
30/09/2018	22:35:12	*Myotis* sp.
30/09/2018	22:35:23	Daubenton's bat
30/09/2018	22:46:04	Common pipistrelle
01/10/2018	02:24:44	*Myotis* sp.
01/10/2018	02:42:43	*Myotis* sp.
01/10/2018	19:34:41	*Myotis* sp.
01/10/2018	19:55:06	*Myotis* sp.
01/10/2018	19:56:14	*Myotis* sp.
01/10/2018	19:56:22	*Myotis* sp.
01/10/2018	20:06:47	*Myotis* sp.
01/10/2018	20:07:30	*Myotis* sp.
01/10/2018	20:09:41	*Myotis* sp.
01/10/2018	20:11:57	*Myotis* sp.
01/10/2018	20:12:35	*Myotis* sp.
01/10/2018	20:12:43	*Myotis* sp.
01/10/2018	20:13:29	*Myotis* sp.
01/10/2018	20:13:51	*Myotis* sp.
01/10/2018	20:14:48	*Myotis* sp.
01/10/2018	20:15:12	*Myotis* sp.
01/10/2018	20:20:34	Daubenton's bat
01/10/2018	20:20:41	*Myotis* sp.
01/10/2018	20:20:51	*Myotis* sp.
01/10/2018	20:21:02	*Myotis* sp.
01/10/2018	20:24:12	*Myotis* sp.
01/10/2018	20:24:25	*Myotis* sp.
01/10/2018	20:24:34	*Myotis* sp.
01/10/2018	20:24:41	*Myotis* sp.
01/10/2018	21:54:27	*Myotis* sp.
01/10/2018	21:54:44	*Myotis* sp.
01/10/2018	21:55:03	*Myotis* sp.
02/10/2018	01:17:08	*Myotis* sp.
02/10/2018	01:54:13	*Myotis* sp.
02/10/2018	05:16:23	Common pipistrelle
02/10/2018	19:40:52	Common pipistrelle
02/10/2018	19:41:06	Common pipistrelle
02/10/2018	19:57:25	*Myotis* sp.
02/10/2018	20:36:40	Common pipistrelle
02/10/2018	20:37:20	Common pipistrelle

02/10/2018	21:13:37	Common pipistrelle
02/10/2018	21:25:49	*Myotis* sp.
02/10/2018	22:28:21	*Myotis* sp.
02/10/2018	22:43:26	*Myotis* sp.
02/10/2018	22:43:36	*Myotis* sp.
02/10/2018	22:57:09	*Myotis* sp.
02/10/2018	23:48:19	*Myotis* sp.
02/10/2018	23:48:33	*Myotis* sp.
03/10/2018	00:18:13	*Myotis* sp.
03/10/2018	03:24:34	*Myotis* sp.
03/10/2018	04:40:54	*Myotis* sp.
03/10/2018	19:44:07	*Myotis* sp.
03/10/2018	19:47:35	*Myotis* sp.
03/10/2018	19:49:21	*Myotis* sp.
03/10/2018	19:50:34	*Myotis* sp.
03/10/2018	19:53:06	*Myotis* sp.
03/10/2018	19:53:43	*Myotis* sp.
03/10/2018	20L16:55	*Myotis* sp.
03/10/2018	20:20:50	Common pipistrelle
03/10/2018	20:38:08	Daubenton's bat
03/10/2018	20:38:20	*Myotis* sp.
03/10/2018	20:39:15	*Myotis* sp.
03/10/2018	20:57:43	*Myotis* sp.
03/10/2018	21:03:38	*Myotis* sp.
03/10/2018	21:05:04	*Myotis* sp.
03/10/2018	21:05:15	*Myotis* sp.
03/10/2018	21:05:22	*Myotis* sp.
03/10/2018	21:05:34	*Myotis* sp.
03/10/2018	21:16:50	Daubenton's bat
03/10/2018	21:18:03	*Myotis* sp.
03/10/2018	21:26:03	*Myotis* sp.
03/10/2018	21:45:04	*Myotis* sp.
03/10/2018	21:48:14	Daubenton's bat
03/10/2018	23:16:20	*Myotis* sp.
03/10/2018	23:16:35	*Myotis* sp.
03/10/2018	23:41:14	*Myotis* sp.
03/10/2018	23:42:23	*Myotis* sp.
03/10/2018	12:47:22	*Myotis* sp.
04/10/2018	00:13:08	Daubenton's bat
04/10/2018	00:13:55	*Myotis* sp.
04/10/2018	19:12:55	Common pipistrelle
04/10/2018	19:17:55	Common pipistrelle
04/10/2018	19:19:41	*Myotis* sp.
04/10/2018	19:22:21	*Myotis* sp.
04/10/2018	19:23:50	*Myotis* sp.
04/10/2018	19:24:06	Common pipistrelle
04/10/2018	19:28:18	Common pipistrelle
04/10/2018	19:29:36	Common pipistrelle
04/10/2018	19:32:34	*Myotis* sp.
04/10/2018	19:32:55	*Myotis* sp.
04/10/2018	19:33:03	*Myotis* sp.
04/10/2018	19:35:29	Common pipistrelle
04/10/2018	19:35:39	Common pipistrelle
04/10/2018	19:44:33	*Myotis* sp.
04/10/2018	19:46:18	*Myotis* sp.
04/10/2018	19:46:27	*Myotis* sp.
04/10/2018	19:47:55	Common pipistrelle
04/10/2018	19:49:34	Common pipistrelle
04/10/2018	19:51:15	Soprano pipistrelle
04/10/2018	20:50:28	*Myotis* sp.
04/10/2018	20:50:28	*Myotis* sp.
04/10/2018	21:17:04	*Myotis* sp.
04/10/2018	23:21:27	Soprano pipistrelle
04/10/2018	23:37:58	*Myotis* sp.
04/10/2018	23:39:17	*Myotis* sp.
04/10/2018	23:39:25	*Myotis* sp.
04/10/2018	23:39:37	*Myotis* sp.
05/10/2018	00:05:45	*Myotis* sp.
05/10/2018	00:06:24	*Myotis* sp.
05/10/2018	00:26:22	*Myotis* sp.
05/10/2018	01:00:06	*Myotis* sp.
05/10/2018	01:03:17	*Myotis* sp.
05/10/2018	01:19:49	*Myotis* sp.
05/10/2018	01:41:19	Daubenton's bat
05/10/2018	01:44:26	*Myotis* sp.
05/10/2018	01:59:08	*Myotis* sp.
05/10/2018	01:59:43	*Myotis* sp.
05/10/2018	02:00:14	*Myotis* sp.
05/10/2018	02:00:30	*Myotis* sp.
05/10/2018	02:00:37	*Myotis* sp.
05/10/2018	02:40:57	*Myotis* sp.
05/10/2018	03:10:35	*Myotis* sp.
05/10/2018	03:39:57	*Myotis* sp.
05/10/2018	03:41:24	*Myotis* sp.
05/10/2018	03:45:02	*Myotis* sp.
05/10/2018	05:03:30	*Myotis* sp.
05/10/2018	19:29:12	*Myotis* sp.
05/10/2018	20:04:42	*Myotis* sp.
05/10/2018	20:33:53	*Myotis* sp.
05/10/2018	21:10:24	Common pipistrelle
05/10/2018	21:10:41	Common pipistrelle
05/10/2018	21:11:50	*Myotis* sp.

05/10/2018	21:12:01	*Myotis* sp.
05/10/2018	21:12:09	*Myotis* sp.
05/10/2018	21:12:16	*Myotis* sp.
05/10/2018	21:13:58	*Myotis* sp.
05/10/2018	21:15:02	Common pipistrelle
05/10/2018	21:18:01	Common pipistrelle
05/10/2018	21:21:45	Common pipistrelle
05/10/2018	21:38:08	*Myotis* sp.
05/10/2018	21:56:20	Common pipistrelle
05/10/2018	22:36:35	*Myotis* sp.
05/10/2018	22:36:43	*Myotis* sp.
05/10/2018	22:36:57	*Myotis* sp.
05/10/2018	22:37:07	*Myotis* sp.
05/10/2018	23:05:24	*Myotis* sp.
05/10/2018	23:55:53	*Myotis* sp.
06/10/2018	00:40:04	*Myotis* sp.
06/10/2018	00:43:09	*Myotis* sp.
06/10/2018	00:43:43	*Myotis* sp.
06/10/2018	00:43:44	*Myotis* sp.
06/10/2018	01:16:50	*Myotis* sp.
06/10/2018	12:21:35	*Myotis* sp.
06/10/2018	01:34:28	*Myotis* sp.
06/10/2018	02:45:35	*Myotis* sp.
06/10/2018	18:01:43	*Myotis* sp.
06/10/2018	20:48:01	*Myotis* sp.
07/10/2018	02:53:06	*Myotis* sp.
07/10/2018	02:53:24	*Myotis* sp.
07/10/2018	02:54:04	*Myotis* sp.
07/10/2018	02:54:14	*Myotis* sp.
07/10/2018	02:55:11	*Myotis* sp.
07/10/2018	02:55:18	*Myotis* sp.
07/10/2018	02:56:17	*Myotis* sp.
07/10/2018	04:21:41	*Myotis* sp.
07/10/2018	04:41:31	*Myotis* sp.
07/10/2018	19:08:03	*Myotis* sp.
07/10/2018	19:08:12	*Myotis* sp.
07/10/2018	19:08:25	*Myotis* sp.
07/10/2018	19:17:56	*Myotis* sp.
07/10/2018	19:18:06	*Myotis* sp.
07/10/2018	19:18:19	*Myotis* sp.
07/10/2018	19:53:23	*Myotis* sp.
07/10/2018	19:53:39	*Myotis* sp.
07/10/2018	19:53:59	*Myotis* sp.
07/10/2018	19:54:21	*Myotis* sp.
07/10/2018	19:54:39	*Myotis* sp.
07/10/2018	20:31:24	*Myotis* sp.
07/10/2018	20:57:24	*Myotis* sp.
07/10/2018	21:03:16	*Myotis* sp.
07/10/2018	21:03:25	*Myotis* sp.
07/10/2018	21:03:40	*Myotis* sp.
07/10/2018	21:06:15	*Myotis* sp.

Appendix 4:

WPHT scores and associated abundance data for macroinvertebrate family/taxa groups recorded at the nine sample locations

Appendix 4. WPHT scores and associated abundance data for macroinvertebrate family/taxa groups recorded at the nine sample locations.

Subphylum/Class/Order	Family	WHPT Scores				Total Abundance at Each Sample Location									Total No. Individuals
		AB1 (1-9)	AB2 (10-99)	AB3 (100-999)	AB4 (1000+)	1	2	3	4	7	9	10	11	12	
TRICLADA (flatworms)	Dendrocoelidae	3	2.6	2.6	2.6					2					**2**
MOLLUSCA (snails, limpets and mussels)	Sphaeriidae (Pea mussels)	4.4	3.5	3.4	2.3	41			179	49	3	33	5	36	**346**
	Lymnaeidae	3.6	2.5	1.2	1.2			1	5						**6**
	Planorbidae (exc *Ancylus* group)	3.2	3	2.4	2.4	1		1	3	3			1		**9**
	Physidae	2.7	2	0.4	0.4	1			3			3	9		**16**
	Ancylus group (= Ancylidae)	5.8	5.5	5.5	5.5					2	7	6	29	3	**47**
	Hydrobiidae	4.1	4.2	4.6	3.7							33	185	183	**401**
OLIGOCHAETA (worms)	n/a	3.6	2.3	1.4	-0.6		1	14	35	19	4	9	3	6	**91**
HIRUDINIA (leeches)	Glossiphoniidae	3.4	2.5	0.8	0.8				1		1	1		2	**5**
	Erpobdellidae	3.6	2	-0.8	-0.8				7						**7**
	Hirudinidae	-0.8	-0.8	-0.8	-0.8				1						**1**
CRUSTACEA (crayfish, shrimps & slaters)	Asellidae	4	2.3	0.8	-1.6	8	4	84	32	52	44	28	24	24	**300**
	Crangonyctidae	3.8	4	3.6	3.6	24		16							**40**
	Gammaridae	4.2	4.5	4.6	3.9		4	8	4	336	320	248	728	160	**1808**
EPHEMEROPTERA (mayflies)	Baetidae	3.6	5.9	7.2	7.5					2	1	7	8		**18**
ODONATA (damselflies and dragonflies)	Calopterygidae (= Agriidae)	5.9	6.2	6.2	6.2	56				15	2	8	56	13	**150**
	Coenagrionidae (= Coenagriidae)	3.4	3.8	3.8	3.8		2	26						1	**29**
	Libellulidae	4.1	4.1	4.1	4.1	1	1								**2**
HEMIPTERA (true bugs)	Hydrometridae	4.3	4.3	4.3	4.3			10							**10**
	Mesoveliidae	4.7	4.7	4.7	4.7		5								**5**
	Nepidae	2.9	2.9	2.9	2.9			1				1	1		**3**
	Naucoridae	3.7	3.7	3.7	3.7	1									**1**

	Pleidae	3.3	3.3	3.3	3.3		2								**2**
	Notonectidae	3.4	3.9	3.9	3.9	4	5	2					1		**12**
	Corixidae	3.7	3.9	3.7	3.7	5	13	8						3	**29**
COLEOPTERA (beetles)	Scirtidae (= Helododae)	6.9	6.8	6.8	6.8	1	2								**3**
	Elmidae	5.3	7.4	8.3	8.3					5	2	23	28	39	**97**
	Haliplidae	3.6	3.4	3.4	3.4	4	6	27							**37**
	Dytiscidae	4.5	4.8	4.8	4.8	21	331	72						1	**425**
	Hydrophilidae	5.8	8.8	8.8	8.8	10	2	9							**21**
	Noteridae	3.2	3.2	3.2	3.2			6							**6**
MEGALOPTERA (alderfly)	Sialidae	4.2	4.4	4.4	4.4	7	28	12	4	34	22	6	1	12	**126**
TRICHOPTERA (Caddisflies)	Hydropsychidae	5.8	7.2	7.4	7.4					3	1	11	8		**23**
	Psychomyiidae	5.8	5.7	5.7	5.7						1	2	1		**4**
	Goeridae	8.8	8.8	9.4	9.4							1	17	1	**19**
	Leptoceridae	6.7	6.9	7.1	7.1						2	1	8	6	**17**
	Phryganeidae	5.5	5.5	5.5	5.5					4		1		6	**11**
DIPTERA (true flies)	Simuliidae	5.5	6.1	5.8	3.9					23	15	29	60	8	**135**
	Tipulidae	5.4	6.9	6.9	7.1	1		3		1	1			1	**7**
	Chironomidae	1.2	1.3	-0.9	-0.9	61	390	117	400	264	39	49	17	25	**1362**
	Ceratopogonidae	5.4	5.5	5.5	5.5		1		1						**2**
	Chaoboridae	3	3	3	3			3							**3**
	Dixidae	7	7	7	7		36								**36**
	Psychodidae	4.5	3	3	3			2	1						**3**
	Stratiomyidae	3.6	3.6	3.6	3.6		1								**1**
	Syrphidae	1.9	1.9	1.9	1.9			4							**4**
	Tabanidae	7.1	7.3	7.3	7.3			1							**1**
Total						**247**	**834**	**427**	**676**	**814**	**465**	**500**	**1190**	**530**	

Appendix 5:

Additional species recorded at aquatic macroinvertebrate sampling locations

Appendix 5. Additional species recorded at aquatic macroinvertebrate sampling locations

Sample Location	Species of Note		
	Plant	**Invertebrate**	**Vertebrate**
1	n/a	n/a	n/a
2	n/a	n/a	n/a
3	n/a	n/a	n/a
4	n/a	n/a	n/a
7	n/a	Signal crayfish (*Pacifastacus leniusculus*)	Threespine stickleback (*Gasterosteus aculeatus*)
9	n/a	Raft spider (*Dolomedes fimbriatus*)	n/a
10	n/a	n/a	2x stone loach (*Barbatula barbatula*); 2x threespine stickleback (*Gasterosteus aculeatus*);
11	n/a	Signal crayfish (*Pacifastacus leniusculus*)	Common minnow (*Phoxinus phoxinus*); threespine stickleback (*Gasterosteus aculeatus*)
12	Himalayan balsam (*Impatiens glandulifera*)	n/a	3x stone loach (*Barbatula barbatula*); 2x threespine stickleback (*Gasterosteus aculeatus*);

Appendix 6:
Water vole habitat suitability assessment results

Appendix 6. Water vole habitat suitability assessment results

	Ditch A		Ditch B		Ditch C		Ditch D		Ditch E		Ditch F		Ditch G		Ditch H		Ditch I		Ditch J		Ditch K		Ditch L		Ditch M		Ditch N		Pond 1	Pond 2
	TLB	TRB	TLB	TRB	TLB	TRB	TLB	TRB	TLB	TRB	TLB	TRB	TLB	TRB	TLB	TRB	TLB	TRB	TLB	TRB	TLB	TRB	TLB	TRB	TLB	TRB	TLB	TRB		
Well-developed (>60%) bankside and emergent vegetation	0	0	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	1	1	0	0	0	1
Year round availability of food sources	1	1	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	1	0	1	1	1	1	1	1	1	0
Suitable refuge areas above extremities in water levels	1	0	0	0	1	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0
Steep banks suitable for burrowing	0	0	1	1	1	1	1	1	1	1	1	1	1	1	0	0	1	1	1	1	0	0	0	1	1	1	0	0	0	0
Permanent open water	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0
Presence of a berm	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lack of disturbance	1	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	1	1	1	0
Nest building opportunities in vegetation above water level	1	0	0	0	1	0	0	1	0	0	0	0	1	0	0	0	0	0	1	0	1	1	0	1	0	0	0	0	1	0
TOTAL	**5**	**2**	**2**	**2**	**5**	**2**	**1**	**5**	**1**	**1**	**1**	**1**	**3**	**1**	**0**	**0**	**1**	**1**	**5**	**1**	**5**	**2**	**2**	**5**	**4**	**4**	**3**	**3**	**4**	**1**