

A417 Missing Link
TR010056

6.4 Environmental Statement
Appendix 8.14 Dormouse Survey
Report

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A417 Missing Link

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**6.4 Environmental Statement
Appendix 8.14 Dormouse Survey Report**

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Executive Summary

The proposed A417 Missing Link scheme aims to provide a dual carriageway to a current stretch of single carriageway between the Cowley roundabout and Crickley Hill. The scheme would increase capacity by creating a free-flowing link between the Brockworth Bypass and Cowley roundabout, resulting in a continuous flow between the M4 Junction 15 (Swindon) and the M5 Junction 11a (Gloucester/Cheltenham).

Suitable hazel dormouse habitat was identified whilst undertaking an extended Phase 1 habitat survey in 2017. A further habitat suitability assessment was undertaken in April/May 2018 which identified 13 areas of potential dormouse habitat within 250 metres of the two scheme options under consideration at the time. These 13 sites were assigned as survey areas 1, 2, 2A, 3, 4, 5, 6, 7, 8, 9, 9a, 10, 10a and 11 and dormouse nest tube surveys set up in each of these areas.

Hazel dormouse surveys were carried out between May 2018 and September 2019. Set up dates were dependent on access agreements being in place and therefore varied across the different sites. The survey on half of site 1 was halted due to health and safety reasons due to the growth of vegetation too close to the A417 carriageway; however, as the site comprised 100 tubes the remaining half of the site still provides a valid survey in connected habitat. Following the preferred route announcement (PRA) in March 2019, the survey effort at sites 7 and 8 were also stopped as they are no longer within 250 metres of the scheme with no potential for impacts to this habitat.

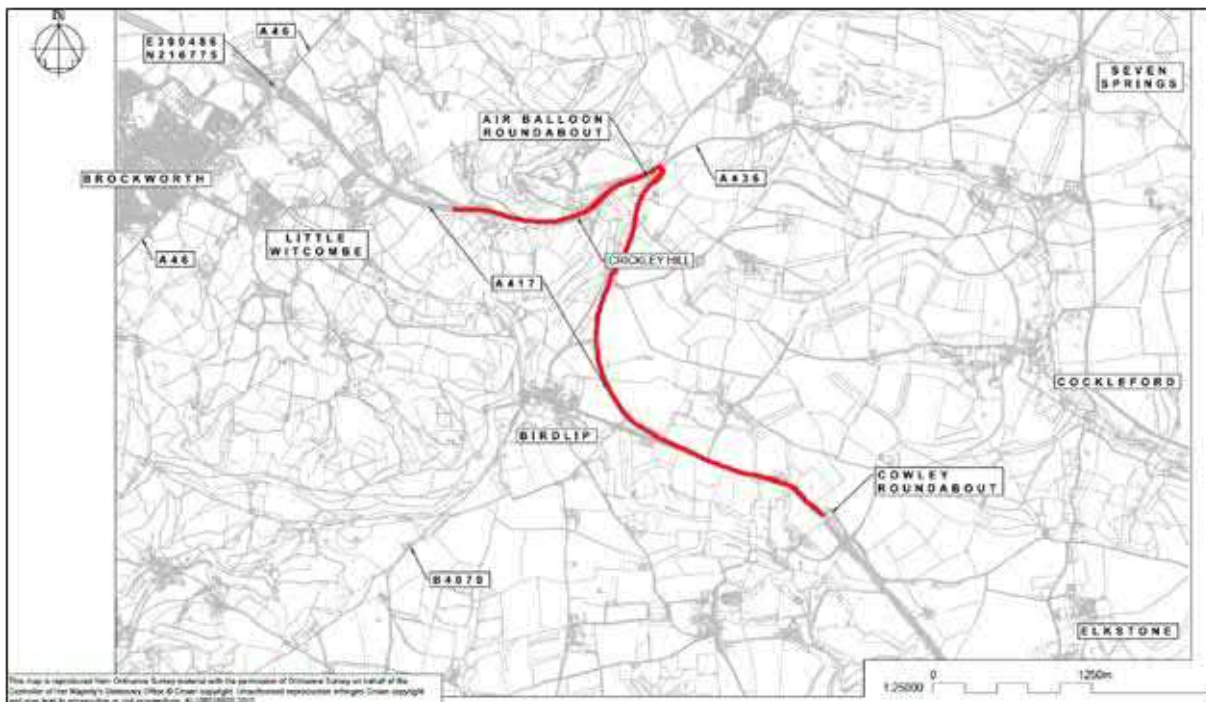
All surveyed sites within 250 metres of Option 30 scored sufficient points to conclude likely absence of dormouse. One site was not accessible for surveys, Emma's Grove woodland and it is therefore not possible to conclude likely absence for this site. However, a lack of evidence from surveys in adjacent habitats would indicate a low likelihood of Emma's Grove supporting a dormouse population as the woodland itself is too small in extent to support a viable population.

1. Introduction

1.1. Background

1.1.1. The A417/A419 provides an important link between the Midlands/North and South of England, between Gloucester and Swindon, and is an alternative to the M5/M4 route via Bristol. The section of the A417 near Birdlip, known as the 'missing link', forms the only section of single carriageway along the route, with an at-grade junction located at the 'Air Balloon' public house. The single carriageway is located between the Cowley roundabout and the base of Crickley Hill, a 5.5kilometres stretch shown on Figure 1.1 below. The proposals are known as the A417 Missing Link scheme, hereafter referred to as 'the scheme'.

Figure 1.1 Current A417 route and scheme extent



1.2. Purpose of the report

1.2.1. This Stage 3 Hazel Dormouse Technical Report has been prepared during Stage 3 of Highways England's Project Control Framework (PCF). This Technical Report provides an overview of the dormouse survey results for the 2018 and 2019 survey period. The report provides the methods, constraints and results of the dormouse surveys undertaken for the scheme.

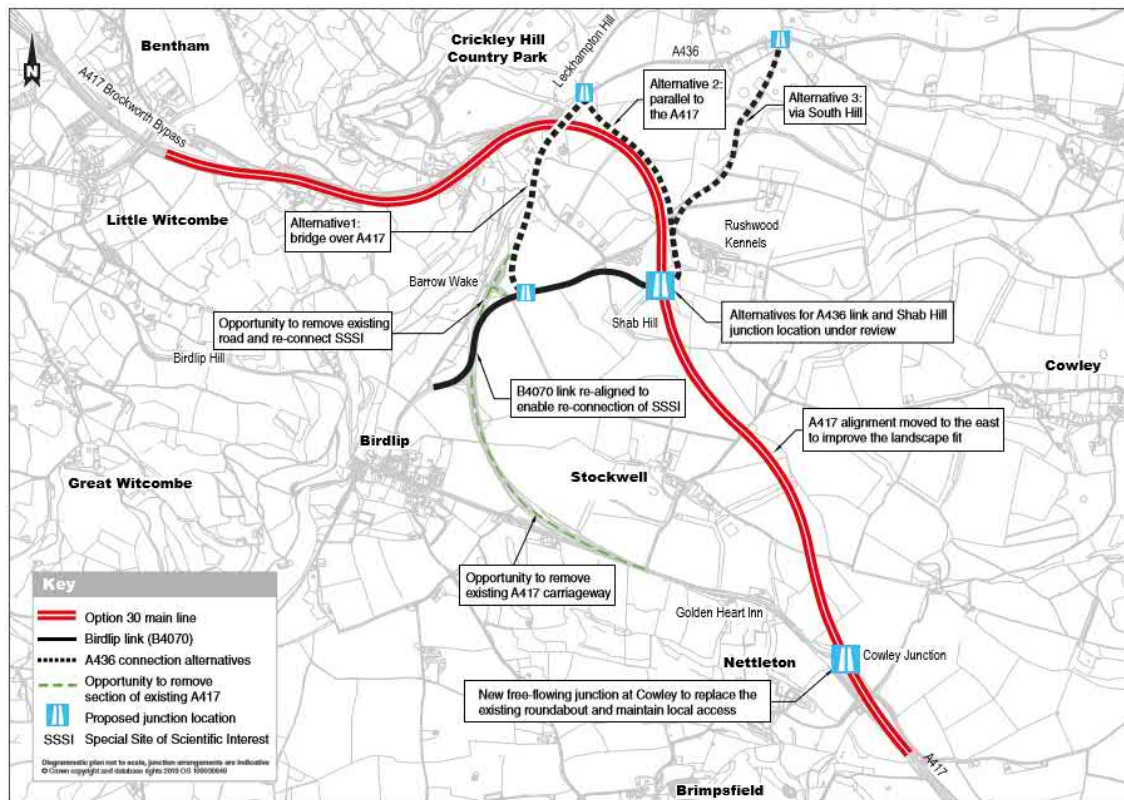
1.3. Overview of the Scheme

- 1.3.1. The proposed scheme would provide a dual carriageway to improve the current Missing Link section of single carriageway of the A417 between Cowley roundabout and Crickley Hill.
- 1.3.2. The proposed scheme would aim to increase capacity by creating a free-flowing link between the Brockworth Bypass and the Cowley roundabout and remove the at-grade junction with the A436 (Air Balloon roundabout). This Missing Link will provide a free-flowing journey between Swindon (M4 Junction 15) and Gloucester / Cheltenham (M5 Junction 11a). The current road and the extent of any proposed scheme is illustrated in Figure 1.1.

Preferred Route Announcement

- 1.3.1. Option 30 is the chosen preferred route option as of March 2019. Option 30 is a 5.5 kilometres long surface route following the route of existing A417 at Crickley Hill, but with less of a slope. A new section of road would be built through Shab Hill to the east of the existing A417, re-joining the existing road near Cowley roundabout, shown in figure 1.2 below. Option 30 would include 2 new slip road junctions:
- a slip road junction at Shab Hill for local and A436 traffic to join or leave the A417 by way of a new link road
 - a slip road junction to replace the existing Cowley roundabout for traffic to Nettleton Bottom, Cowley, Elkstone and other local destinations
- 1.3.2. A new link road would be built between the slip road junction at Shab Hill and the existing A417 to connect traffic to and from Birdlip and the A436 with the new A417. This new link road would end in a new roundabout near Barrow Wake.
- 1.3.3. If Option 30 was constructed a section of the existing A417 could be closed to traffic and be demolished. Refer to figure 1.2 below.

Figure 1.2 A417 Missing link proposed option 30



1.4. Scope of the Report

1.4.1. The objectives of this report are:

- to present the methodology, constraints and results of the presence/absence and population estimate surveys for hazel dormouse
- to present the relative abundance of hazel dormouse populations, if any

1.4.2. Guidance on ecological assessment recommends that all ecological features that occur within a zone of influence (Zoi) for a proposed scheme are investigated (CIEEM, 2016)¹. All areas within 250 metres of the proposed scheme footprint were assessed for hazel dormouse habitat suitability.

1.5. Legislation

Legal Protection

1.5.1. The hazel dormouse is fully protected by the *Conservation of Habitats and Species Regulations 2017*, which transposes the Council Directive 92/43/ECC (known as the Habitats Directive) on the conservation of natural habitats and of

¹ Chartered Institute of Ecology and Environmental Management (2016) Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater and Coastal

wild fauna and flora into UK law. Dormice are also protected under the *Wildlife and Countryside Act 1981* (as amended).

- 1.5.2. Under Regulation 43 of the Conservation of Habitats and Species Regulations it is illegal to:
- intentionally or deliberately injure, kill or take any wild dormouse
 - intentionally or deliberately damage, destroy or obstruct any access to any structure or place used for shelter, breeding, or protection by a dormouse
 - or to intentionally or recklessly disturb a dormouse whilst it is using such a structure or place
 - possess or advertise / sell / exchange a dormouse (dead or alive) or any part of a dormouse
- 1.5.3. Under Schedule 5 of the Wildlife and Countryside Act 1981 it is illegal to:
- Intentionally or deliberately kill, injure or take any wild hazel dormice
 - intentionally or deliberately damage, destroy or obstruct any access to any structure or place used for shelter, breeding, or protection by a dormouse
 - or to intentionally or recklessly disturb a dormouse whilst it is using such a structure or place
 - possess or advertise / sell / exchange a dormouse (dead or alive) or any part of a dormouse
- 1.5.4. The hazel dormouse is a European Protected Species under Annex IV of the Habitats Directive and under the Bern Convention 2 III and is on the IUCN Red List.
- 1.5.5. The *UK Biodiversity Action Plan* (UKBAP) 1994 – 2010 has been superseded by the *UK Post-2010 Biodiversity Framework* covering the period 2011 - 2020. UKBAP priority habitats and species were used to form the basis for the statutory list of habitats and species of 'principal importance for the conservation of biodiversity in England' under Section 41 of the *Natural Environment and Rural Communities (NERC) Act 2006*.
- 1.5.6. Section 40 of the NERC Act 2006 requires public bodies, including local authorities, 'to have regard to the conservation of biodiversity in England' when carrying out their normal functions. The local planning authority therefore must consider the impact on biodiversity of the proposed development. The NERC Act identifies species of 'principal importance for the conservation of biodiversity in England' (Section 41) to guide public bodies in implementing their duty. This priority list includes dormice. The strategic direction for biodiversity policy for the next decade is set out in the national strategy for *England Biodiversity 2020*.

1.6. Status of hazel dormouse at a national level

- 1.6.1. Hazel dormice are native to the UK but are nationally rare and vulnerable to extinction, largely due to habitat loss. They are a species of principal importance for the conservation of biodiversity in England under the NERC Act (2006). Although the exact size of the UK population is unknown, there has been a long-term decline in both number of individuals and the geographical range.
- 1.6.2. Their distribution is predominantly confined to southern England and southern Wales and is fragmented throughout. Dormouse monitoring programmes have recently provided an indication that the decline is slowing and as part of an ongoing hazel dormouse reintroduction programme, the current range is slowly being extended².

1.7. Status of hazel dormouse at a county level

- 1.7.1. Gloucestershire Council describe the status of hazel dormice within the county as rare. However, there are large areas of suitable habitat which 'may house populations currently unknown to us'³.
- 1.7.2. Dormice are rarely recorded in South Gloucestershire. To date no specific, comprehensive survey of the area has been carried out, so it's not known whether dormice are very localised or if they are just under recorded.

1.8. Hazel dormouse ecology

- 1.8.1. Dormice are highly arboreal preferring to move between understory, hedgerows, woodlands and scrub during the active season (April to November).
- 1.8.2. They are reluctant to cross open ground and are believed to rarely descend to ground level except for when hibernating over the winter.
- 1.8.3. They have complex structural habitat requirements including connective habitat to forage and for dispersal, presence of a range of different tree and scrub species that will provide suitable food year-round, and nesting habitat for shelter, breeding and hibernation⁴. They are primarily associated with deciduous

² People's trust for endangered species (2018) *Hazel (or Common) dormouse* [online] available at: <https://ptes.org/get-informed/facts-figures/hazel-common-dormouse-muscardinus-avellanarius/> (last accessed November 2018).

³ Gloucestershire County Council (Unknown) *The South Gloucestershire Biodiversity Action Plan, Species Action Plans*. [online] available at: <https://www.southglos.gov.uk/documents/pte080091.pdf> (last accessed November 2018)

⁴ Highways England (2001) *Design Manual for Roads and Bridges, Volume 10, Section 4, Part 5 HA 97/01 Nature Conservation Advice in Relation to Dormice* [online] available at: <http://www.standardsforhighways.co.uk/ha/standards/dmrb/vol10/section4.htm> (last accessed April 2018).

woodland (containing oak, hazel, honeysuckle and bramble) and species-rich hedgerows⁵, although they have been found in a range of other habitats such as coniferous woodland, scrub and heathland.

- 1.8.4. Research has shown that dormice tend to prefer well established hedges over 3.5 metres in height ⁶.

⁵ Bright, P. W., Morris, P. A., and Mitchell-Jones, A., (2006) *Dormouse Conservation Handbook*. English Nature.

⁶ Gloucestershire County Council (Unknown) *The South Gloucestershire Biodiversity Action Plan, Species Action Plans*. [online] available at: <https://www.southglos.gov.uk/documents/pte080091.pdf> (last accessed November 2018)

2. Methodology

2.1. Desk Study

- 2.1.1. A detailed biological records search was requested from Gloucestershire Centre for Environmental Records Centre (GCERC) in 2017, within a 2 kilometre radius of the scheme. All records for protected species, priority habitats and designated sites were returned. The results for dormice showed there were no records of dormice within 2 kilometres of the scheme.
- 2.1.2. All potentially suitable habitats with potential to be impacted by the two scheme options under consideration at the time (Option 12 and Option 30), were identified using the Defra Multi Agency Geographic Information for the Countryside (MAGIC) online viewer tool (Defra, 2017), the use of 1:10,000 Ordnance Survey Mapping and aerial photography. These were recorded and given a unique identifier (Appendix A).
- 2.1.3. At the time of the desk study and subsequent surveys, there were two options under consideration; therefore all potentially suitable habitat within 250 metres of the two options (as of May 2018) were subject to further survey, until the preferred route announcement (PRA) of option 30 in Spring 2019.

2.2. Habitat Assessment

- 2.2.1. An extended Phase 1 habitat survey was undertaken in May 2017 and suitable habitat for dormice was identified within 250 metres of the proposed scheme. The habitats identified during the desk study were subject to a 'ground-truthing' exercise, capturing additional habitats and scoping out areas that were not, or were no longer, suitable for dormice.
- 2.2.2. Hedgerows, woodland and scrub within 250 metres of the scheme, were assessed further for its suitability to support dormice using the following criteria:
- age range of trees and shrubs
 - level of diversity of trees and shrubs
 - level of suitability of trees and shrubs
 - availability of key food sources
 - connectivity to wider landscape via suitable habitats
 - signs of dormice present for example, open nuts, nests

2.3. Field Survey

- 2.3.1. The dormouse survey methodology followed the *Dormouse Conservation Handbook* ⁴. The guidelines recommend that a minimum of 50 nest tubes are

deployed in suitable and connected habitat in order to determine the presence or likely absence of dormice. The nest tubes should be checked monthly during the active season (April to November inclusive).

2.3.2. The *Dormouse Conservation Handbook* suggests an index of probability of finding dormice for each month outside of the dormouse hibernation season (Table 2.1). This is used as a basis to calculate the necessary survey effort to make a robust conclusion of presence or likely absence. The table below assumes that 50 tubes have been placed in suitable habitat.

2.3.3. It is recommended that absence should not be assumed on a score of less than 20. It is not possible to wholly prove the absence of dormice from areas of suitable habitat; however, an adequate survey will give confidence that significant populations have not been overlooked.

Table 1 Index of probability of finding hazel dormice present in nest tubes in any one month.

Month	Index of probability
April	1
May	4
June	2
July	2
August	5
September	7
October	2
November	2

2.3.4. Two route options were originally scoped for suitable dormouse habitat. The habitat identified as being suitable for dormice within 250 metres of the scheme consisted of woodland and hedgerows. Within these distinct areas of suitable habitat (Appendix A) thirteen survey sites were identified within 250 metres of the scheme (Appendix B). Due to the extent of some of the connected suitable habitat more than one survey site was established within certain connected areas, with multiple survey sites set up to ensure robust results.

2.3.5. Dormouse nest tubes were set up across the 13 survey sites from the end of May 2018 through until August 2018. Set up dates varied as land access was not granted to all areas at the start of the survey season. A minimum of 50 tubes were deployed at each site.

2.3.6. In order to achieve a points score of 20, the tubes were checked for evidence of dormice once in each month between May 2018 to September 2019 until a minimum of 20 points had been achieved. All surveys were carried out in suitable weather conditions (dry and no strong winds) and by competent ecologists, with surveys led by a Natural England class licence holder and all potential nests checked and verified by a Natural England class survey licence

holder. The dates and weather conditions for each survey undertaken are detailed in Appendix C.

2.4. Site Status Assessment

2.4.1. Following the completion of the surveys, an assessment of the status of the project site as a whole was then made. The importance of the site takes into account the population estimate but also several other factors:

- The quality and rarity of the habitat and population,
- How connected the population is to the wider area,
- The local significance of the population and
- The estimated size of the population.

2.5. Survey constraints

2.5.1. Access was granted to the majority of identified dormouse survey areas, with one main exception, Emma's Grove woodland. This area of broadleaved woodland was observed from adjacent areas to support mature hazel coppice along with a good diversity of tree and shrub species, and appears to provide high quality dormouse habitat. This area of woodland is partially connected to Ullen Wood and survey site 4, with a stock fence which is partially vegetated with bramble scrub and rough grassland providing some linear connectivity, although full arboreal connectivity is not possible. There is potential that a population associated with this woodland may have been missed by the surveys. However, the woodland itself is too small to support a viable dormouse population alone, and any population would have to be associated with connected hedgerows and woodland.

2.5.2. Although access was granted for all other survey sites with suitable dormouse habitat, access to some was not granted until later in the 2018 survey window. For this reason, surveys continued into 2019 to gain sufficient points. Surveys continued until September 2019 to ensure the sites reached a survey effort score of at least 20 (see section 2.3). Table 2 summarises the set-up dates for all survey sites as well as the survey effort scores for each month.

2.5.3. The suitability of some dormouse sites changed during the surveying period for various reasons. Some sites were managed e.g. hedgerows cut either by farmers of the local highways management authority. Other sites were vulnerable to public interference with some tubes interfered with.

2.5.4. Where sites were made unsuitable surveys were stopped and tubes removed. To compensate for public interference an extra 10 tubes were put up in sites that

were publicly accessible and where possible survey tubes were placed well away from footpaths and other regularly accessed areas.

- 2.5.5. A small number of nest tubes were destroyed by livestock and/or by hedge trimming. However, these were replaced as soon as they were discovered and so is not considered to have impacted on the survey results.
- 2.5.6. Surveys at half of site 1 were stopped due to health and safety concerns over the proximity to the A417. This site was originally comprised of 100 tubes and therefore surveying the remaining 50 safely still enabled a valid survey to be undertaken within connected habitat.
- 2.5.7. Following the PRA of Option 30 in March 2019, surveys on sites 7 and 8 were halted. As these sites are no longer within 250 metres of the scheme no further survey effort was required. However, the data recorded at these sites up to March 2019 is presented in Appendix C for completeness and to give additional context for the status of dormice within the wider area.

Table 2 Site names, set up dates and survey effort score

Dormouse Site	Site set up date	Survey Effort Score
1	12 May 2018	20
2	1 May 2018	20
2A	24 July 2018	20
3	12 June 2018	23
4	12 June 2018	22
5	21 June 2018	23
6 & 6A	4 June 2018	22
7	4 June 2018	10.5
8	6 June 2018	2
9	30 May 2018	27
9A	25 July 2018	24
10	4 July 2018	20
11	21 August 2018	23

3. Results

3.1. Desk Study results

3.1.1. The data search results from GCERC revealed no records of dormice within a 2 kilometre radius of the scheme. However, there are large areas of suitable habitat and to date no specific, comprehensive survey of the area has been carried out. Therefore, it is possible that dormice are very localised or under recorded in Gloucestershire. The nearest record to the site, as identified on the National Dormouse Database (Peoples Trust for Endangered Species) is approximately 2.6 kilometres north of the scheme with a record dating from 2017.

3.2. Habitat Assessment

3.2.1. All habitat within 250 metres of the scheme was assessed for its suitability to support dormice. Ten distinct habitat areas were determined as having suitable dormouse habitat; these were broken up into 13 survey sites for the nest tube surveys.

3.2.2. Surveys were undertaken at all survey sites in 2018; however, after PRA in March 2019, surveys at sites 7 and 8 were discontinued and not carried on into the 2019 survey season. These two sites are still described in further detail below for completeness.

Description of Habitats

3.2.3. The 13 survey sites are described in more detail in the sections below. Appendix B shows the locations of the dormouse tubes within the 13 survey sites.

Site 1

3.2.4. Site 1 (Fly up) consists mainly of mature native hedgerows and young trees with connecting woodland edges, all bordering recreational fields. Half of the site is within a recreational facility and the other half connects to the A417 verge. Due to access issues the second half of site 1 was not set up until June 2018. The hedgerows have good connectivity to the surrounding landscape and other areas of suitable dormice habitat. This site is made up of 1.43 hectares of woodland and 1.9 kilometres of linear hedgerow habitat. The woodland canopy consists of hawthorn *Crataegus monogyna*, ash *Fraxinus excelsior*, willow *Salix sp.*, elder *Sambucus nigra* and hazel *Corylus avellana*. Hedgerow species present include hawthorn, blackthorn *Prunus spinosa* bramble *Rubus fruticosus*, dogwood *Cornus sanguinea* and field maple *Acer campestre*.

3.2.5. Figure 3.1 below demonstrates the type of habitat present at site 1.

Figure 3.1 Site 1 habitat examples



Site 2

3.2.6. Site 2 (Dog Lane) consists of a small broadleaved woodland covering 2.12 hectares and 350 metres of hedgerow running along a quiet lane. It is made up of frequent hawthorn, hazel and dogwood together with occasional bramble and ivy *Hedera helix*.

3.2.7. Figure 3.2 below demonstrates an example of the habitat present at site 2.

Figure 3.2 Site 2 habitat example



Site 2A

3.2.8. Site 2A (Crickley Hill) is part of Crickley Hill and Barrow Wake SSSI. It is a mature broadleaved woodland with a sparse understorey in parts, however large areas display strong understorey connectivity. The site is set on a steep hillside covering an area of 13.3 hectares with linear hedgerows to providing connectivity to surrounding areas. There is an abundant availability of food sources within the site and connect surrounding habitat. Woodland species

present include pedunculate oak *Quercus robur*, ash, field maple, hawthorn and mature coppiced hazel.

3.2.9. Figure 3.3 below demonstrates an example of the habitat present at site 2A.

Figure 3.3 Site 2A habitat example



Site 3

3.2.10. Site 3 is connected to Crickley Hill and Barrow Wake SSSI and site 5. It is a mature broadleaved woodland set on the side of a hill close to Crickley Hill and Barrow Wake SSSI covering approximately 4.8 hectares. Strong connectivity to the surrounding landscape through connected hedgerows and sections of woodland. Woodland species present include field maple, hawthorn, blackthorn and mature coppiced hazel.

3.2.11. Figure 3.4 below demonstrates an example of the habitat present at site 3.

Figure 3.4 Site 3 habitat example



Site 4

3.2.12. Site 4 (Ullen Wood) is a mature ancient semi-natural broadleaved woodland covering an area of 23.5 hectares with 350 metres of hedgerow linking site 3 to site 11 (Shab Hill) as well as surrounding coppiced hazel and oak woodland.

Woodland species present include ash, field maple, hawthorn, hazel and blackthorn.

3.2.13. Figure 3.5 below demonstrates an example of the habitat present at site 4.

Figure 3.5 Site 4 habitat example



Site 5

3.2.14. Site 5 (Barrow Wake) is in 2.3 hectares of continuous, dense scrub with frequent mature trees bordering the existing A417, within the Crickley Hill and Barrow Wake SSSI. The site starts in Barrow wake carpark along the Highways boundary and moves north towards a woodland section linked with site 3. This site is connected to a wider area of suitable dormouse habitat, via hedgerows to the west and woodland to the south. Species include frequent blackthorn, hawthorn, hazel, oak, elm *Ulmus* sp., crab apple *Malus sylvestris* and dog wood.

3.2.15. Figure 3.6 below demonstrates an example of the habitat present at site 5.

Figure 3.6 Site 5 habitat example



Site 6

3.2.16. Site 6 is located in a 3-hectare section of broadleaved and coniferous woodland. The site is predominately a coniferous plantation surrounded by a broadleaved-woodland edge. The woodland is surrounded by arable fields and grazed farmland. Dense continuous hedgerows connect the site to a large number of surrounding woodland areas including 57.2 hectares of Cally Hill Plantation and Ullen Wood to the North. Site 6 has hedgerow connections to site 4 and 11. There are 16 extra tubes located to the east of the main site in half a hectare of broadleaved woodland separated by a narrow farm track from site 6. This was a supplementary site to site 6. Due to the small size of habitat present and distance from the scheme (with no likely impacts), this additional area was not set-up as a distinct site, but additional tubes were placed to sample this habitat.

3.2.17. Figure 3.7 below demonstrates an example of the habitat present at site 6.

Figure 3.7 Site 6 habitat example



Site 7

3.2.18. Site 7 consists of native hedgerows around the edge of a field put to pasture and includes the edge of a broadleaved woodland. The hedgerows also border the A417. The site comprises 1500 metres of hedgerow and 4 hectares of broadleaved woodland. The hedgerows are largely comprised of hawthorn interspersed with field maple, dogwood and blackthorn with occasional ash, holly, elder, hazel and beech. The woodland section is dominated by ash, alder *Alnus glutinosa*, beech and hawthorn.

3.2.19. Figure 3.8 below demonstrates an example of the habitat present on at site 7.

Figure 3.8 Site 7 example habitat



Site 8

3.2.20. Site 8 is located within mature native hedgerows surrounding agricultural fields. To the north of the site is the A417 and connected to the south is small sections of broadleaved woodland. The site consists of 2300 metres of hedgerow and 6.9 hectares broadleaved woodland. The species composition comprises hazel, hawthorn, field maple, blackthorn, elm, elder, hornbeam, ash, wayfaring tree *Viburnum lantana* and dogwood. The hedgerows present are well managed; however, the woodland section does not appear to be subject to regular management.

3.2.21. Figure 3.9 below shows an example of habitat present at site 8.

Figure 3.9 Site 8 example habitat



Site 9

3.2.22. Site 9 is located within the soft estate of the A417, to the west of the southern end of the scheme. It is comprised of 1.06 hectares of semi natural broadleaved woodland and a 323 metres of native species rich hedgerow. The hedgerows run between the A417 carriageway and grazed farmland. The highways verge

woodland and hedgerows are well managed and allow a diverse range of flora species including; hawthorn and hazel, interspersed with beech, ash, field maple and sycamore *Acer pseudoplatanus*, with very occasional holly *Ilex aquifolium* and pedunculate oak.

3.2.23. Figure 3.10 below demonstrates an example of the habitat present at site 9.

Figure 3.10 Site 9 example habitat



Site 9A

3.2.24. Site 9A comprises 1.2 kilometres of species poor hedgerow and 1.1 hectares of broadleaved woodland. The northern section of this site has a wide section of hedgerow which is dominated by mature coppiced hazel. The hedgerows surround arable and pasture fields and are connected to site 9. The hedgerows and woodland consist of hawthorn, hazel and blackthorn, interspersed with beech, ash, field maple, pedunculate oak and dogwood.

3.2.25. Figure 3.11 below demonstrates an example of the habitat present at site 9A.

Figure 3.11 Site 9A example habitat



Site 10

- 3.2.26. Site 10 comprises of 1.02 hectares of both semi natural and broadleaved plantation woodland and 183 metres of intact species poor hedgerow. The hedgerow and woodland margin surround pasture fields grazed by livestock. This site is linked to suitable surrounding habitat, including sporadic woodland areas, via hedgerows.
- 3.2.27. Figure 3.12 below demonstrates an example of the habitat present at site 10.

Figure 3.12 Site 10 example habitat



Site 11

- 3.2.28. Site 11 (Shab Hill) consists of 8.56 hectares of semi natural broadleaved woodland and 797 metres of species poor hedgerow. The hedgerows and woodland margin surround poor semi-improved grassland and semi-improved calcareous grassland. Site 12 is linked to site 4 by dense continuous hedgerows. The hedgerows are comprised of hawthorn and blackthorn, interspersed with elder, hazel and field maple. The woodland area includes frequent mature beech with an understorey layer of hawthorn, elder and holly on the fringes of the woodland.
- 3.2.29. Figure 3.13 below demonstrates an example of the habitat present at site 11.

Figure 3.13 Site 11 example habitat



3.3. Nest Tube Surveys

3.3.1. Following the completion of the dormouse surveys in 2018 and 2019 no dormice or evidence of dormouse have been identified. A small number of potential started nests were discovered at sites 1,2,5,6 and 9. These lacked the structure or confirmed dormouse signs such as stripped bark. Some of these nests comprised collections of green leaves, indicating possible use by dormice. Subsequent surveys found these did not develop into dormouse nests, with either no further use of the tube or evidence of wood mouse *Apodemus sylvaticus* identified, including feeding signs, individuals and nests characteristic of this species. Survey summary information for each site is provided in Appendix C, including photographs of potential started nests.

3.3.2. A summary of the survey effort for each site is provided in table 3 below.

Table 3 Nest Tube Survey Summary

Dormouse Site	Number of Tubes	Site set up date	Survey Months	Survey Effort Score
1	100	12 May 2018	July, August, September, October, May	20
2	50	1 May 2018	July, August, September, October, May	20
2A	50	24 July 2018	August, September, May, June, September	20
3	50	12 June 2018	July, September, October, April, May, September	23
4	50	12 June 2018	July, October, April, May, June, August, September	22
5	50	21 June 2018	July, September, October, April, May, September	23
6 & 6A	50 (+16 at 6A)	4 June 2018	July, August, September, October, May	22
7	75	4 June 2018	August, September, October – discontinued as outside of Option 30 buffer	10.5
8	100	6 June 2018	October - discontinued as outside of Option 30 buffer	2

9	50	30 May 2018	July, August, September, October, May, September	27
9A	50	25 July 2018	August, September, October, April, May, August	24
10	50	4 July 2018	July, August, September, October, May	20
11	50	21 August 2018	September, October, April, May, June, July, August	23

3.3.3. A minimum of 20 points was achieved for all sites, with the exception of sites 7 and 8 which were discontinued after the PRA as they fell well outside of the Option 30 survey buffer. Therefore, due to the robust level of survey effort, the results give confidence that significant populations of hazel dormouse have not been overlooked within the surveyed areas or nearby connected habitat. Therefore, the likely absence of hazel dormouse from the works footprint can be assumed. However, consideration should be given to the lack of survey undertaken within the high-quality habitat at Emma’s Grove due to the lack of access here.

3.4. Site Status

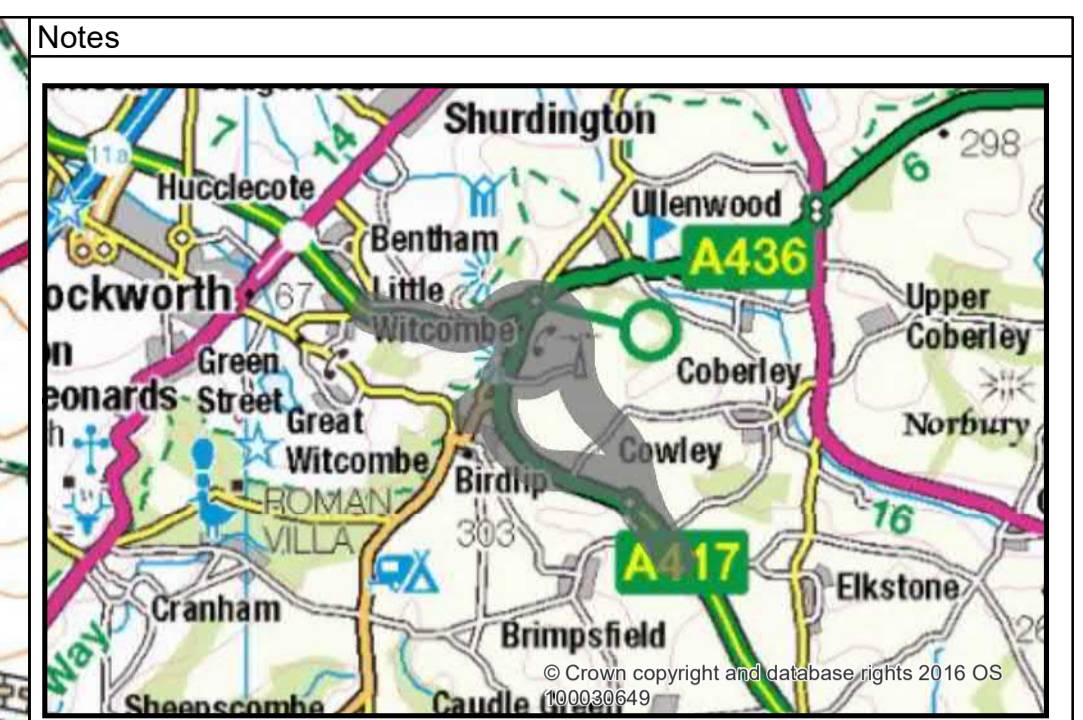
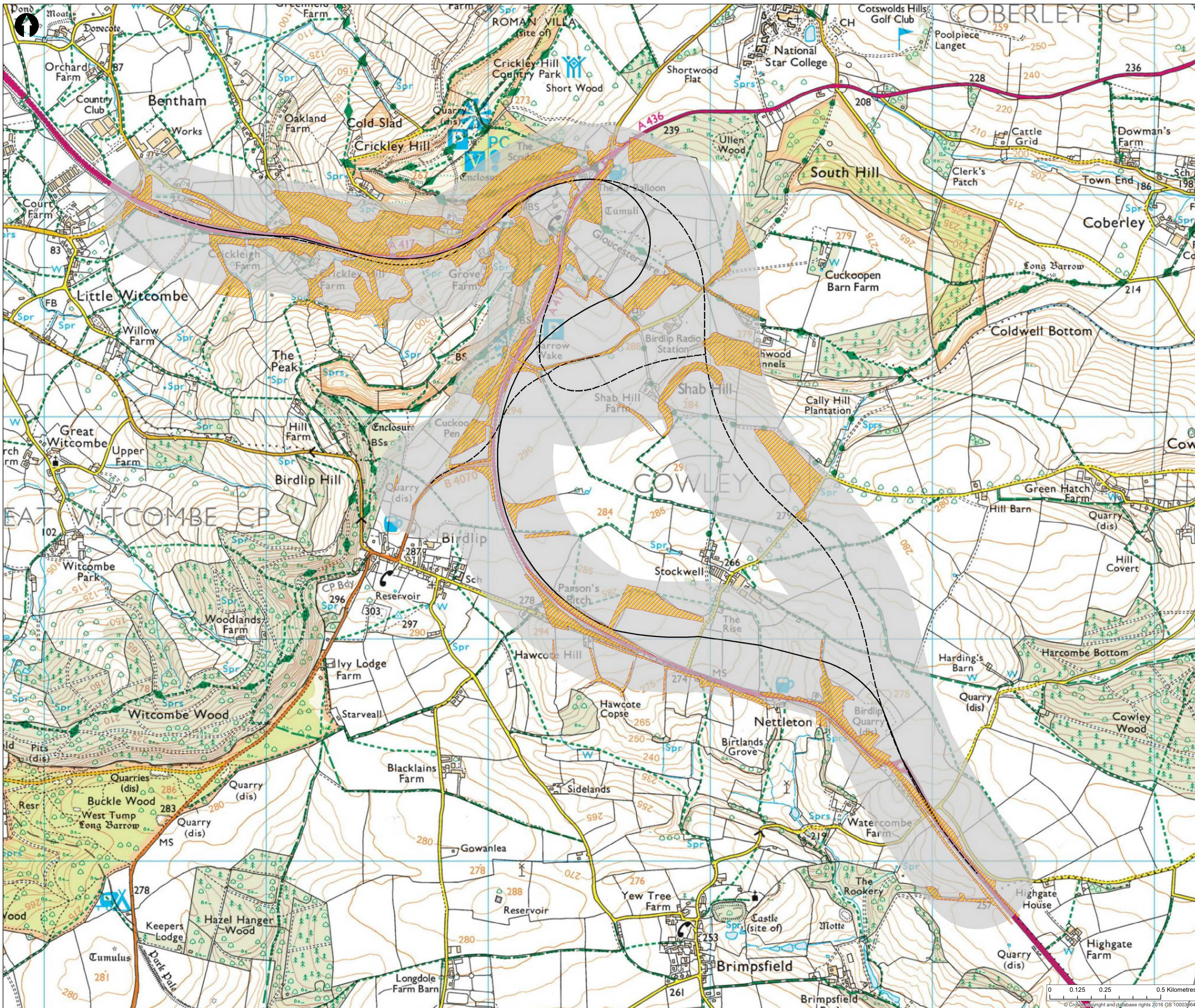
3.4.1. Dormice are not known to be widespread in Gloucestershire. Whilst the nest tube surveys concluded the likely absence of dormice within 250 metres of the scheme, several areas of habitat within the scheme footprint are considered suitable for dormice and one area of woodland, Emma’s Grove, could not be surveyed.

3.4.2. Due to the small size of suitable dormouse habitat within the scheme footprint, the low county wide population count for hazel dormouse and the considerable amount of suitable habitat present within the wider area, the project site is considered to be of low conservation value for dormice.

4. Conclusion

- 4.1.1. The nest tube surveys concluded the likely absence of dormice within 250 metres of the scheme. One area of high-quality habitat was not accessible during the 2018 and 2019 surveys, Emma's Grove. Consideration should be given to the potential for dormice to be present within this area of woodland. However, the lack of evidence within the adjacent surveyed areas would indicate that the likelihood of this woodland supporting a population is low.
- 4.1.2. However, due to the high suitability of habitats for this species within the wider landscape, the availability of connectivity to suitable habitat within the scheme footprint, and the mobile nature of hazel dormouse, it is possible that dormice could colonise these habitats in future years and updating surveys may be required if construction is not commenced by September 2021.

Appendix A – Suitable dormouse habitat within 250 metres of the scheme

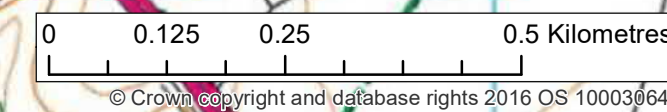


- Notes
- SUITABLE DORMOUSE HABITAT WITHIN BUFFER
 - OPTION 12 CENTRELINE
 - OPTION 30 CENTRELINE
 - OPTIONS 12 AND 30 250 M BUFFER
- (Option centrelines correct at time of survey)

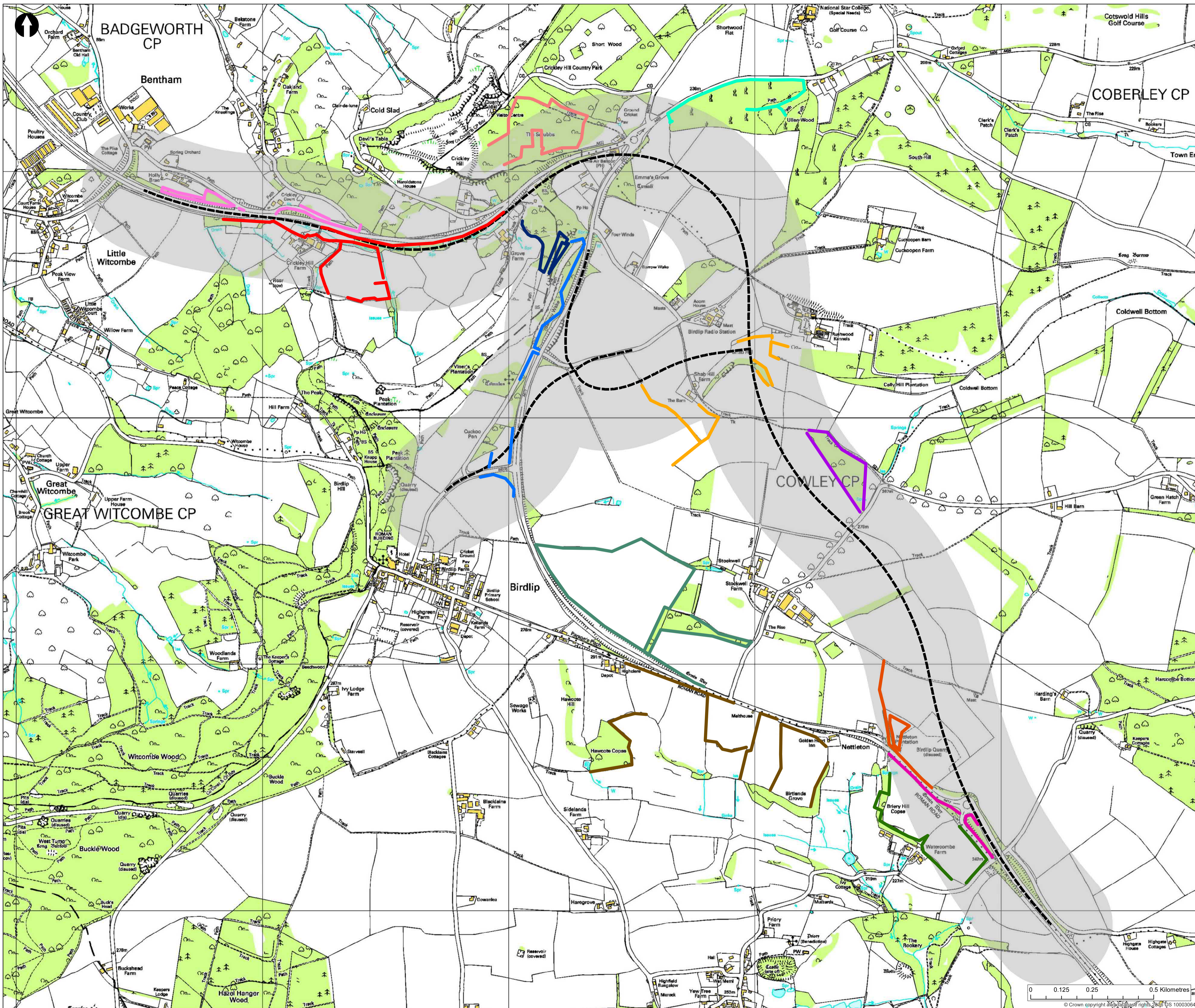
Rev	Date	Amendment Details	Drawn	Chk'd	App'd
P02	20/11/19	Minor Amendments	NB	SW	SM
P01	03/09/19	FIRST REVISION	NB	SW	SM

Mott MacDonald Sweco					

S02						FOR INFORMATION					
A417 MISSING LINK											
SUITABLE DORMOUSE HABITAT WITHIN 250 METRES OF OPTION 12 AND 30											
Scale	1:8,000	Designed	NB	Drawn	NB	Checked	SW	Approved	SM		
Original Size	A1	Date	03/09/2019	Date	03/09/2019	Date	03/09/2019	Date	03/09/2019		
Drawing Number	HE.P14	Originator	551505 - MMSJV	Volume	- VOL -	Project Ref. No.			551505		
Location	000	Type	DR	Role	LB	Number	00058	Revision			P01



Appendix B – Dormouse nest tube locations



Notes

SURVEY SITES

- 1
- 2
- 2A
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 9A
- 10
- 11

--- OPTION 30 CENTRELINE (at time of survey)

OPTION 30 250 METRE BUFFER

Rev	Date	Amendment Details	Drawn	Chk'd	App'd
P02	20/11/19	Minor Amendments	NB	SW	SM
P01	03/09/19	FIRST REVISION	NB	SW	SM

Mott MacDonald Sweco

Client: **highways england**

Drawing Status: S02 Suitability: FOR INFORMATION

Project Title: **A417 MISSING LINK**

Drawing Title: **DORMOUSE NEST TUBE SURVEY SITES**


Scale: 1:7,214	Designed: NB	Drawn: NB	Checked: SW	Approved: SM
Original Size: A1	Date: 03/09/2019	Date: 03/09/2019	Date: 03/09/2019	Date: 03/09/2019
Drawing Number: 551505 - MMSJV - VOL -	Originator: DR	Volume: LB	Project Ref. No: 551505	Revision: P02
000	00059	00059	00059	00059




Scale: 0 0.125 0.25 0.5 Kilometres


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FILE LOCATION: P:\Southampton\HWA\GIS\Projects\353982 - A417\Ecology\GIS_2019\SURVEY_MAPS\DORMOUSE\REPORTING MAPS_NB\APPENDIX B_A417_DM_SURVEY_SITES\APPENDIX B_A417_DM_SURVEY_SITES


Appendix C – Nest tube survey results summary



Site	Number of Tubes	Date	Start/Finish Time	Weather	Summary	Points	Photographs
1	100	03/07/18	12:09 - 14:45	Optimal. Sunny, no cloud and gentle breeze	No dormice	2	
		15/08/18	10:30-12:00	Light rain before. Mild and muggy.	No dormice	5	
		10/09/18	14:15-15:30	Overcast with light wind.	Tube 38 had some green leaves in, although mainly dead leaves. No structure.	7	


		17/10/18	11:30-12:10	Cloudy with intermittent sun, light breeze, w arm.	Tube 1,2, 38 and 42 possible beginnings of nest w with some green leaves, but mainly dead leaves. No structure.	2	  
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		28/05/19	17:00-18:00	Dry, scattered cloud. Rain earlier in day. Muggy, warm with light breeze.	No dormice	4		
		TOTAL : 20						
2	50	05/07/18	12:00-13:30	Very hot and sunny	No dormice	2		
		15/08/18	12:30-13:30	Light rain before. Mild and muggy.	No dormice	5		
		11/09/18	10:00-11:00	Overcast (stratus), calm.	One potential starter nest tube 16 with collection of green hazel leaves but no structure.	7		
		17/10/18	10:30-11:00	Sunny, warm, light breeze	Tube 41 active wood mouse	2		
		15/05/19	10:20-11:10	Sunny, warm, light breeze	No dormice	4		
		TOTAL : 20						
2A	50	28/08/18	14:30-15:30	Warm, cloudy, approx. 20°C	No dormice	5		
		16/10/18	10:10-11:20	Damp, cool, cloudy	No dormice	2		
		10/05/19	10:15-11:45	Still, mild, dry	Tube 7 cache of beech nuts	4		
		19/06/19	14:20-15:30	Overcast, mild.	No dormice	2		
		18/09/19	10:00-12:00	Hot and muggy	No dormice	7		



		TOTAL : 20					
3	50	25/07/18	17:25-18:15	Warm and sunny 20°C	No dormice	2	
		06/09/18	11:00-14:00	Dry	No dormice	7	
		16/10/18	11:30-13:30	Damp, dry and cool	No dormice	2	
		17/04/19	09:00-12:30	Warm and dry	No dormice	1	
		16/05/19	12:15-13:00	Warm, some hazy cloud, light w inds	No dormice	4	
		18/09/19	10:00-12:00	Warm and dry	No dormice	7	
		TOTAL : 23					
4	50	04/07/18	12:23-13:00	Warm and cloudy	No dormice	2	
		16/10/18	14:15-16:00	Damp, cloudy, cool	No dormice	1 (half not accessed)	
		16/04/19	13:00-16:30	Warm and dry	No dormice	1	
		16/05/19	10:55-12:05	Sunny w ith hazy cloud w arm	Blue tit nest tube 19,	4	
		20/06/19	15:00-16:15	Warm and cloudy	No dormice	2	
		19/08/19	15:30-16:00	Sunny w ith scattered cloud	Start of w ood mouse nest	5	
		23/09/19	12:00-13:30	Raining just before.	No dormice	7	
		TOTAL : 22					
5	50	24/07/18	08:30-10:00	Temp 18°C, no rain, 2% cloud cover/sunny, no wind	No dormice	2	

		04/09/18	11:00-13:00	Dry	No dormice	7		
		17/10/18	12:20-13:00	Sunny, w arm, light breeze	Tube 29 dead leaves w ith a couple of fresh oak leaves w ith no structure.	2		
		11/04/19	10:30-11:00	Dry	No dormice	1		
		09/05/19	10:30-11:15	Sunny, clouds, w arm, dry	No dormice	4		
		17/09/19	15:00-17:00	Sunny, clouds, w arm, dry	No dormice	7		
		TOTAL : 23						
6	50	05/07/18	12:10-13:45	Optimal, sunny no cloud gentle breeze	No dormice	2		
		15/08/18	12:00-15:30	Optimal, sunny no cloud gentle breeze	No dormice	5		

		12/09/18	09:30-11:30	Overcast	Tube 28 dead leaves and moss with no structure.	7		
		23/10/18	11:30-12:15	Windy and cold but dry	No dormice	2		
		09/05/19	10:00-11:30	Overcast, still	No dormice	4		
		TOTAL : 20						
9	50	04/07/18	10:50-11:50	Warm and cloudy 20°	No dormice	2		
		16/08/18	11:00-12:00	Rained before survey. Warm and cloudy 20°	No dormice	5		
		04/09/18	11:00-13:30	Dry	Tube 16 and 33 wood mouse nut cache, Tube 34 and 37 collection of green leaves no structure.	7		

								
		24/10/18	11:00-12:00	Dry and breezy, 5°	6 tubes w with small collection of leaves but no structure, and one with a berry cache.	2		
		09/05/19	09:45-10:45	Cloudy and cool	No dormice	4		
		23/09/19	13:00 – 14:00	Overcast, still	No dormice	7		
		TOTAL : 27						
9A	50	16/08/18	12:00-13:00	Rained before survey. Warm and cloudy 20°	No dormice	5		
		05/09/18	12:00-13:00	Warm and dry	No dormice	7		
		25/10/18	12:00-13:20	Sunny and dry	No dormice	2		
		19/04/19	09:00-12:00	Warm and dry	No dormice	1		
		16/05/19	11:00-12:00	Sunny and dry	Active birds nests tube 8 and 11	4		
		28/08/19	13:00-13:30	Dry	No dormice	5		
		TOTAL : 24						
10	50	23/07/18	15:30-17:30	27°, no rain, , 40% cloud cover, light breeze	No dormice	2		

		16/08/18	13:30-15:00	Rain in morning, sunny spells, dry during survey.	No dormice	5	
		11/09/18	11:40-12:25	overcast (stratus), light rain at start	No dormice	7	
		23/10/18	14:00-15:50	Chilly, strong breeze, no rain	Tube 10 and 11 small mammal nests. Tube 22 nut cache.	2	 

		20/05/18	11:30-13:00	Warm and sunny	Tube 42, moss nest found. unclear what constructed the nest unlikely dormouse	4	
						TOTAL : 20	
11	50	11/09/18	13:40-14:30	Overcast with light wind	Fresh leaves in tube 36	7	
		25/10/18	10:00-11:35	Overcast with light wind	Tube 36, 47, 48, 48 and 50 wood mouse nests	2	
		18/04/19	15:00-17:00	Warm and dry	No dormice	1	
		17/05/19	09:30-11:00	Cloudy and mild	No dormice	4	
		19/06/19	14:00-15:00	Damp and mild	Tube 14 and 19 cache of nuts	2	
		16/07/19	12:00-13:30	Hot and muggy	No dormice	2	

A417 Missing Link
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		20/08/19	15:30-17:00	Warm, light breeze and cloudy. 23 ^C	8 tubes with wood mouse nut caches	5	
		TOTAL : 23					