

A417 Missing Link
TR010056

6.4 Environmental Statement
Appendix 8.18 Water Vole Technical
Report

Planning Act 2008

APFP Regulation 5(2)(a)
Infrastructure Planning (Applications: Prescribed Forms and
Procedure) Regulations 2009

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**The Infrastructure Planning
(Applications: Prescribed Forms
and Procedure) Regulations 2009**

A417 Missing Link

Development Consent Order 202[x]

**6.4 Environmental Statement
Appendix 8.18 Water Vole Technical Report**

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Executive summary

Highways England are proposing an upgrade to dual carriageway of the Missing link section of the A417 between Cowley roundabout and Crickley Hill (Birdlip, Gloucestershire, Grid reference SO919158). This connection aims to improve journey times and reduce the safety risks associated with this section of the road network.

This report investigates the presence of water vole *Arvicola amphibius* within the zone of influence of the scheme. The report is informed by a desk study undertaken within 2 kilometres of the redline boundary and subsequent water vole surveys undertaken within 250 metres of the proposed scheme redline boundary. The results of a desk study undertaken in 2017 are presented, along with habitat assessments and subsequent field signs surveys that were undertaken in August 2018 and May 2019.

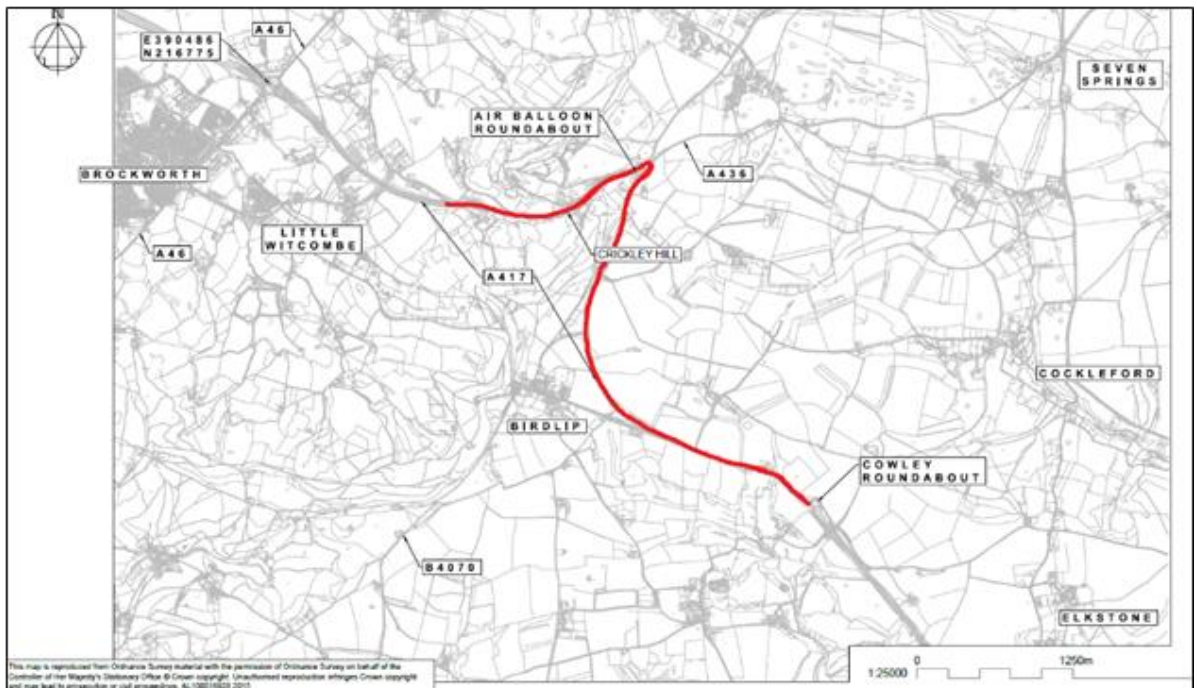
No results of water voles were returned within 2 kilometres of the redline boundary by the biological records search. Two watercourses; Norman's Brook and Upper Frome, were identified as lying partly or wholly within the survey area and were assessed as having low suitability for water voles. The field signs surveys recorded no evidence of water voles on either watercourse.

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 as 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 5.5km stretch shown on Figure 1.1 below (central grid reference SO934161).

Figure 1.1 A417 Missing Link Scheme Location Plan

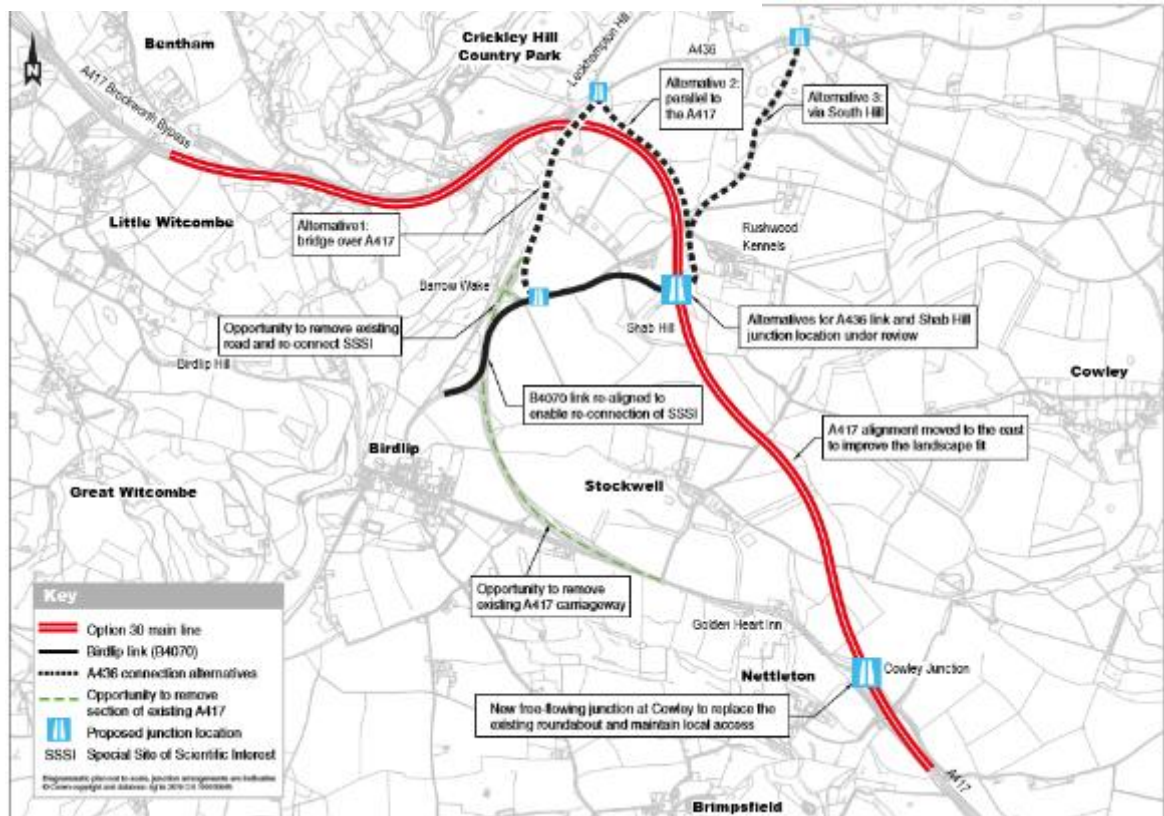


1.2. Scheme proposal

- 1.2.1. 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. The scheme will provide a free-flowing journey between Swindon (M4 Junction 15) and Gloucester (M5 Junction 11a). This connection aims to improve journey times and reduce the safety risks associated with this section of the road network.
- 1.2.2. The preferred route was announced by Highways England as option 30 in March 2019 (Figure 1.2 below). A third ascending lane would be added to the A417 at Crickley Hill and the gradient would be reduced to 7%. A new section of road

would be built through Shab Hill to the east of the current A417 and the roundabouts at Cowley and Air Balloon would be removed. A new junction would be added at Shab Hill with links to Birdlip and the A436. Of the three options considered for a connection to the A436, Alternative 2 has been progressed.

Figure 1.2 A417 Preferred route Announcement



1.3. Scope of the report

1.3.1. The objectives of this report are:

- to collate and review existing records for water voles
- to present the methods, constraints and findings of the habitat assessment and field signs surveys
- to inform impact assessment, valuation and recommendations in the Biodiversity Chapter of the Environment Statement

1.4. Legislation and national policy

1.4.1. Water voles are fully protected under the Wildlife and Countryside Act 1981 (as amended). In summary it is an offence to:

- Intentionally kill or injure these species.

- Intentionally or recklessly:
 - Damage or destroy any structure or place used for shelter or protection
 - Disturb these species whilst occupying any structure or place used for shelter or protection.
 - Obstruct access to any structure or place used by these species for shelter or protection.

1.4.2. Water voles are listed as a species of 'principal importance for the conservation of biodiversity in England' under Section 41 of the NERC Act 2006. Following the production of *Biodiversity 2020*, the national strategy for England, actions were identified by experts to help in the recovery of populations of the S41 listed species. Actions identified for the recovery of water voles include the following:

- Continue and extend the National Key Sites for water voles initiative
- Identify Regional Key Areas for water voles following agreed methodologies
- Establish and maintain a national water vole database and GIS
- Continue or establish (as appropriate) and maintain a programme of regular monitoring in National and Regional Key Areas and at a sample of other sites
- Maintain and, where appropriate, extend the area of suitable water vole habitat in National and Regional Key Areas
- Reduce the impact of mink predation, prioritising action in Regional Key Areas.
- Ensure appropriate protection of the water vole and its habitat under the *Wildlife and Countryside Act*

1.5. Status of water voles at the national level

1.5.1. Water voles are widely distributed throughout the lowland areas of Great Britain but are absent from Ireland. Water voles have declined over the last century across the UK, owing predominately to predation by non-native mink and changes in land management. Between 1989 and 1998 a decline of 78% was recorded¹.

1.5.2. Since 1998, it is estimated that the Water vole population has suffered a further 50% decline, although range remains stable. Changes in land management approaches and captive breeding projects are positive drivers of change, but the future population trend is predicted to show an overall decline².

¹ Strachan, C., Strachan, R. & Jefferies, D. J. 2000. Preliminary report on the changes in the water vole population of Britain as shown by the national surveys of the 1989-1990 and 1996- 1998. London: The Vincent Wildlife Trust.

² Mathews, F., Kubasiewicz, L.M., Gurnell, J., Harrower, C.A., McDonald, R.A. and Shore, R.F. (2018). A Review of the Population and Conservation Status of British Mammals: Technical Summary. A report by the Mammal Society under contract to Natural England, Natural Resources Wales and Scottish Natural Heritage. Natural England, Peterborough.

1.6. Water vole ecology

- 1.6.1. Water voles in the UK are strongly correlated with aquatic habitats, although populations on the continent (and rare examples in the UK) also form terrestrial communities⁴. They prefer slow flowing rivers, ditches and lakes.
- 1.6.2. Water voles favour watercourses with steep earthen banks; excavating burrows into these banks with entrances both above and below the water level. Colonies are vulnerable to changes in water levels therefore, steep banks ensure that in times of high flow, water voles can retract to areas of higher ground. Water voles feed predominately on vegetation and require an abundant supply of food throughout the year. 227 plant species have been identified in their diet. Their preference is for well vegetated channels, which provide an abundant food supply whilst providing cover from predators.
- 1.6.3. The males home range is approximately 130 metres, with females typically having smaller ranges of 30 metres. Water voles are quite short-lived animals and will have multiple litters each year. In a good year, this means that populations can expand significantly and thus spread into less suitable habitat.

⁴ Dean, M., Strachan R., Gow, D., Andrews, R. (2016). *The Water Vole Mitigation Handbook* (The Mammal Society Mitigation Guidance Series) [online] available at: <http://www.fensforthefuture.org.uk/admin/resources/downloads/water-vole-mitigation-guidance-final-2016.pdf> (last accessed July 2019)

2. Methodology

2.1. Desk study

- 2.1.1. A detailed desk study was undertaken by Mott Macdonald in 2017 which identified records of protected and notable species within 2 km of the scheme options. These were obtained from Gloucestershire Centre for Environmental Records.
- 2.1.2. Personal communications with Gloucestershire Wildlife Trust (GWT) during 2018 also identified populations of water vole within the local area.
- 2.1.3. The desk study included reviewing other survey and environmental assessment reports undertaken for the study site, including records from previous surveys. WSP undertook a Stage 2 Assessment of a proposed scheme which partly covered the options currently being considered. The results of this Stage 2 Assessment were reported in 'A417 Cowley to Brockworth Bypass Improvement Scheme - Stage 2 Ecology and Nature Conservation Report' (WSP 2006)⁵.

2.2. Field surveys

- 2.2.1. Following the extended phase 1 habitat survey undertaken in spring 2017 by Mott MacDonald, two watercourses with potential to be affected by the scheme were identified as having potential to support water voles. Habitat suitability assessments were completed on Norman's Brook and Upper Frome in August 2018. These were combined with surveys for water vole field signs. A second visit to both watercourses for field signs was completed in May 2019.
- 2.2.2. The Zone of Influence (Zoi) for water vole surveys is in accordance with guidelines provided in the Water Vole Mitigation Handbook and survey experience of the lead surveyor. All watercourses within 250m of the redline boundary were assessed. Watercourses outside of this buffer were included where considered necessary, owing to connectivity to other watercourses. The survey area plus 200 metres upstream and 200 metres downstream was surveyed where access was available.
- 2.2.3. Surveys for water vole field signs followed the guidelines set out in the Water Vole Conservation Handbook⁶. All surveys were undertaken within the water vole's main breeding season (mid-April to September for Southern England) and during good, stable weather.¹ At each watercourse a survey was undertaken

⁵ A417 Cowley to Brockworth Bypass Improvement Scheme – Stage 2 Ecology and Nature Conservation Report, WSP, March 2006 .

⁶ Strachan, R., Moorhouse, T., Gelling, M. (2011). *Water Vole Conservation Handbook 3rd Edition*. Wildlife Conservation Research Unit, Oxford.

during the early season (mid-April to June) and during the late season (July-September). During the survey a habitat assessment was completed, with each watercourse assigned a suitability ranking of either negligible, low, moderate or high. Suitability of habitat for supporting water voles was based on the following:

- bank profile, channel profile and characteristics and water levels
- availability of food sources
- vegetation structure (particularly the extent of suitable marginal vegetation)
- level of shading
- disturbance levels
- bordering land use
- connectivity with other areas of suitable or sub-optimal habitat

2.2.4. During each survey, the banks of each watercourse or water body (up to a distance of 2 metres from the water's edge) were inspected for signs of use by water vole, with a note made of the number of each type of water vole sign recorded so that abundance could be estimated (ranked abundance as frequent, scarce, or none for each section surveyed). Field signs recorded included the following:

- presence of latrines
- presence of burrows (both active and inactive)
- presence of runs
- presence of footprints
- presence of feeding remains
- individual droppings
- sightings and / or sounds (characteristic sound entering the water) of individuals
- An indication of relative population size was estimated based on the number of latrines recorded within the survey area

2.2.5. All surveys were undertaken by experienced Mott MacDonald ecologists, familiar with The Water Vole Mitigation Handbook³ and Water Vole Conservation Handbook⁵ survey guidance, along with having the required knowledge, skills and experience as set in CIEEM's Competencies for Species Survey: Water Vole⁷.

⁷ CIEEM, Technical Guidance Series. Competencies for Species Survey: Water Vole (April 2013)

2.3. Survey constraints and limitations

- 2.3.1. The surveys were undertaken under optimal conditions at suitable times of the year. However, the surveys provide a snapshot of activity at the site and therefore there is always the risk of protected species being overlooked, either owing to the timing of the survey or the scarcity of the species at the site.
- 2.3.2. Due to survey and access agreements, surveys were split over two years, with late season surveys undertaken in 2018 and early season surveys undertaken in 2019. This is not considered to be a constraint to the survey results.
- 2.3.3. Conditions on site meant that some areas were difficult to access, owing to the density of vegetation. An assessment of these areas was made as far as was practicable, but it is possible that signs of water vole were missed and therefore such features would not have been addressed within this report. However, these densely vegetated areas are likely to be heavily shaded by the density of the vegetation and therefore the suitability of these areas for water vole is reduced.

3. Results

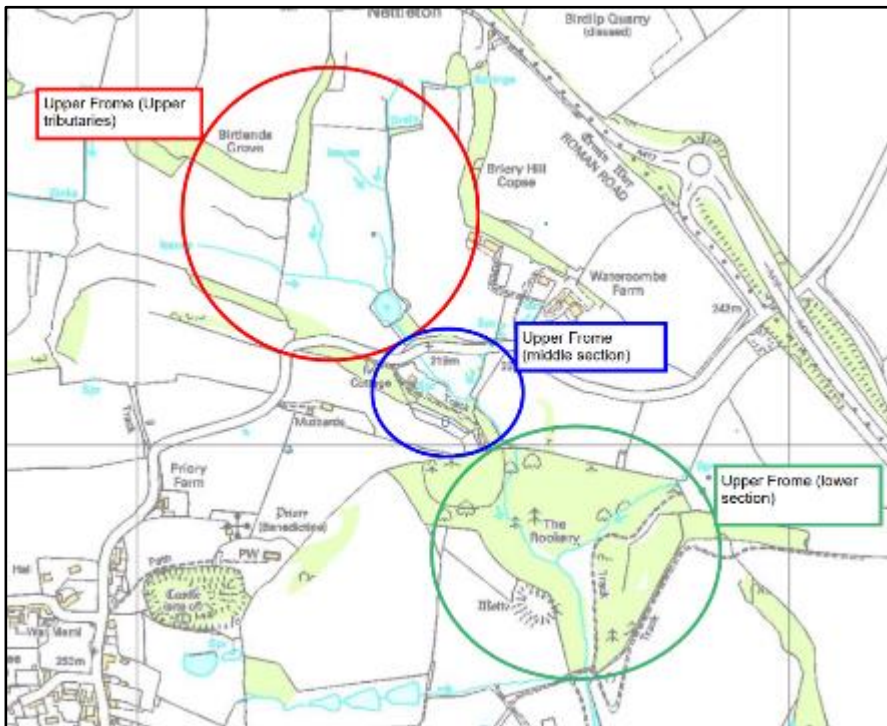
3.1. Desk study

- 3.1.1. No records of water voles within 2km were returned by the biological records search from GCER.
- 3.1.2. The WSP Stage 2 Assessment (2006) surveyed for water voles along Norman's Brook (formerly thought of as Horsbere Brook) in 2003 but found no evidence.
- 3.1.3. GWT confirmed the presence of water voles in Horsbere Brook, approximately 3km west of the survey area.

3.2. Habitat assessment

- 3.2.1. Habitat assessments were undertaken at two watercourses within the survey area; Norman's Brook and Upper Frome, in August 2018.
- 3.2.2. Norman's Brook as watercourse can be split into two sections; The 875m length to the immediate south of the existing A417 all falls within 250m of the redline boundary and was surveyed along its length for its suitability for water voles and field signs. The section to the north of the road is outside of the survey area and therefore not assessed, but runs under a long culvert (approximately 900m) where it connects to the surveyed portion. The southern part of the watercourse (adjacent to the A417) was previously thought to be connected to Horsbere Brook, however, tracer surveys in 2019 confirmed the watercourse to be connected to Norman's Brook.
- 3.2.3. The habitat assessment of upper Frome was split into three distinct sections owing to their differing flows, bank profiles and vegetation structures. The upper tributaries flow slowly from springs south of Nettleton through heavily grazed pasture. After these upper tributaries join in a pond at Watercombe Farm, the middle section flows quickly through woodland with steep-sided rocky banks. The watercourse slows at Brimpsfield Park and joins a tributary from the east to form the lower section. This lower section flows slowly through shallow and low-sided earth-banked woodland. A diagram of the Upper Frome sections is provided below in Figure 3.1.
- 3.2.4. A small 90m section of the Upper Frome (upper tributaries) falls within 250m of the redline boundary and was surveyed for its suitability for water voles and for field signs. As per the water vole mitigation handbook, a further 250m downstream section was subjected to survey. This covered the full length of the Upper Frome (upper tributaries).

Figure 3.1 Upper Frome sections



- 3.2.5. The middle and lower sections of the Upper Frome were also surveyed due changing flows, bank profiles and vegetation structures. A total length of 960m was surveyed along the Upper Frome.
- 3.2.6. The habitat assessments for these surveys are detailed below in table 3.1. Habitat photos are provided in Appendix B and photographs of field signs are provided in Appendix C.

Table 3.1 Water vole habitat assessment

Site name, location & approximate length	Bank profile, bank characteristics and water level	Vegetation structure and shading levels	Bordering land use, disturbance levels	Connectivity	Overall suitability for water voles
Norman's Brook, (SO 92940 15802 to SO 92118 15795), 875m.	Small watercourse in deeply incised channel. Earth banks that have collapsed in places, suitable for water vole burrows. Low flow with frequent man-made structures along length; culverts, pipes, weirs. Water levels appear to	Heavily shaded by woodland along length with limited aquatic vegetation. Areas with increased light penetration where trees have fallen along bankside. Woodland ground flora dominated by dog's mercury, hart's tongue fern, common	Woodland extends 10m from both banks. Wider area is pasture, rough grassland and scrub. Closely borders current A417 to the north and busy bike park to the south	Upstream connectivity poor. Downstream connectivity poor with long culvert (c900 meters) connecting to Norman's Brook.	Low

Site name, location & approximate length	Bank profile, bank characteristics and water level	Vegetation structure and shading levels	Bordering land use, disturbance levels	Connectivity	Overall suitability for water voles
	fluctuate considerably.	nettle and pendulous sedge.			
Upper Frome (Upper tributaries) (SO 94369 12538 to SO 94384 13235), 330m	Minor agricultural ditch with frequent livestock encroachment creating heavily eroded banks. Low suitability for water vole burrows. Shallow along length with frequent muddy pooling and drying out in places. Depth up to 10cm	Water mint and watercress in areas of pooling, with heavily grazed grass and rush species. Occasional shading from hawthorn, blackthorn or elder trees/shrubs.	Surrounding land heavily grazed by cows, leading to muddy pooling in ditch and erosion of banks.	No upstream connection, downstream more suited to water voles.	Negligible
Upper Frome (middle section) (SO 94384 13235 to SO 94584 12999), 260m	Largely steep-sided rocky banks with slow flow and average depth of 15cm. Some areas with earth bank sides and shallower depth.	Limited aquatic vegetation with banks of tall ruderal and willow scrub. Species include bramble, nettle, hogweed, dock, thistle and meadow cranesbill. Watercourse almost completely shaded along length.	Surrounding land is unmanaged scrub and tall ruderal with pasture and woodland in wider landscape. No livestock but possible disturbance from cats or dogs of local home owners.	No upstream connection, downstream more suited to water voles.	Low
Upper Frome (lower section) (SO 94584 12999 to SO 94694 12657), 370m	Shallow, slow running stream in steep-sided valley with average depth of 10cm. Low banks generally not suited to water vole burrows.	Limited aquatic vegetation with heavy shading from open woodland along majority of length. Some open areas with improved grassland and ruderal vegetation.	Stream runs through pheasant shoot with managed woodland, tall ruderal and improved grassland on valley floor. Highly disturbed by game birds and grazing cows.	Downstream connectivity to River Frome	Low

3.2.7. Norman's Brook has low suitability for water voles due to its heavy shading, lack of aquatic herbaceous vegetation, poor bankside vegetation and fluctuating flows.

3.2.8. The Upper Frome (Upper tributaries) has negligible suitability for water voles as its banks are heavily trampled by livestock and has a very low flow with limited herbaceous vegetation. The middle and lower sections of the Upper Frome have low suitability as they are largely undisturbed by livestock but are heavily shaded and lack aquatic or bankside herbaceous vegetation.

3.3. Field signs

3.3.1. No signs of water voles were recorded in either of the two watercourses across the two survey visits. Evidence of mammals along the watercourses was limited to field vole and brown rat. These are detailed in table 3.2 below. Photos are provided in Appendix C.

Table 3.2 Water vole field signs results

Watercourse ID	Type of Feature	Date	Easting	Northing	Notes	
Upper Frome (Upper tributaries)	Mammal dropping (not WV)	15 August 2018	394385	213288	Field vole droppings	Photo 1
Upper Frome (Upper tributaries)	Mammal droppings (not WV)	15 August 2018	394380	213304	Rat droppings	Photo 2
Upper Frome (Upper tributaries)	Mammal dropping (not WV)	15 August 2018	394295	213252	Field vole droppings	
Upper Frome (Upper tributaries)	Feeding remains	15 August 2018	394350	213246	Feeding remains, not indicative of water vole	Photo 3
Upper Frome (Upper tributaries)	Mammal dropping	15 August 2018	394856	212232	Mammal dropping on muddy bank - not water vole	
Upper Frome (lower section)	Burrow	15 August 2018	394871	212226	Mammal hole low to waterline, 20cm wide – not water vole	
Upper Frome (lower section)	Burrow	15 August 2018	394850	212209	Likely kingfisher 0.6m above water-line. Some evidence of whitewashing, 10cm wide.	
Upper Frome (lower section)	Burrow	15 August 2018	394739	212913	Likely rat burrow on earth bank side of shallow stream. 10cm diameter. No visible droppings, under woodland canopy on bankside.	Photo 4
Upper Frome (lower section)	Footprint	15 August 2018	394653	212818	Footprint of small mammal - unlikely to be water vole as digits not splayed in most indicative star configuration	Photo 5

Watercourse ID	Type of Feature	Date	Easting	Northing	Notes	
Upper Frome (lower section)	Burrow	22 May 2019	394665	212787	Rat burrow in bank	
Upper Frome (lower section)	Burrow	22 May 2019	294695	212599	Rat burrow in bank of island in centre of lake	
Norman's Brook	Burrow	16 August 2018	392484	215690	Rat burrow with excavated soil in entrance	Photo 6
Norman's Brook	Feeding remains	16 August 2018	392484	215690	Feeding remains, not indicative of water vole	
Norman's Brook	Burrow	16 August 2018	392838	215726	Rat burrow	

3.3.2. Table 3.3 below provides details on weather conditions and dates of the surveys undertaken.

Table 3.3 Water vole survey dates and weather conditions

Survey area	Date	Air temperature (°C)	Rain (0-5)	Cloud cover (0-8)	Wind (Beaufort scale)
Norman's Brook visit 1	16/8/2018	17	0	6	2
Norman's Brook visit 2	28/5/2019	14	0	2	2
Upper Frome (all sections) visit 1	15/8/2018	19	0	7	2
Upper Frome (all sections) visit 2	22/5/2019	16	0	1	1

3.4. Assessment of water vole population

3.4.1. Water voles are assumed to be absent from the survey area as no records were returned by the desk study and no evidence was recorded during the field signs surveys.

4. Potential Impacts

- 4.1.1. The impact assessment will be covered within the biodiversity chapter of the Environmental Statement for the project. At the time of writing, the Scheme is still being designed and firm conclusions on impacts will be detailed in the aforementioned document.

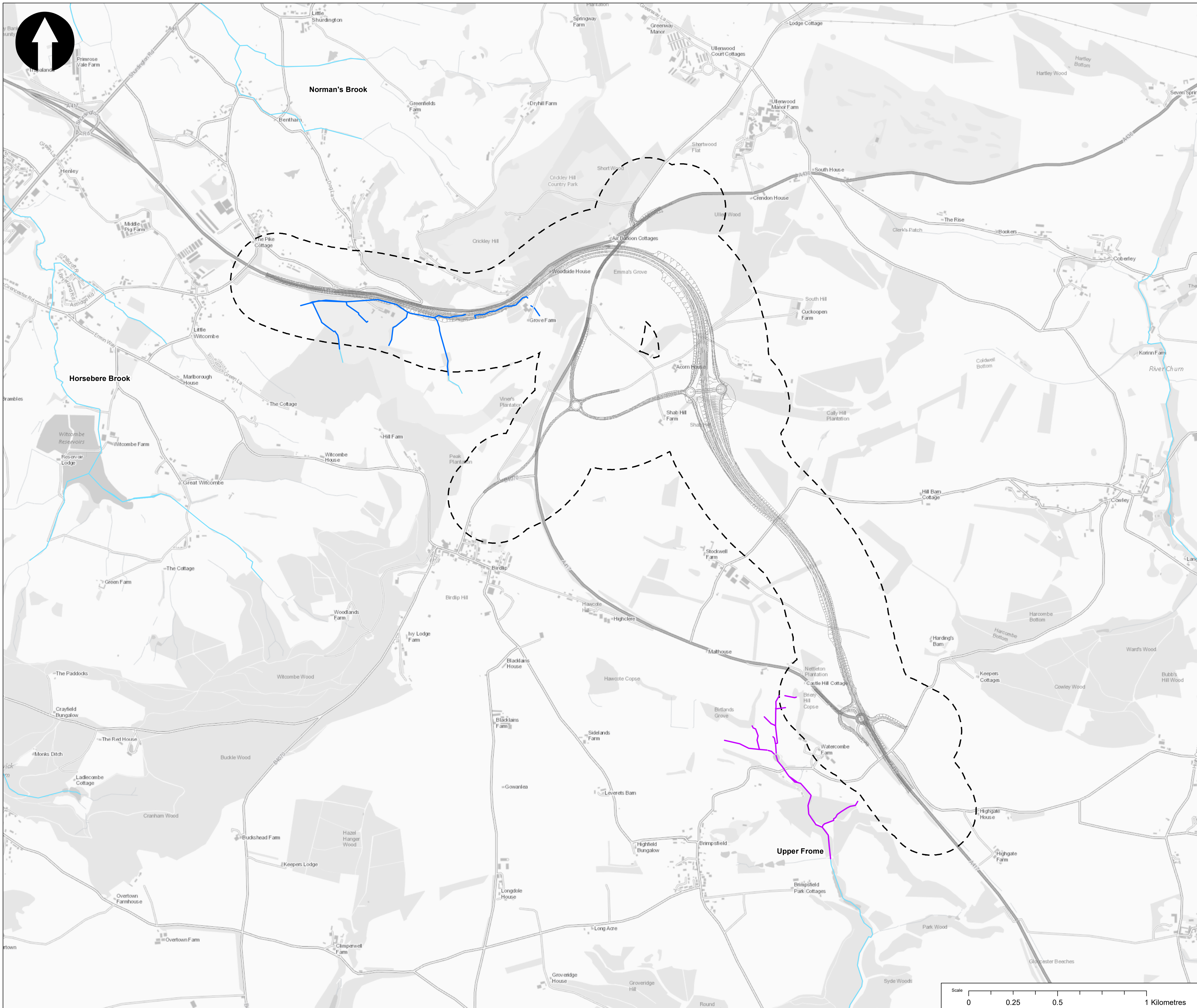
5. Mitigation and Enhancement Recommendations

- 5.1.1. Full details of ecological mitigation measures will be included within the biodiversity chapter of the Environmental Statement for the project.
- 5.1.2. Positive measures should be considered that may offer benefits to Water voles, including habitat reconnection and enhancement.

6. Conclusion

- 6.1.1. A biological records search undertaken in 2017 returned no records of water voles within 2km. Personal communication with Gloucestershire Wildlife Trust confirmed the presence of water voles in Horsbere Brook, approximately 3km from the scheme.
- 6.1.2. Low suitability water vole habitat was identified at two watercourses; Norman's Brook and Upper Frome, within 250m of the redline boundary. Each watercourse was surveyed in both August 2018 and May 2019 for field signs and returned no evidence of water voles.
- 6.1.3. Water voles are assumed to be absent from the survey area as no records were returned by the desk study and no evidence was recorded during the field signs surveys.
- 6.1.4. Full details of potential impacts and mitigation recommendations will be included in the biodiversity chapter of the Environmental Statement for the project.

Appendix A - Water vole survey area



Notes

Legend

- Scheme Extent (at time of survey)
- 250 Metre Scheme Buffer

Water Vole Survey Network

- River Network Outside Survey Area
- Normans Brook Survey Area
- Upper Frome Survey Area

P02	28/10/2019	REVIEW AMENDMENTS	JW	VH	SM
P01	15/07/2019	DRAWING PRODUCED	WG	VH	SM
Rev	Date	Amendment Details	Drawn	Chk'd	App'd

Mott MacDonald Sweco



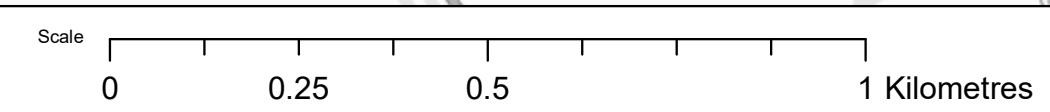
Client	FOR INFORMATION	Suitability	S2
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Project Title
A417 MISSING LINK

Drawing Title
WATER VOLE SURVEY AREA

Scale	1:10,000	Designed	WG	Drawn	JW	Checked	VH	Approved	SM
Original Size	A1	Date	15/07/19	Date	28/10/19	Date	28/10/19	Date	28/10/19

Drawing Number	HE 551505	Originator	MMSJV	Volume	EBD	Project Ref. No.	551505
Location	000	Type	DR	Role	LB	Number	00050
							P02



Appendix B - Habitat assessment photos



Norman's Brook
habitat assessment



Norman's Brook
habitat assessment



Upper Frome
(Upper tributaries)
habitat assessment



Upper Frome
(Upper tributaries)
habitat assessment



Upper Frome
(Middle section)
habitat assessment



Upper Frome
(Middle section)
habitat assessment



Upper Frome
(Lower section)
habitat assessment

Appendix C - Field signs photos

 A close-up photograph of dark, moist mud. A silver coin is placed on the mud as a scale reference. Several small, dark, cylindrical droppings are visible on the surface of the mud.	<p>Photo 1: Field vole droppings</p>
 A close-up photograph of a muddy bank with some green grass blades. A single, dark, elongated dropping is visible on the mud.	<p>Photo 2: Rat dropping</p>
 A photograph of a pond or stream with dense green aquatic vegetation. The water surface is covered with various plant stems and leaves.	<p>Photo 3: Feedings remains, not indicative of water vole</p>



Photo 4: Likely rat burrow on earth bank side of shallow stream. 10cm diameter. No visible droppings, under woodland canopy on bankside.



Photo 5: Footprint of small mammal - unlikely to be water vole as digits not splayed in most indicative star configuration



Photo 6: Rat burrow
with excavated soil
in entrance