A358 Taunton to Southfields Dualling

Water vole Technical Report

PCF STAGE 2

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Executive summary

The proposed A358 Taunton to Southfields Dualling scheme (hereafter referred to as 'the scheme'), aims to provide a dual carriageway along the length of the A358 between Taunton and Ilminster in Somerset, connecting the A303 at Ilminster to the M5 motorway to the north. The scheme would include grade separated junctions with the purpose of providing a high-quality free flow journey for those using the route, and the removal of at-grade junctions and direct accesses.

Water vole habitat assessments and presence surveys were undertaken by Mott MacDonald Sweco Joint Venture between 2017 and 2020, to determine the habitat suitability of each watercourse and identify water vole field signs to confirm presence of water voles within 250m of the scheme.

Of the original 74 watercourses identified in the scheme vicinity, 58 were scoped out as they were either no longer within 250m of the scheme buffer or the habitat was assessed as unsuitable for water voles. Fifteen watercourses were subject to presence surveys. Watercourse 32 has not yet been assessed and will require presence surveys subject to a habitat assessment in 2021.

Water voles have been confirmed as present within the 250m scheme buffer on watercourses 17, 20 and 24a. Additionally, water vole signs have been recorded on watercourses 19, 24, 30, 39 and 55 but no other field signs have been identified in these locations and therefore presence cannot be confirmed. Mink field signs were recorded along watercourse 36. Signs of mink were also noted along watercourses 14a, 30, 34 and 36 but outside the 250m scheme buffer.

No water vole field signs were recorded at the remaining seven watercourses during either of the two presence surveys.

At the time of writing, the project is still within the early design phase, therefore the full extent of potential impacts of the scheme on water vole populations is yet to be confirmed. Impacts and mitigation to alleviate any potential impacts will be detailed within the Biodiversity Chapter of the scheme Environmental Statement, when published.

1. Introduction

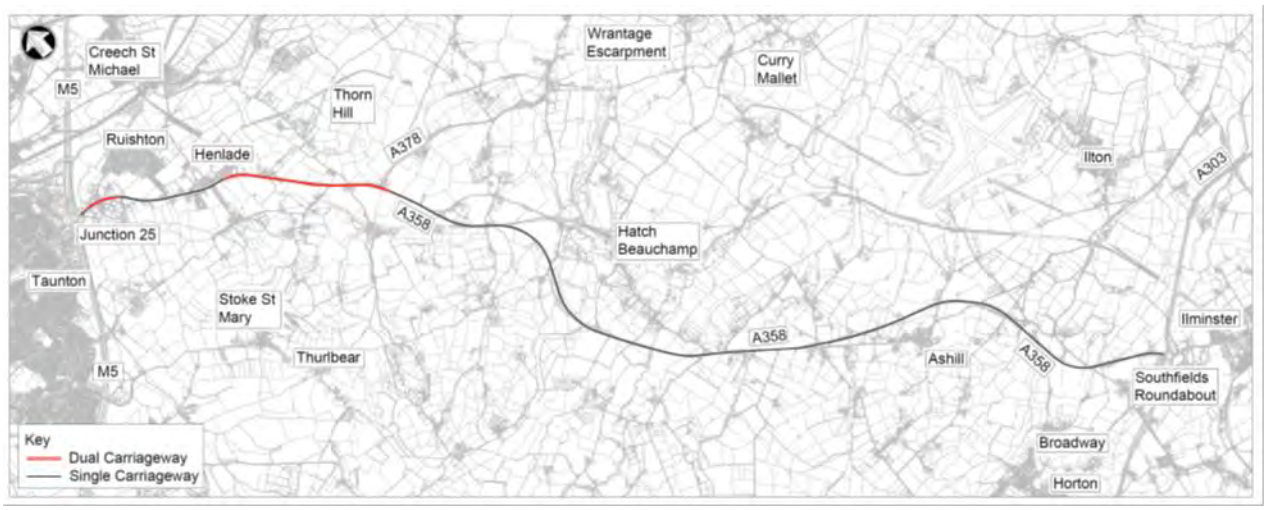
1.1. Background

1.1.1. The A303 / A358 corridor is a vital connection between the south-west, London and the south-east. Due to the population density, employment opportunities, urban concentrations and tourist attraction of the South West the A303 / A30 / A358 corridor experiences a wide range of traffic flows which lead directly to severe and regular instances of congestion and delay.

1.1.2. The A303 / A30 is part of the strategic road network (SRN) and together with the A358 forms a key strategic link between the South West Peninsular (SWP) and the rest of the south, south-east and London. Although it is dualled over much of its length there are several unimproved single carriageway sections between the M3 motorway at Basingstoke and the M5 at Taunton and Exeter which cause congestion, especially during summer weekends.

1.1.3. The existing A358 between Taunton and Southfields Roundabout is predominantly single carriageway with a short (1.1 miles) dual carriageway section in the vicinity of Thornfalcon and a 3 lane (2+1) section (0.3 miles) immediately to the south of that. It has many side roads and private accesses directly onto it. The national speed limit applies between Southfields and Henlade where it reduces to 30mph; the speed limit increases to 40mph north of Henlade on the approach to M5 junction 25. A plan showing the existing route between Taunton and Southfields is provided in Figure 1:1.

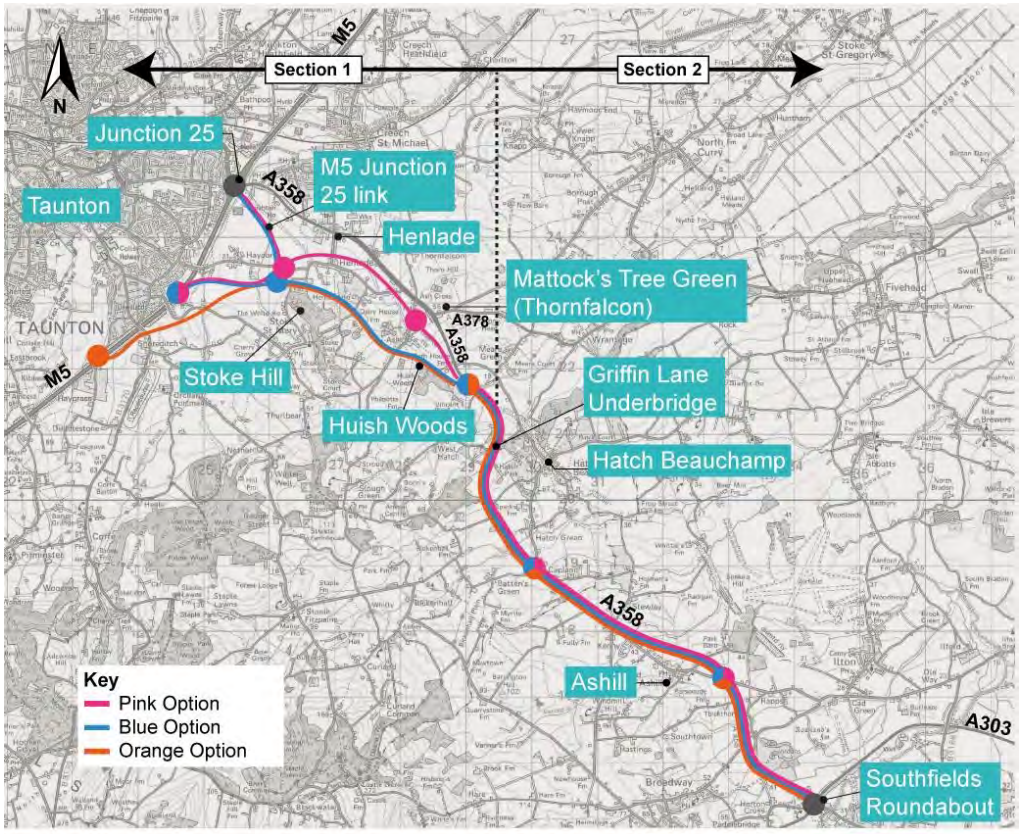
Figure 1:1 : A358 Taunton to Southfields existing road layout



1.1.4. Three potential route options were chosen, the Orange, Pink and Blue. At the public consultation in 2017 only the Orange option was presented. A further consultation was held in 2018 in which all three options were presented. The three route options presented at the 2018 consultation are described below:

- The **Pink option** commences at a new junction on the M5 approximately 1.2 miles (2 kilometres) south of junction 25. South-facing slip roads from the M5 would combine to become the new dual carriageway, which runs eastwards and north of Stoke Hill. Here a limited-movement junction is proposed with east-facing slip road connections to the new road which would allow traffic to travel between the new A358 and junction 25 via a new 0.9 mile (1.5 kilometre) dual carriageway link past the planned Nexus 25 site. The proposed route would then follow the existing A358 to Southfields Roundabout enabling the existing road to be upgraded from a single to a dual carriageway. The total length of the Pink option is 9 miles (14.6 kilometres), plus the 0.9 miles (1.5 kilometres) spur leading to M5 junction 25.
- The **Blue option** commences at the M5 approximately 1.2 miles (2 kilometres) south of junction 25 and runs eastwards on a more southerly alignment. At Stoke Hill a junction is proposed similar to that with the Pink option which would allow traffic to travel between the road and junction 25 via a new 1.2 miles (2 kilometres) dual carriageway link past the planned Nexus 25 site. The road would then continue in a south-easterly direction to West Hatch Lane, where an all-movement, grade separated junction is proposed to allow access to Hatch Beauchamp, Henlade and surrounding communities, and the A378. This option is identical to the Pink option from this point onwards to Southfields Roundabout. The total length of the Blue option is 8.7 miles (14.1 kilometres), plus the 1.2 miles (2 kilometres) spur leading to M5 junction 25.
- The **Orange option** commences at the M5 approximately 2.1 miles (3.5 kilometres) south of junction 25 at a proposed new 2-bridge roundabout which would form a new all-movements junction between the new A358 and the motorway. The proposed road initially takes a north-easterly course towards Henlade before arcing around the north of Stoke Hill. In contrast to the Blue option, there is no link to junction 25 from this location, and therefore no junction at Stoke Hill. This option is identical to the Blue option from this point onwards. The total length of the Orange option is 9.5 miles (15.3 kilometres).

Figure 1:2 : Route options presented at the public consultations



Source: Mott MacDonald Sweco Joint Venture. This Map is based upon Ordnance Survey material with the permission of Ordnance Survey on behalf of the Controller of Her Majesty's Stationery Office © Crown copyright. Unauthorised reproduction infringes Crown copyright and may lead to prosecution or civil proceedings. Highways England 100030649 2016.

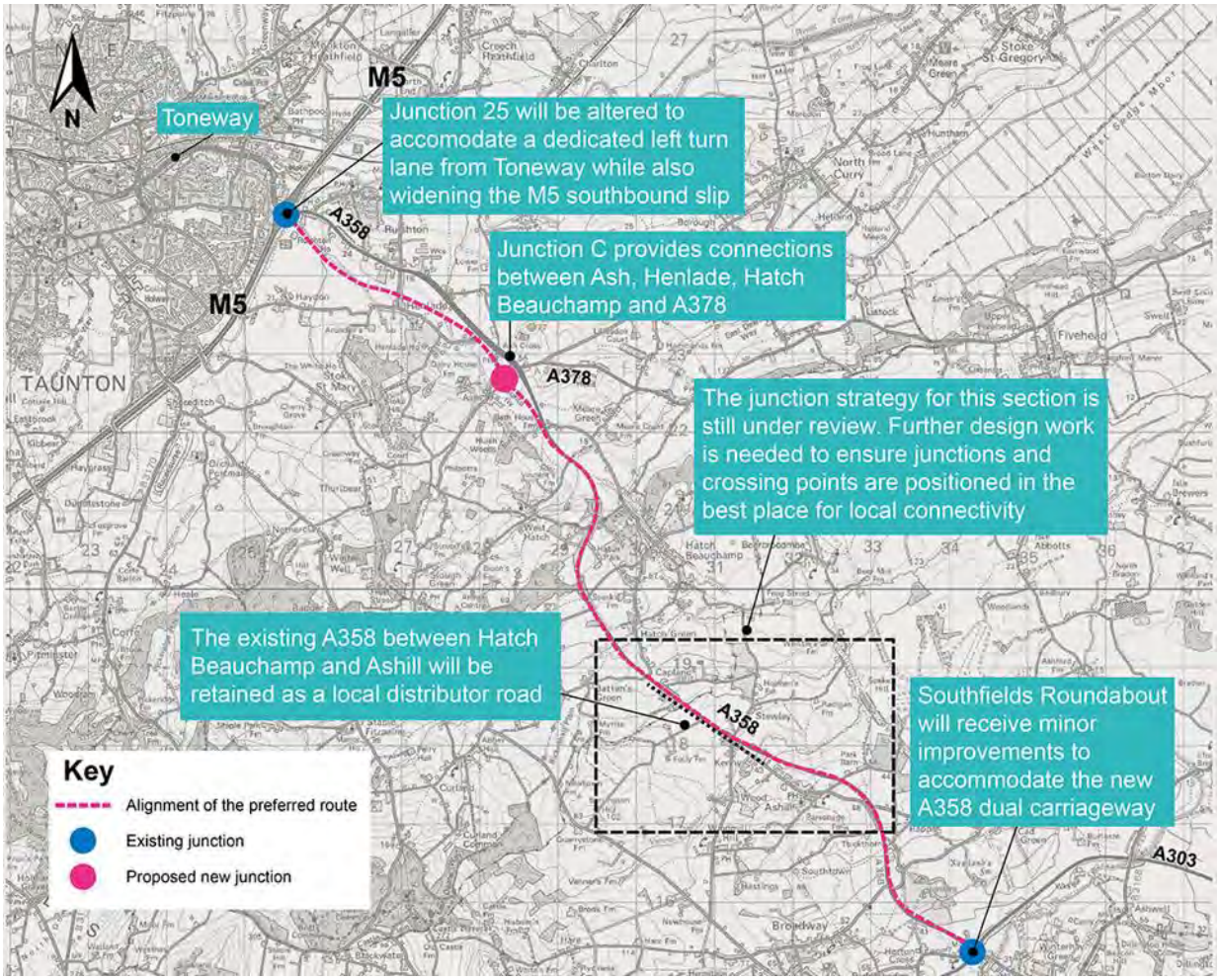
1.2. Scheme proposal

1.2.1. The scheme would provide a dual carriageway along the length of the A358 between Taunton and Ilminster in Somerset, connecting the A303 at Ilminster to the M5 motorway to the north. The scheme would include grade separated junctions and, with the purpose of providing a high-quality free flow journey for those using the route, the removal of at-grade junctions and direct accesses.

1.2.2. The Preferred Route Announcement (PRA) on 13 June 2019 identified the Pink Modified option as the preferred route option (PRO). Please refer to the Scheme Appraisal Report (SAR) for details of the development of the Pink option to the Pink Modified option.

1.2.3. The Pink Modified option would comprise online widening between West Hatch Lane and Southfields Roundabout. This option would involve the re-use of a large amount of the existing A358 corridor, and between West Hatch Lane and Henlade the route would pass close to the A378 junction at Mattocks Tree Green. This would enable direct movement between the proposed road and the A378. The Pink Modified option retains the bypass to Henlade, connects with the A378, and connects directly to junction 25 on the M5. A plan showing the Pink Modified option route is shown in Figure 3 below.

Figure 1:3 : Pink Modified option



1.3. Purpose of the report

1.3.1. This Stage 2 Water vole Technical Report has been prepared during Stage 2 of the Highways England's Project Control Framework (PCF). This Technical Report provides an overview of the water vole surveys results undertaken between 2017 and 2020 within 250m of the Pink Modified option. The report provides methods, constraints and results of the water vole surveys undertaken for the scheme. Results of surveys undertaken that are now not within 250m are presented in Appendix D for completeness.

1.4. Scope of report

1.4.1. The objective of the report is to present the methodology, constraints and results of the water vole surveys

1.4.2. The report does not provide any detailed impact assessment or recommendations for mitigation as this aspect will be developed by the RDP DIP during PCF Stage 3 of the scheme.

1.4.3. Guidance on ecological assessment recommends that all ecological features that occur within a zone of influence (ZoI) for a proposed scheme are investigated (Chartered Institute of Ecology and Environmental Management (CIEEM), 2016)[1]. All watercourses within 250m of the Pink Modified option proposed scheme footprint were assessed for water vole suitability.

1.5. Legislation

1.5.1. Water vole *Arvicola amphibius* are afforded full protection under the *Wildlife and Countryside Act 1981* (as amended).

1.5.2. Under Schedule 5 of the *Wildlife and Countryside Act 1981* it is illegal to:

- intentionally kill, injure or take any part or derivative of water vole
- possess, sell, control or transport live or dead water voles or parts of them
- intentionally or recklessly damage or destroy or obstruct access to any structure or place used for shelter or protection by water vole
- intentionally or recklessly disturb water vole whilst they are occupying a structure or place used for that purpose

National Planning Policy Framework

1.5.3. The *National Planning Policy Framework* (NPPF) 2019 sets out government's planning policies for England and how these are expected to be applied. Chapter 15 'Conserving and enhancing the natural environment', sets out the Government's policies on biodiversity. In summary, with regards to ecology and biodiversity, the NPPF requires that the planning system and planning policies should:

- protecting and enhancing valued landscapes, sites of biodiversity or geological value and soils
- minimising impacts on and providing net gains for biodiversity
- if significant harm to biodiversity resulting from a development cannot be avoided, adequately mitigated, or, as a last resort, compensated for, then planning permission should be refused
- development on land within or outside a Site of Special Scientific Interest, and which is likely to have an adverse effect on it should not normally be permitted.

[1] Chartered Institute of Ecology and Environmental Management (2016) Guideline for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater and Costal.

- development resulting in the loss or deterioration of irreplaceable habitats should be refused, unless there are wholly exceptional reasons and a suitable compensation strategy exists
- development whose primary objective is to conserve or enhance biodiversity should be supported; while opportunities to incorporate biodiversity improvements in and around developments should be encouraged, especially where this can secure measurable net gains for biodiversity.

1.6. Status of water vole at national level

1.6.1. Water voles are widely distributed throughout Great Britain including Anglesey and the Isle of Wight, but are absent from Ireland, Isle of Man and the Scottish Islands (with the exception of the Sound of Jura Islands). Water vole populations in Britain dramatically declined in the 20th century. This decline can be attributed to predation by the introduced invasive American mink *Mustela vison*, and loss, deterioration and fragmentation of suitable habitat resulting from inappropriate wetland management (for example urbanisation and heavy grazing by livestock).

1.6.2. In 2012, the *UK Post-2010 Biodiversity Framework* superseded the *UK Biodiversity Action Plan* (BAP) 2007[2]. Consequently, the water vole, which was historically listed as a UK BAP priority species, is now listed as a species of 'principal importance for the conservation of biodiversity in England', under Section 41 (S41) of the *Natural Environment and Rural Communities (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[3]. Actions identified for the recovery of water voles include the following:

- 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
- Reduce the impact of mink predation, prioritising action in Regional Key Areas
- Maintain appropriate protection of the water vole and its habitat under the *Wildlife and Countryside Act 1981* (as amended)
- Continue and extend the National Key Sites for water vole initiative. Identify Regional Key Areas for water voles following agreed methodologies
- Maintain and, where appropriate, extend the area of suitable water vole habitat in National and Regional Key Areas

1.6.3. Highways England's BAP identifies their approach to meeting the key performance indicator identified within the *Roads Investment Strategy* of "no net loss of

[2] UK Government (1994). UK Biodiversity Action Plan [online] available at: http://jncc.defra.gov.uk/PDF/UKBAP_ConBio-UKApproach-2007.pdf (last accessed October 2017).
[3] Natural England (2014). Section 41 Species - Priority Actions Needed (B2020-008) [online] available at: http://publications.naturalengland.org.uk/publication/4958719460769792.

biodiversity by 2020". Biodiversity is required to be fully considered during the building of any new roads and opportunities sought to work with stakeholders and enhance the network for wildlife.

1.7. Status of water vole at county level

1.7.1. Water voles occur on slow flowing watercourses throughout Somerset, including in urban areas.

1.7.2. Although the UK BAP has been superseded, BAPs are still widely used at county level to support Biodiversity 2020. Somerset Local BAPs are no longer extant as they were not renewed after their expiry date. However, the local authority has a duty to have regard for the conservation of this species as it receives full protection at a national level. Although numbers have declined in Somerset, the area remains a stronghold due to the success of conservation measures. Rivers, reedbeds and ponds are listed as habitats of 'principal importance for the conservation of biodiversity in England'.

1.7.3. The *South Somerset Local BAP*[4] outlines a number of actions taken from *Somerset Biodiversity Strategy* and details how planning authorities should safeguard and seek to enhance biodiversity in their work. Key targets listed within the Local BAP of relevance to this scheme includes:

- "Reduction in biodiversity loss from development and an increase in the number of significant developments where biodiversity is enhanced."

1.7.4. Policy EQ4 (Biodiversity) within the *South Somerset District Council Local Plan 2006 – 2028* contains the following which are relevant to the conservation of water voles.

1.7.5. "All proposals for development, including those which would affect sites of regional and local biodiversity, nationally and internationally protected sites and sites of geological interest", will:

- Protect the biodiversity value of land and buildings and minimise fragmentation of habitats and promote coherent ecological networks
- Maximise opportunities for restoration, enhancement, and connection of natural habitats
- Incorporate beneficial biodiversity conservation features where appropriate
- Protect and assist recovery of identified priority species
- Ensure that Habitat Features, Priority Habitats, and Geological Features that are used by bats and other wildlife are protected and that the design including proposals for lighting does not cause severance or is a barrier to movement

[4] South Somerset District Council (May 2008) South Somerset Local Biodiversity Action Plan [online] available at: https://www.southsomerset.gov.uk/media/333016/biodiversity_action_plan_2008.pdf

1.7.6. Where there is a reasonable likelihood of the presence of protected and priority species, development design should be informed by, and applications should be accompanied by, a survey and impact assessment assessing their presence. If present, a sequential approach to the design of the proposal should be taken that aims first to avoid harm, then to lessen the impact, and lastly makes compensatory provision for their needs.

1.7.7. Development will not be allowed to proceed unless it can be demonstrated that it will not result in any adverse impact on the integrity of national and international wildlife and landscape designations, including features outside the site boundaries that ecologically support the conservation of the designated site."

1.7.8. Policy CP8 (Environment) within the *Taunton Deane Borough Council Core Strategy 2011 – 2028* (now adopted by Somerset West and Taunton council), contains the following which is relevant to the conservation of water voles.

1.7.9. "The Borough Council will conserve and enhance the natural and historic environment and will not permit development proposals that would harm these interests or the settings of the towns and rural centres unless other material factors are sufficient to override their importance.

1.7.10. Development will be supported at sustainable locations to improve green infrastructure, public access, visual amenity and the overall quality of the natural environment. Development will need to mitigate and where necessary, compensate for adverse impacts on landscape, protected or important species, important habitats and natural networks, river and ground water quality and quantity so that there are no residual effects."

1.8. Water vole ecology

1.8.1. The water vole is typically a semi-aquatic species and lives in a wide range of natural and semi-natural wetland habitats. Suitable habitat includes rivers, streams, lakes, canals, and ponds, and on rare occasions on brackish waters of estuaries and saltmarshes where reed-fringed saline lagoons offer stable water conditions. The inhabitation of road drainage ditches by water voles, demonstrates that although the species is sensitive to disturbance, it can habituate to suboptimal conditions and degraded habitats where good quality habitat is lacking.

1.8.2. The length of territory occupied by female water voles varies from 30m to 150m and the home-range of males is from 60m to 300m. The upper limits are used where habitat is poor or when the population density is low. Little is known about the dispersal distance of water vole, but generally the species is considered a poor disperser (approximately between 1 and 2 kilometres) with research suggesting variation is dependent on upland / lowland habitat, linear waterbodies / network of river catchments

and sex of individual[5]. It is thought that water voles cannot detect suitable habitat beyond a range of 200m and they will stop dispersing if they arrive at a place that comprises habitat capable of supporting a breeding population and is not already fully occupied by adults[6].

1.8.3. Except for a fossorial population in Scotland, water voles typically inhabit and commute along watercourses, dispersing either upstream or down. As such, roads, urban development and extensive areas of vegetation clearance act as barriers to dispersal.

[5] C. McGuire, D. Whitfield, H. Perkins, C. Owen (2014). National Water vole Database and Mapping Project. Guide to the Use of Project Outputs to End of 2012 [online] available at: http://www.hiwwt.org.uk/sites/default/files/files/Reports/Guide%20to%20the%20Use%20of%20Project%20Outputs%202014.pdf (last viewed October 2017).

[6] S.P. Rushton, G.W. Barreto, R.M. Cormack, D.W. Macdonald, R. Fuller (2000). Modelling the effects of mink and habitat fragmentation on the water vole. Volume 37, Issue 3, Pages 475–490 [online] available at: http://onlinelibrary.wiley.com/doi/10.1046/j.1365-2664.2000.00504.x/full (last viewed October 2017).

2. Methodology

2.1. Desk study

2.1.1. A detailed desk study search was requested from Somerset Environmental Records Centre (SERC) in October 2017, to identify water vole records within a 2 kilometre radius of the scheme. A search of local planning developments revealed Nexus 25 (a new entertainment and business complex south of M5 junction 25) had undertaken water vole surveys in May 2015.

2.2. Habitat assessment

2.2.1. A total of 74 watercourses were identified within 250m of the scheme using 1:10,000 Ordnance Survey mapping and were assessed for their potential to support water vole, using the standard methodology detailed in the *Water vole Conservation Handbook*[7] during a walkover survey. This included assessment of:

- bank and channel profile including water depth and width, bank substrate and gradient suitability for burrowing
- water levels (noting evidence of fluctuations) and current
- availability of food sources
- in-channel, marginal and bank side vegetation structure to provide shelter and food sources
- level of shading
- disturbance levels
- pollution
- evidence of predators
- bordering land use
- connectivity with other areas of suitable or sub-optimal habitat

2.2.2. Photographs were taken along each watercourse to record their condition at the time of survey making it easier to monitor changes.

2.2.3. Bankside habitat was assessed within 5m of the water's edge and excluded disturbed land (such as arable, heavily grazed or trampled land), all categories of bare ground and maintained short grassland (such as semi-improved and amenity grassland).

2.3. Survey methodology

2.3.1. A water vole field sign survey was carried out, using the standard methodology detailed in the *Water vole Conservation Handbook* 3rd Edition, at the same time as habitat

[7] Strachan, R., Moorhouse, T. and Gelling, M. (2011). The Water vole Conservation Handbook. Third Edition. The Wildlife Conservation Research Unit 2011.

assessments, where suitable or suboptimal habitat had been identified, and where sufficient access, time and suitable weather allowed (no heavy rainfall or flooding in preceding days). Ecologists walked the length of each watercourse (within 250m of the proposed routes) along one bank, recording the number and location of water vole, mink, and rat field signs, observed within 2m of the water's edge.

2.3.2. Searches for water vole field signs included:

- latrines and individual droppings
- burrows (both active and inactive)
- burrows with 'plugs' (comprise of vegetation and latrines)
- cropped vegetation around burrow entrance
- nests above ground
- feeding remains
- footprints
- pathways / runs in vegetation
- sightings of water voles
- sound of water vole entering the water

2.3.3. For each watercourse identified as having potential to support water vole, two surveys were carried out at least two months apart. There are two periods when surveys can be undertaken; the early season window is between mid-April and June, and the late season window is between July and September. One survey was undertaken in the early period and one in the later period to identify how water voles utilise the habitat throughout the year.

2.3.4. For example, water voles may only feed and commute along a watercourse later in the season due to increased competition for resources following mid-summer breeding, resulting in individuals being pushed out of a connected watercourse. Conversely, the ephemeral nature of some watercourses will restrict the movement of water voles due to temporal changes in water level throughout the year.

2.3.5. The late season survey period is more informative when determining population size as latrines will be more prevalent following a growth in population size, and therefore there is a higher likelihood of surveyors observing water vole field signs.

2.3.6. Where suitable habitat was identified but no water vole field signs observed, or where water vole field signs were recorded during the first survey for each watercourse, a second survey was carried out at least two months later.

2.3.7. Water vole field signs surveys were carried out on 15 watercourses between June 2017 and August 2020.

2.3.8. All watercourses except watercourse 21 had two surveys undertaken, one in the early season (mid-April to June) and one in the late season (July to September). However, where land access was an issue these surveys were not necessarily in the same year. Watercourse 21 had two surveys undertaken in the early season due to access constraints.

2.3.9. No surveys have been undertaken to date on watercourse 32. Access has not yet been granted as of November 2020 and therefore a habitat assessment and subsequent surveys are to be undertaken in 2021.

2.4. Constraints

2.4.1. Sections of watercourses were often obscured by dense bankside vegetation, some banks were too steep to transverse, the water was too deep to wade through the channel or too fast to use a rowing boat. In these situations, binoculars were used where conditions allowed. Therefore, a definitive conclusion to the absence of water vole cannot be made where field signs were not recorded. Surveys are merely an indication to the likely absence of water vole.

2.4.2. In addition, the distribution of water vole populations along a watercourse will react to changes in mink population density and distribution, management of watercourses and its associated riparian and bankside habitat (changes in habitat structure, food quantity and quality). For this reason, changes in habitat is monitored.

2.4.3. It is recommended that any watercourses currently scoped out of further surveys, because habitat was suboptimal (over-shaded) or unsuitable (dry) during the habitat assessment, or because at the time of the presence surveys water voles were likely absent (no field signs observed), that have potential for water voles to naturally recolonise now or in the future, these watercourses should be resurveyed prior to works commencing, after another season has passed since the data was recorded.

2.4.4. Shelter provided by bankside habitat and stable water levels allowed a few surveys to be undertaken despite rainfall. Water vole and mink field signs were not thought to have been washed away preceding or during these surveys and as such surveys were confidently carried out. No surveys were cancelled due to rain. However, a couple of surveys were rescheduled due to cattle with calves in fields through which the surveyors required access to watercourses.

2.4.5. For the reasons stated above, some watercourses were surveyed on more than one date for either, or both, the first and second survey to ensure the whole length of each watercourse was assessed for water vole activity.

2.4.6. Where land access was an issue, the two surveys in the early and late season were not all undertaken in the same year. Watercourse 21 had two surveys undertaken in the early season due to access constraints. Surveys undertaken across two different

years are considered sufficient to assess water vole presence as there were no significant changes in the habitat between surveys in these locations.

2.4.7. No surveys have been undertaken to date on watercourse 32 as land access has not yet been granted. As a minimum requirement, a habitat assessment survey will be carried out along this watercourse before any works can proceed. Following the completion of the habitat assessment, field sign surveys may be required.

3. Results

3.1. Desk study

3.1.1. The following designate sites are located within 1 kilometre of the Pink Modified option where water voles are a qualifying feature:

- South Taunton Streams Local Nature Reserve (LNR) which encompasses Blackbrook
- Bridgwater and Taunton Canal Local Wildlife Site (LWS)

3.1.2. The Somerset Environmental Records Centre (SERC) holds 12 records of water vole field signs within a 2 kilometre radius of the scheme, including four sightings (one dead), droppings, feeding signs and tracks (although tracks in isolation cannot reliably identify water vole, as rat footprints can look similar). The most recent record was noted in 2008.

3.1.3. Nexus 25 surveys recorded water vole field signs along a drainage ditch within Swingrite Golf Centre, Haydon in 2015.

3.1.4. The results of the desk study are detailed within Appendix A.

3.2. Habitat assessment

3.2.1. After the preferred route announcement, 32 of the original 74 watercourses were scoped out as they were no longer within 250m of the scheme buffer. Of the remaining 42, 26 were scoped out as the habitat was assessed as being unsuitable for water voles due to factors such as lack of available food resources or lack of water. Watercourses 30 and 31 were scoped in for further survey as although the habitat in some sections was unsuitable for water vole, suitable habitat was present in the remaining sections of the watercourses within the buffer.

3.2.2. Watercourse 32 has not yet been assessed as access has not yet been granted as of November 2020.

3.2.3. Following the habitat assessments, 15 watercourses within 250m of the scheme were scoped in as having habitats suitable to support water vole (watercourses 17, 19, 20, 21, 24, 24a, 24b, 30, 31, 34, 36, 39, 52, 55 and 57). Subsequently, surveys were required on these watercourses to identify field signs and to determine the presence or likely absence of water voles on the watercourse.

3.2.4. The habitat assessments and associated photos are included in Appendix B. An overview map of all watercourses scoped in or out for further survey is located in Appendix C.

3.3. Field signs

3.3.1. Water vole field sign surveys were carried out on 15 watercourses between June 2017 and August 2020.

3.3.2. Water vole field signs or potential water vole field signs were recorded on eight watercourses within the 250m buffer: 17, 19, 20, 24, 24a, 30, 39 and 55. An outline of the findings of these surveys is presented in Table 3:1 below and Appendix D.

Table 3:1 : Summary of field sign survey findings on watercourses within 250m of the scheme

ID	Early season survey date	Evidence of water vole?	Late season survey date	Evidence of water vole?
17	June 2017 May 2018	Yes (burrows, latrines, etc) Yes	September 2017	Yes
19	July 2017 May 2019	None None	September 2017 September 2019	Possible (more likely rat) Possible (more likely rat)
20	May 2018 June 2019	Yes - 1 footprint None	September 2019	Yes – feeding remains
21	June 2017 May 2018	None None	N/A	Two early season surveys undertaken
24	May 2019 June 2020	No (evidence outside 250m buffer) None	September 2019 August 2020	None Possible (also evidence outside 250m buffer)
24a	May 2019 June 2020	No Yes	September 2019 August 2020	Yes No
24b	June 2020	None	August 2020	None
30	June 2019 June 2020	Possible water vole burrows None	September 2017 September 2019 August 2020	None (possible burrows outside buffer) Possible water vole burrows None (evidence recorded outside 250m buffer)
31	May 2019	None	September 2019	None
32	To be completed 2021		To be completed 2021	
34	May 2018	None	September 2019	None
36	June 2017	None	September 2019	None
39	May 2018 June 2020	Possible water vole burrows Possible water vole burrows	July 2017 September 2017 September 2019 August 2020	None None None None
52	June 2019	None	September 2017	None
55	June 2019	Possible water vole burrow	September 2017	None
57	June 2017 July 2017	None None	September 2017	None

3.3.3. *The Water Vole mitigation handbook*[8] states that 'the presence of water voles is the only field sign that can reliably be used on its own. Experience is required to distinguish between feeding remains, burrows and footprints of water voles and other species. However, a combination of these other signs in close proximity to each other is highly suggestive of water vole presence.'

3.3.4. Using this guidance, presence of water voles has been confirmed on watercourses 17, 20 and 24a due to either the presence of latrines or a combination of water vole field signs in close proximity to each other.

3.3.5. Watercourse 17 had 19 burrows, two feeding stations and six latrines recorded within 250m of the scheme during the first survey in June 2017. In September 2017, six burrows were identified with no other field signs. An additional survey was undertaken in May 2018 where four active burrows, two latrines, eight feeding stations and two footprints were recorded. Further to this, surveyors identified an incidental record of a water vole burrow with a mown lawn during other surveys in February 2020.

3.3.6. Watercourse 20 was difficult to fully assess due to dense vegetation present along both banks. However, a water vole footprint was identified in May 2018 under a footbridge near where the ditch joins watercourse 19. In September 2019, probable water vole feeding remains were identified only 4m west of the footprint. Due to the combination of field signs recorded, water vole presence is likely in this location.

3.3.7. Several feeding stations (vegetation eaten at a 45 degree angle) and active burrows were found on watercourse 24a confirming presence here. Approximately 300m north of the buffer on watercourse 24, a water vole was spotted and feeding remains, burrows and footprints also identified. On the section of watercourse 24 within the buffer, a single potential water vole burrow was identified in August 2020. Although the two watercourses are connected, the evidence on watercourse 24a and the evidence recorded outside the buffer are both over 400m away from the burrow recorded on watercourse 24 and are therefore too far away for presence to be confirmed on this section of watercourse.

3.3.8. Potential water vole burrows were identified on watercourses 19, 24, 30, 39 and 55 but no other field signs were recorded and therefore presence cannot be confirmed.

3.3.9. A 'plop' noise, indicative of water vole, was heard during the second presence survey along watercourse 19. However, water vole presence is not conclusive as footprints were the only other field sign noted, which could be associated with the presence of rat.

[8] Dean, M., Strachan, R., Gow, D. and Andrews, R. (2016) The Water vole Mitigation Handbook (Mammal Society Mitigation Guidance Series). Eds Fiona Mathews and Paul Chanin. Mammal Society, London.

3.3.10. No water vole field signs were recorded at seven watercourses (21, 24b, 31, 34, 36, 52, 57) during either of the two surveys.

3.3.11. Mink field signs were recorded along watercourse 36. Signs of mink were also noted along watercourses 14a, 30, 34 and 36 but outside the 250m scheme buffer.

3.3.12. A full outline of survey results is presented in Appendix D, with photos and locations of all water vole field signs presented in Appendix E. These results are mapped in Figure C.2, Appendix C.

3.4. Estimating population size

3.4.1. Six latrines observed in June on watercourse 17 are indicative of one female. In addition, a ‘plop’ sound was heard three times during the same survey suggesting potentially a maximum of three water voles were disturbed, however only latrines can reliably be used to estimate relative population size. A maximum of 19 burrows and two feeding stations were recorded along watercourse 17. These records suggest a low population of water voles are present along watercourse 17.

3.4.2. No latrines were recorded on any other watercourse and therefore a population assessment cannot be made for these watercourses.

4. Conclusion

4.1.1. Habitat assessments undertaken between 2017 and 2019 identified 15 watercourses that were within 250m of the scheme with habitat suitable for water voles. These watercourses were subject to water vole field sign surveys between 2017 and 2020.

4.1.2. Water voles have been confirmed as present within the 250m scheme buffer on watercourses 17, 20 and 24a. Additionally, water vole signs have been recorded on watercourses 19, 24, 30, 39 and 55 but no other field signs have been identified in these locations and therefore presence cannot be confirmed.

4.1.3. No water vole field signs were recorded at watercourses 21, 24b, 31, 34, 36, 52 and 57 during either of the two surveys and are therefore likely absence is assumed at these watercourses. Watercourse 32 has not yet been assessed and will require surveys subject to the habitat assessment in 2021.

4.1.4. Latrines recorded suggest a low population of water voles along watercourse 17. An accurate assessment of water vole populations cannot be made for the other water courses due to the lack of latrines recorded. However, due to the low numbers of field signs recorded, large populations of water vole are unlikely within the 250m buffer.

4.1.5. Mink field signs were recorded along watercourse 36. Signs of mink were also noted along watercourses 14a, 30, 34 and 36 but outside the 250m scheme buffer.

Appendix A. Biological records desk search

Table A-1. Somerset Environmental Records Centre water vole records within a 2km radius of the scheme.

Site / Location	Grid reference	Start date	End date	Abundance
Cypress cottage, Creech St Michael	ST276251	26/04/1999	26/04/1999	One count of adult
Creech St Michael	ST270257	01/08/1995	01/08/1995	One count of present
Flood Defence Works, River Tone, Creech St Michael	ST274252	11/06/2008	11/06/2008	Minimum one count of signs
R. Tone, opposite Ham	ST28512516	01/04/2007	31/05/2007	
R. Tone, opposite Ham	ST28312503	01/04/2007	31/05/2007	One count of tracks
R. Tone, near M5 bridge	ST25952530	01/04/2007	31/05/2007	One count of tracks
R. Tone, near M5 bridge	ST25982533	01/04/2007	31/05/2007	One count of droppings; one count of tracks
R. Tone, near M5 bridge	ST25992533	01/04/2007	31/05/2007	One count of tracks
R. Tone, near Ruishton	ST26422519	01/04/2007	31/05/2007	One count of tracks
Tone Bridge to Knapp Bridge / Cypress Cottage	ST275251	27/04/2005	27/04/2005	One count of male; one count of dead
Bridgwater and Taunton Canal	ST270257	01/01/1995	31/12/1995	
Bridgwater & Taunton Canal Hyde Bridge Farm to 100m east of M5	ST260258	11/05/2004	11/05/2004	One count of feeding signs; one count of droppings

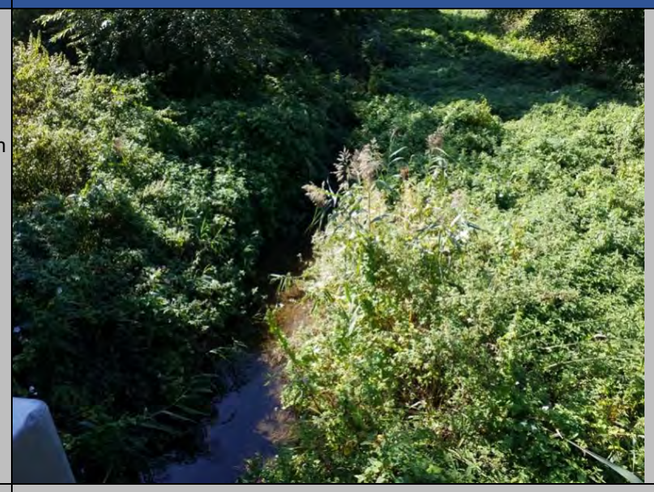
Table A-2. Nexus 25 surveys

Site/Location	Grid reference	Start date	End date	Abundance
Summerfield Developments (land south of M5 junction 25)	ST259238	May 2015	May 2015	Active burrows, latrines, feeding stations (number not specified)

Appendix B. Habitat assessment results

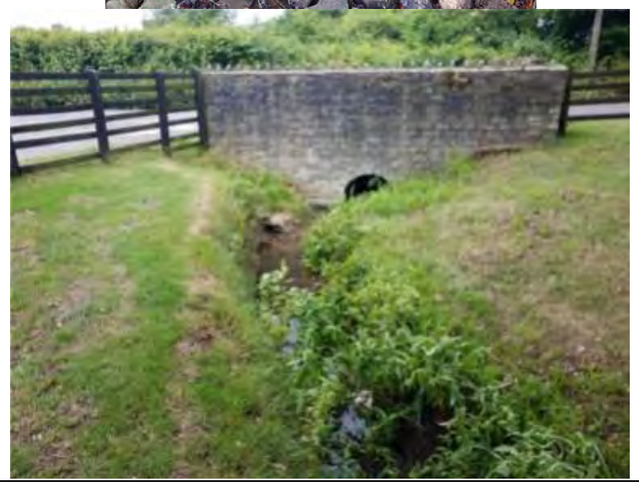
Water course	Date	Scoped out/survey required	Reason	Habitat Description	Photo
1	Not visited	Scoped out	Outside 250m buffer		
2	Not visited	Scoped out	Outside 250m buffer		
3	Not visited	Scoped out	Outside 250m buffer		
4	Not visited	Scoped out	Outside 250m buffer		
5	Not visited	Scoped out	Outside 250m buffer		
6	Not visited	Scoped out	Outside 250m buffer		
7	18.07.2017	Scoped out	Outside 250m buffer Dry	Dry ditch, overgrown with vegetation, banks trampled by livestock	
8	Not visited	Scoped out	Outside 250m buffer		
9	No watercourse assigned to this number				
10	19/06/17	Scoped out	Dry Outside 250m buffer		
11	11/06/17	Scoped out	Dry Outside 250m buffer		
12	22/06/17	Scoped out	Dry, isolated, overgrown Outside 250m buffer		
13	19/06/17	Scoped out	Dry where surveyed, ditch isolated Outside 250m buffer		
14	26/06/17 06/07/17	Scoped out	Dry Outside 250m buffer		
14a	29/06/17	Scoped out	Outside 250m buffer	Suitable habitat – dense herbaceous vegetation, vertical banks with silt bars, connected to suitable habitat. Some natural erosion to vertical earth banks (meandering watercourse), water up to 2m in depth, 2-5m wide, moderate flow. Willow dominates overhanging treeline (60% shading) also comprises blackthorn, hazel, hawthorn, (pendulous sedge, meadow sweet, tall grasses) and bramble scrub in open section, adjacent arable crop. Slight disturbance – Public Rights of Way (PRoW) along east bank (~3m from top of embankment). Medium connectivity. Occasional silt bars. Less suitable areas comprise mossy banks within wooded areas and channel substrate comprises rocks and pebbles.	

Water course	Date	Scoped out/survey required	Reason	Habitat Description	Photo
	06/07/17	Scoped out	Outside 250m buffer	Suitable habitat - Short section of riparian vegetation, predominantly steep / vertical banks, some short sections of overhanging tall grasses, connected to suitable habitat. Vertical earth banks, 3.5m deep, 2-5m wide, slow flow. Predominantly tall grasses and herbaceous species along embankments, with trees along mid-section of watercourse length. Vegetation comprises tall grasses, pendulous sedge, blackthorn, hazel, willow, meadow sweet, alder, bramble and hawthorn. Shading 35%. Slight disturbance – PRoW adjacent. Medium connectivity.	
	20/07/17	Scoped out southern section	Unsuitable habitat - limited food source and shelter Outside 250m buffer	Predominantly shaded (80%) by bankside trees and heavily overgrown banks (bramble and hazel), with limited understorey predominantly bare or ivy covered. Some short sections of grassy, herbaceous habitat on top of banks, not bank slopes.	
15	26/06/17	Scoped out southern section	Dry Unsuitable habitat Outside 250m buffer	Dry and unsuitable habitat.	
	29/09/17	Scoped out mid-section	Dry Unsuitable habitat Outside 250m buffer	Dry and unsuitable habitat. Northern section adjacent M6 is shallow and unsuitable bankside habitat.	

Water course	Date	Scoped out/survey required	Reason	Habitat Description	Photo
15a	20/05/19	Scoped out	Outside 250m buffer	A slow flowing and shallow tributary to the River Tone. The stream has a gravel bed, dense tall ruderals on banks and vertical undercut earth banks. The stream has multiple barriers including weirs and culverts for fish and water vole migration. The water was clear showing no evidence of pollution or high turbidity. There is lots of vegetation present surrounding stream with good food availability but not many submerged weeds. The terrestrial habitat surrounding the stream south of the A358 bridge is currently bare earth with geotextile silt fencing preventing silt run-off from the construction site. Eventually watercourse 15a becomes a drainage ditch for the M5 motorway verge.	
15b		Scoped out	Outside 250m buffer		
15c		Scoped out	Outside 250m buffer		
15d		Scoped out	Outside 250m buffer		
16	27/06/17	Scoped out	Dry and unsuitable habitat Outside 250m buffer		
17	27/06/17	Surveys required	Suitable habitat for water voles present	Linear unmanaged grassland, hedgerows and scattered broad-leaved trees (comprise crack willow, hawthorn, blackthorn, elder and field maple) adjacent watercourse. 40% shading. Herbaceous vegetation comprises of false-oat grass, false brome, fool's watercress, greater willowherb, wood avens, water figwort. Shallow (0.5m), slow flow, 2-5m wide with vertical earth banks. Adjacent golf driving range and arable fields. Medium connectivity.	
17a	20/07/17	Scoped out	Dry		

Water course	Date	Scoped out/survey required	Reason	Habitat Description	Photo
18	27/06/17	Scoped out	Outside 250m buffer Suboptimal habitat – heavily shaded and shallow water, but good herbaceous vegetation, steep earth banks, medium connectivity, potential for commuting and foraging	Heavily overgrown with nettles, 50% shading comprising scattered trees (hazel, field maple and elder), tall grasses, nettles, patches of bramble scrub, ivy, blackthorn, cleavers, hart's tongue, wood avens. Water < 5m depth, 1-2m wide, low flow, arable fields adjacent.	
19	03/07/17	Surveys required (northern section)	Sections of suitable habitat along mid-section of the extent north of Stock Road, Henlade.	Suboptimal and unsuitable habitat in most southerly section (still north of Stock Road, Henlade). Suitable habitat comprised herbaceous banks (meadowsweet, hart's tongue, hemp agrimony) and adjacent grassland dominated by false oat-grass. Bulrush and fool's watercress present within the water course. Occasional trees comprised of alder, ash, dogwood, crack willow, English elm, elder, field maple, goat willow, blackthorn and hawthorn. Food sources present include sedges, greater willowherb. 60% shading. Overall, slow flow, shallow (<0.5m), narrow drainage ditch (1m) with vertical earth banks.	
	22/05/19	Surveys required (southern section)	Sections of suitable habitat present	Good surrounding habitat with plenty of vegetation for shelter and food availability. The eastern end is heavily shaded with predominantly bankside trees and little submerged vegetation. The western section is more open with more submerged vegetation and foraging opportunities. Lots of recent tree felling on the western end with high recent disturbance. this is also creating barriers to distribution to the west with construction and with felled trees in watercourse. Possibility of pollution entering watercourse from ongoing construction.	

Water course	Date	Scoped out/survey required	Reason	Habitat Description	Photo
20	23/05/18	Surveys required	Sections of suitable habitat present	Very shallow ditch overgrown with bramble with little access to most of the stream due to the dense vegetation to fully assess. Mostly bramble and ferns present. Due to this the watercourse is almost completely shaded and there is minimal disturbance. Land adjacent is pastoral/arable farmland. The bank is mostly steep with shallow sections in places. Water depth ranges from 0.5-1m.	
21	20/06/17	Surveys required	Suboptimal habitat (water level very low and covered in duck weed in places), however, good connectivity to adjoining watercourse 20 (which joins WC19) and 17a (which joins WC17 where water voles have been recorded).	Hawthorn, field maple and hazel hedgerow, hogweed, cleavers, ivy, bramble, sorrel, clover, pendulous sedge, thistles, horsetail and perennial rye grass result in 70% shading. Hemlock water dropwort dominates standing water (>2m depth), southern and north ends dominated by duckweed.	
22	28/06/17	Scoped out	Dry and overgrown Outside 250m buffer		
23	20/06/17	Scoped out	Dry and unsuitable habitat.		

Water course	Date	Scoped out/survey required	Reason	Habitat Description	Photo
24	04/06/19	Surveys required	Sections of suitable habitat present	Shallow, slow moving stream. In the northern section, banks are quite bare with short grass surrounding and high levels of disturbance from horses, dogs and people. In the southern section the water course is wider and deeper (but still >1m) and heavily shaded, surrounded by deciduous woodland. Food availability varies – along most of the watercourse there is limited availability although there are patches in places.	
24a	11/09/19	Surveys required	Sections of suitable habitat present	Stoney bottomed watercourse with steep earth banks on one side and shallower banks on the other. Lots of vegetation (mostly bramble) occasionally blocks view along bank. Food sources for water vole are not abundant within the watercourse although they are present in places.	 

Water course	Date	Scoped out/survey required	Reason	Habitat Description	Photo
24b	09/06/20	Surveys required	Sections of suitable habitat present	Shallow stream leading to pond with steep sides. The stream is very overgrown with willowherb, trees and other vegetation making a full assessment difficult. Some areas more disturbed and some areas very quiet. The stream borders areas of woodland, mown grassland and arable farmland. Sections have good availability of food for water voles whilst other areas have lower availability.	
25	20.06.2017	Scoped out	Dry, cattle poaching, unsuitable habitat		
26	20.06.2017	Scoped out	Dry, cattle poaching, unsuitable habitat		
27	13.09.2017	Scoped out	Dry		
28	28.06.2017	Scoped out	Outside 250m buffer Unsuitable habitat	Unsuitable habitat (dry or shallow, shallow/flat banks, limited bankside habitat), disturbance from pedestrians and dogs, isolated (ditch between 2 ponds is within woodland with predominantly dense ivy understorey and pendulous sedge banks).	
29	28.06.2017	Scoped out	Dry (one puddle), unsuitable habitat.		
30	28/06/17	Scoped out mid-section	Unsuitable habitat	Slow flowing stream heavily shaded by woodland (80%) with limited understorey for shelter. Earth bank profile mainly flat, though some areas have steep (>45 degrees) or vertical profiles. Shallow rocky channel. Bare, moss or ivy-covered banks.	
		Surveys required	Suboptimal habitat - some areas of suitable habitat and food availability present (although minimal)	Shallow slow flowing stream with steep banks and little food availability, not much submerged vegetation. Heavily shaded and little disturbance.	

Water course	Date	Scoped out/survey required	Reason	Habitat Description	Photo
31	18/07/17	Scoped out southern section	Dry and overgrown in section or water shallow with banks bare or ivy-covered within woodland.		
	10/09/19	Surveys required	Suboptimal habitat - some areas of suitable habitat and food availability present (although limited)	Ditch with shallow earth banks. Predominantly within woodland with little to no bankside vegetation. Slopes are mossy or bare with ivy covered sections. Adjacent habitat is permanent grassland pasture or arable crop. Little understorey in woodland and bankside vegetation lacked structure. Food source limited – some tall grasses/sedges available.	
32		Initial survey required	Access denied		
33	21/06/17	Scoped out	Dry (puddles in sections), unsuitable habitat		

Water course	Date	Scoped out/survey required	Reason	Habitat Description	Photo
34	21/06/17	Surveys required	Suboptimal habitat due to low food availability and lack of connectivity but some suitable areas present	Vertical/undercut bank (natural erosion) with no vegetation cover on one side and pebble/boulder bank dominated by Himalayan balsam, willowherb and nettles on the other. Mosaic of shallow flow over pebbles and deep static pool. Predominantly heavily shaded by bankside trees (hazel, willow, hawthorn), bushes and fallen tree debris. Mosaic of wild garlic, fern sp., ivy, common hogweed and brambles dominate understorey with occasional pendulous sedge, in shaded barer areas. The stream has evidence of hard engineering and baffles. However, natural forming meanders are present away from settlements. There are multiple barriers including roads, concreate bridges and weirs. However, there are pebble beeches, boulders, piles of wood and banks offering plenty of ledges for water voles. The water levels are currently low but the stream rarely dries and the banks are heavily shaded reducing the number of grasses and sedges. There are pools and riffles with pebble beaches, fossils and exposed limestone bedrock within the stream.	
35	22/06/17	Scoped out	Field signs recorded adjacent to a property at the western end of the watercourse (burrow, run, footprints and feeding station), are thought to be rat and not water vole due to isolation of the watercourse and unsuitable habitat along the rest of its length.	Fairly narrow and short wet ditch (<20m wet), small pools of standing water on section closest to the road. The rest of the ditch is shaded and dry. Bankside habitat comprises ivy, brambles, nettles, cow's parsley, field maple, hawthorn, oak, ash, hazel.	
36	23/06/17	Surveys required	Sub-optimal habitat but some suitable areas present	Open and wide (2-5m) channel. Pools of standing water, pebble and silt channel, fallen and overhanging mature trees, several deadwood and flood debris piles along length. Predominantly heavily shaded by bankside trees (90% shading), bushes with sporadic patches of dense bramble and rose scrub. Bramble, pendulous sedge, elder, hazel, willow, hawthorn, blackthorn. Static pools with vertical earth banks in most part.	
37	06/07/17	Scoped out	Predominantly dry ditch, flat slopes in more northerly extent due to cattle poaching. Cows grazing in adjacent fields south of A358.		
38	05/07/17	Scoped out	Dry and overgrown (No access to eastern section		

Water course	Date	Scoped out/survey required	Reason	Habitat Description	Photo
			within residential gardens – isolated).		
39	05/07/17	Surveys required	Suitable habitat – herbaceous banks and suitable substrate and bank profile for burrowing	50% shading from woodland (ash, plum, elder, horse chestnut), tall grasses and herbaceous species along banks (including pendulous sedge, willowherb and nettle). Water <0.5m deep, ~2m wide, slow flow. Vertical earth banks, with small areas of bank erosion by sheep in adjacent field.	
	27/09/17	Surveys required	Suitable habitat – herbaceous banks and suitable substrate and bank profile for burrowing	Shaded habitat with woodland (50% shading) some areas of watercourse not shaded comprise a mixture of tall grasses, frequent bankside trees (ash, plum, elder, horse chestnut), bankside herbs and aquatic umbellifers (including fool's water cress, pendulous sedge, Himalayan, fool's water cress within the stream). Vertical earth banks, low flow, 0.5-1m depth and ~2m wide.	
40	05.07.2017	Scoped out	Unsuitable habitat - overgrown, pooled water in sections		
41	05.07.2017	Scoped out	Dry, overgrown, unsuitable habitat		
42	19.09.2017	Scoped out	Unsuitable habitat		
43	19.09.2017	Scoped out	Dry, unsuitable habitat		
44	19.09.2017	Scoped out	Unsuitable habitat	60% shaded. Dry in western section but flows (2cm) in the eastern section on western side of track, however, this is beyond 250m from the proposed works.	
45	19.09.2017	Scoped out	Unsuitable habitat	Dry ditch along the road with a small stagnant pool likely from a blocked drain. Water depth in the north section is ~ 1-2cm deep. However, it offers little foraging and commuting opportunities for water vole. The water level is shallower further north and does not flow.	

Water course	Date	Scoped out/survey required	Reason	Habitat Description	Photo
46	19.09.2017	Scoped out	Dry		
47	19.09.2017	Scoped out	Dry		
48	29.06.2017	Scoped out	Dry		
49	29.09.2017	Scoped out	Dry or shallow, overgrown		
50	20.07.2017	Scoped out	Dry, overgrown		
51	19.09.2017	Scoped out	Dry or shallow, overgrown		
52	19/09/17	Surveys required	Suitable habitat – herbaceous banks and suitable substrate and bank profile for burrowing	Steep earth banks overgrown in the western section of the stream where it is very shallow, with a slow flow and deep pools. The stream flows faster in the east and the water depth increases to 10cm with beaches and pools. Aquatic and bankside vegetation comprised water hemlock, water mint, bramble, nettle, broadleaved dock and grasses. 70% shading.	
53	19.09.2017	Scoped out	Dry		
54	19.09.2017	Scoped out	Unsuitable habitat	Earth banks with concrete reinforcement near the underpass and waterfall at the junction with the A358. Very dark in some wooded areas (80% shaded) where ivy and Himalayan balsam are prevalent, and duckweed dominates the water. Moderate flow of 1m depth. Vegetation along steep earth banks comprised bramble, nettle, oak, willowherb, pendulous sedge, rhododendron, broadleaved dock and ash. Flat slope where cattle and vehicle cross watercourse.	
54a	19.09.2017	Scoped out	Dry		

Water course	Date	Scoped out/survey required	Reason	Habitat Description	Photo
55	25/09/17	Surveys required	Suitable habitat – herbaceous banks and suitable substrate and bank profile for burrowing	Variable width (1-2m) and depth (1-2m) in areas with riffles, pools, beaches and waterfalls. Predominantly vertical earth banks with concrete reinforcement near the highways. The channel becomes deeper towards the east. 80% shading. Mosaic of vegetation, comprising bramble, nettle, broadleaved dock, water mint, ash, oak, blackthorn and sedges.	
56	20/07/17	Scoped out	Unsuitable habitat, overgrown and dry		
57	29/06/17	Surveys required	Suitable habitat – herbaceous banks and suitable substrate and bank profile for burrowing	Meandering river, water depth over 2m, variable flow (slow to rapid), width (2-15m) and height of vegetated banks. Bankside habitat comprised predominantly of hawthorn, bramble, willow, tall grasses creating in 20% shading along watercourse. Path along some section of watercourse, not heavily used and set back from the water's edge (>3m).	

Water course	Date	Scoped out/survey required	Reason	Habitat Description	Photo
	19/07/17	Surveys required	Suitable habitat – herbaceous banks and suitable substrate and bank profile for burrowing	Sections suitable to support water vole comprise bankside dominated by Himalayan balsam, nettles, tall grasses, sporadic patches of bramble and scattered willow tree species (40% shading). These suitable areas comprise steep earth banks, varying in height. On average, water flow is moderate (variable – sluggish to fast), estimated to be 1-2m deep (variable along some lengths of the River Isle) and the watercourse is typically wider than 4m (5-10m).	
57a		Scoped out	Outside 250m buffer		
58		Scoped out	Outside 250m buffer		
59		Scoped out	Outside 250m buffer		
60		Scoped out	Outside 250m buffer		
61		Scoped out	Outside 250m buffer		
62		Scoped out	Outside 250m buffer		
63		Scoped out	Outside 250m buffer		
64		Scoped out	Outside 250m buffer		
64a		Scoped out	Outside 250m buffer		

Appendix C. Figures

Figure C.1 – Watercourse overview

Figure C.2 – Water vole field sign maps

- Watercourse 17
- Watercourse 19
- Watercourse 20
- Watercourse 24
- Watercourse 24a
- Watercourse 30
- Watercourse 39
- Watercourse 55

NTS 0 400 800 1,200 1,600 2,000 m

REV.	DATE	AMENDMENT DETAILS	ORIG	CHK'D	APP'D
P1	27/11/2020	Suitable for Stage Approval	ER	KG	ER

Notes

Pink Modified Scheme, Mott MacDonald (2018)
Water vole data, Mott MacDonald (2018)

Service Layer Credits: Contains OS data © Crown Copyright and database right 2020

Key to symbols

- Pink modifed scheme option
- 250m buffer

References drawings

Survey status

- Confirmed water vole presence
- Possible evidence of water vole
- No evidence of water vole
- Scoped out - outside 250m buffer
- Scoped out - unsuitable habitat
- No surveys undertaken

Drawing Status: Suitable for Stage Approval
Suitability: S4

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Client: highways england

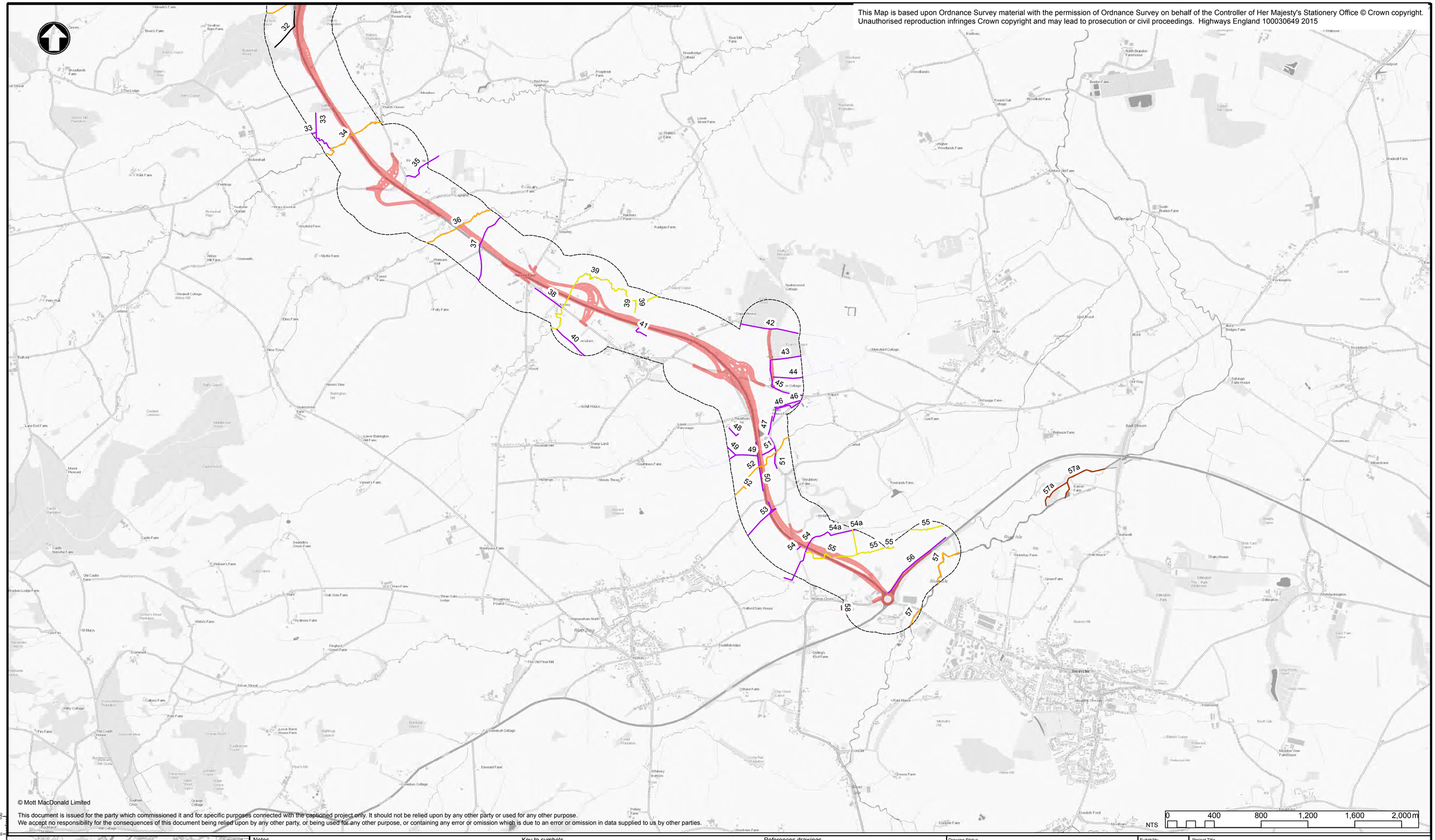
Project Title: A358 Taunton to Southfields

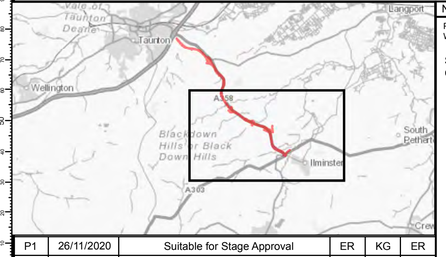
Drawing Title: Water vole survey status
Page 1 of 2

Scale	Designed	Drawn	Checked	Approved
NTS	KG	ER	KG	ER
Original Size: A1	Date: 27/11/2020	Date: 27/11/2020	Date: 27/11/2020	Date: 27/11/2020

Drawing Number: HE551508 - MMSJV - EBD - 000 - DR - LB - 0112
(HE PIN | Originator | Volume | Location | Type | Role | Number)

Project Ref. No.: 370774
Revision: P1





REV.	DATE	AMENDMENT DETAILS	ORIG	CHK'D	APP'D
P1	26/11/2020	Suitable for Stage Approval	ER	KG	ER

Notes

Pink Modified Scheme, Mott MacDonald (2018)
Water vole data, Mott MacDonald (2018)

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Key to symbols

Pink modifed scheme option

250m buffer

Survey status

Possible evidence of water vole

No evidence of water vole

Scoped out - outside 250m buffer

Scoped out - unsuitable habitat

No surveys undertaken

References drawings

Drawing Status: Suitable for Stage Approval

Suitability: S4

Project Title: A358 Taunton to Southfields

Drawing Title: Water vole survey status
Page 2 of 2

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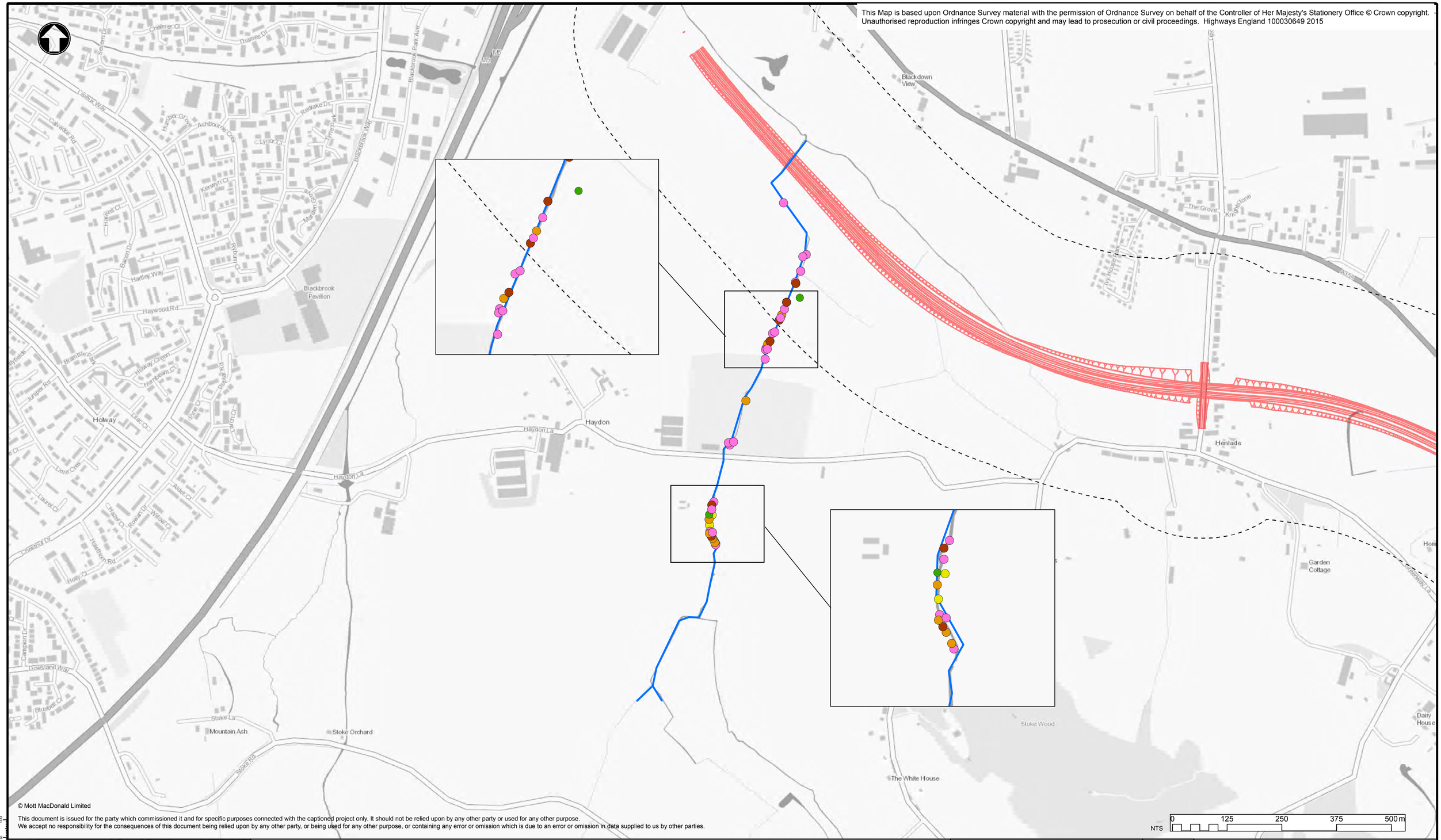
Scale	Designed	Drawn	Checked	Approved
NTS	KG	ER	KG	ER
Original Size	**Date**	**Date**	**Date**	**Date**
A1	26/11/2020	26/11/2020	26/11/2020	26/11/2020

Drawing Number: HE PIN | Originator | Volume | Location | Type | Role | Number
HE551508 - MMSJV - EBD - 000 - DR - LB - 0113

Project Ref. No.: 370774

Revision: P1



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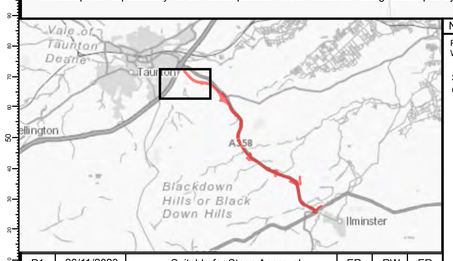

REV.	DATE	AMENDMENT DETAILS	ORIG	CHK'D	APP'D
P1	26/11/2020	Suitable for Stage Approval	ER	RW	ER

Notes

Pink Modified Scheme, Mott MacDonald (2018)
Watervole field signs, Mott MacDonals (2017 - 2019)

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Key to symbols

- Pink modified scheme option
- Watercourse
- 250m buffer

Record

- Burrow
- Feeding signs
- Footprint
- Latrine
- Plop sound

References drawings

Drawing Status: Suitable for Stage Approval

Suitability: S4

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Client: highways england

Project Title: A358 Taunton to Southfields

Drawing Title: Water vole field signs watercourse: 17
Page 1 of 8

Scale	Designed	Drawn	Checked	Approved
NTS	KG	ER	KG	ER
Original Size	Date	Date	Date	Date
A1	26/11/2020	26/11/2020	26/11/2020	26/11/2020

Drawing Number: HE PIN | Originator | Volume
HE551508 - MMSJV - EBD -
000 Location - DR - LB - Type | Role
0114 Number

Project Ref. No.: 370774

Revision: P1

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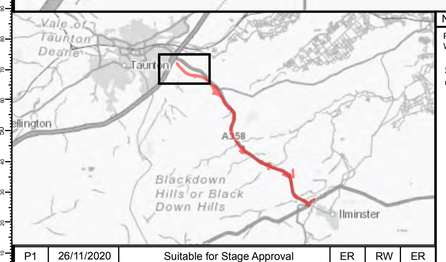

REV.	DATE	AMENDMENT DETAILS	ORIG	CHK'D	APP'D
P1	26/11/2020	Suitable for Stage Approval	ER	RW	ER

Notes

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Key to symbols

- Pink modified scheme option
- Watercourse
- 250m buffer

Record

- Burrow
- Plop sound

References drawings

Drawing Status: Suitable for Stage Approval

Suitability: S4

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Project Title: A358 Taunton to Southfields

Drawing Title: Water vole field signs water course: 19
Page 2 of 8

Scale	Designed	Drawn	Checked	Approved
NTS	KG	ER	KG	ER
Original Size	Date	Date	Date	Date
A1	26/11/2020	26/11/2020	26/11/2020	26/11/2020

Drawing Number: HE551508 - MMSJV - EBD - 000 - DR - LB - 0115
(HE PIN | Originator | Volume | Location | Type | Role | Number)

Project Ref. No.: 370774

Revision: P1

NTS

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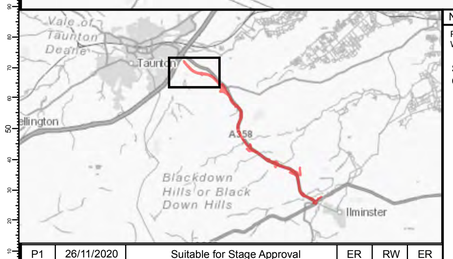

REV.	DATE	AMENDMENT DETAILS	ORIG	CHK'D	APP'D
P1	26/11/2020	Suitable for Stage Approval	ER	RW	ER

Notes

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Key to symbols

- Pink modified scheme option
- Watercourse
- 250m buffer

References drawings

Record

- Feeding signs
- Footprint

Drawing Status: Suitable for Stage Approval

Suitability: S4

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Project Title: A358 Taunton to Southfields

Drawing Title: Water vole field signs watercourse: 20
Page 3 of 8

Scale	Designed	Drawn	Checked	Approved
NTS	KG	ER	KG	ER
Original Size	**Date**	**Date**	**Date**	**Date**
A1	26/11/2020	26/11/2020	26/11/2020	26/11/2020

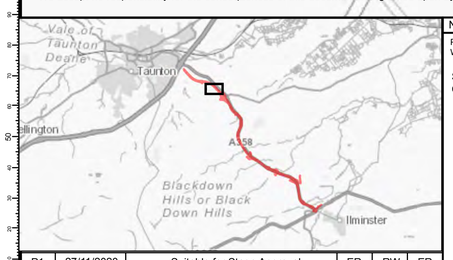
Drawing Number: HE PIN | Originator | Volume
HE551508 - MMSJV - EBD -
000 - DR - LB - 0116
Location | Type | Role | Number

Project Ref. No.: 370774

Revision: P1

Home Farm
Garden Cottage
Greenway La
A358
Keirles
Ash Cross
Dairy House Farm

NTS 0 40 80 120 160 m



REV.	DATE	AMENDMENT DETAILS	ORIG	CHK'D	APP'D
P1	27/11/2020	Suitable for Stage Approval	ER	RW	ER

Notes

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Key to symbols

Pink modified scheme option
Watercourse
250m buffer

Record

Burrow
Feeding signs

References drawings

Drawing Status: Suitable for Stage Approval
Suitability: S4

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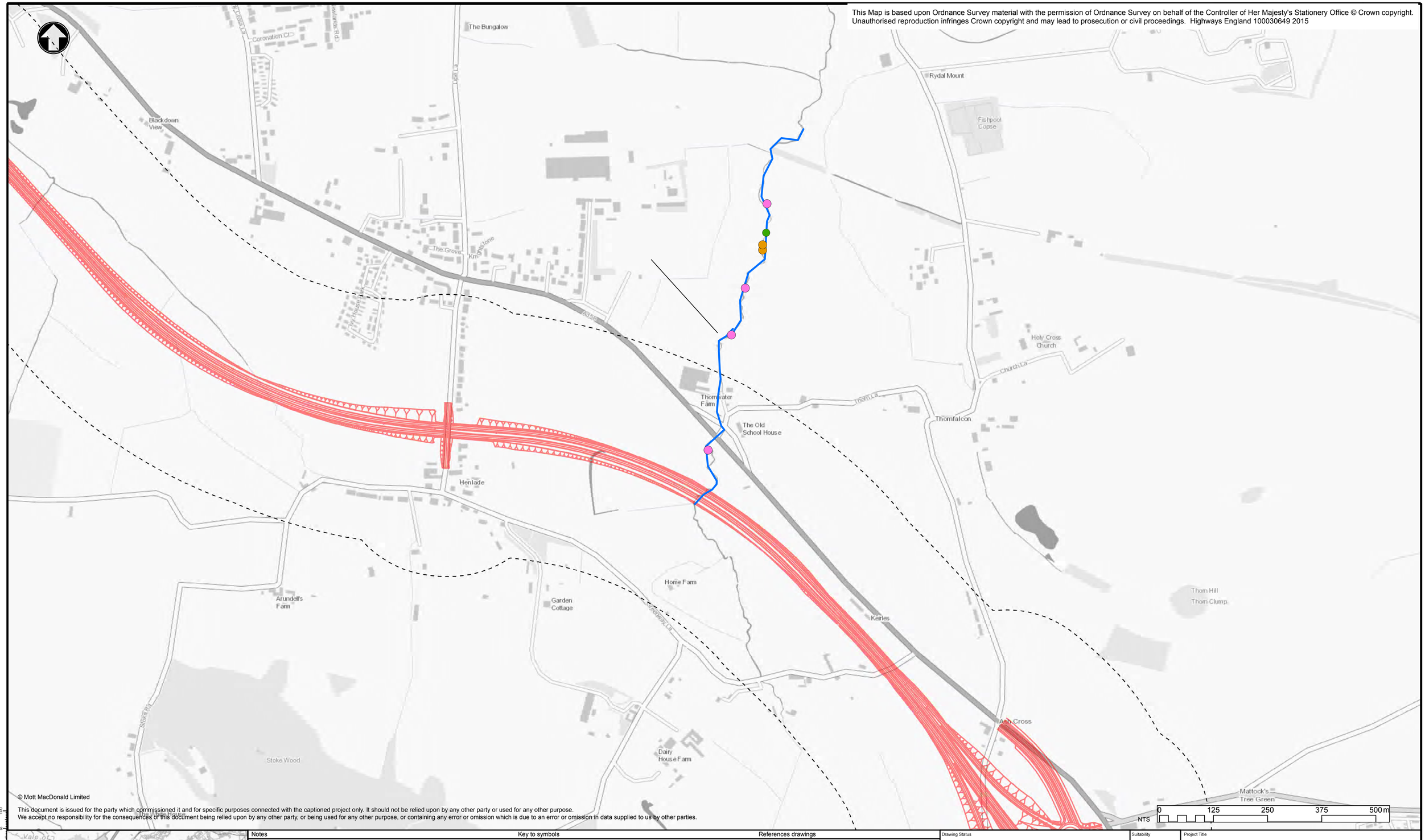
Project Title: A358 Taunton to Southfields

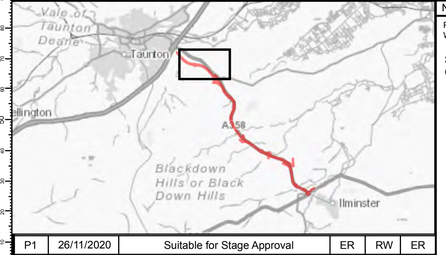
Drawing Title: Water vole field signs watercourse: 24a
Page 4 of 8

Scale	Designed	Drawn	Checked	Approved
NTS	KG	ER	KG	ER
Original Size	Date	Date	Date	Date
A1	27/11/2020	27/11/2020	27/11/2020	27/11/2020

Drawing Number: HE551508 - MMSJV - EBD - 000 - DR - LB - 0117
(HE PIN | Originator | Volume | Location | Type | Role | Number)

Project Ref. No.: 370774
Revision: P1





REV.	DATE	AMENDMENT DETAILS	ORIG	CHK'D	APP'D
P1	26/11/2020	Suitable for Stage Approval	ER	RW	ER

Notes

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Key to symbols

- Pink modified scheme option
- Watercourse
- 250m buffer

Record

- Burrow
- Feeding signs
- Footprint

References drawings

Drawing Status: Suitable for Stage Approval

Suitability: S4

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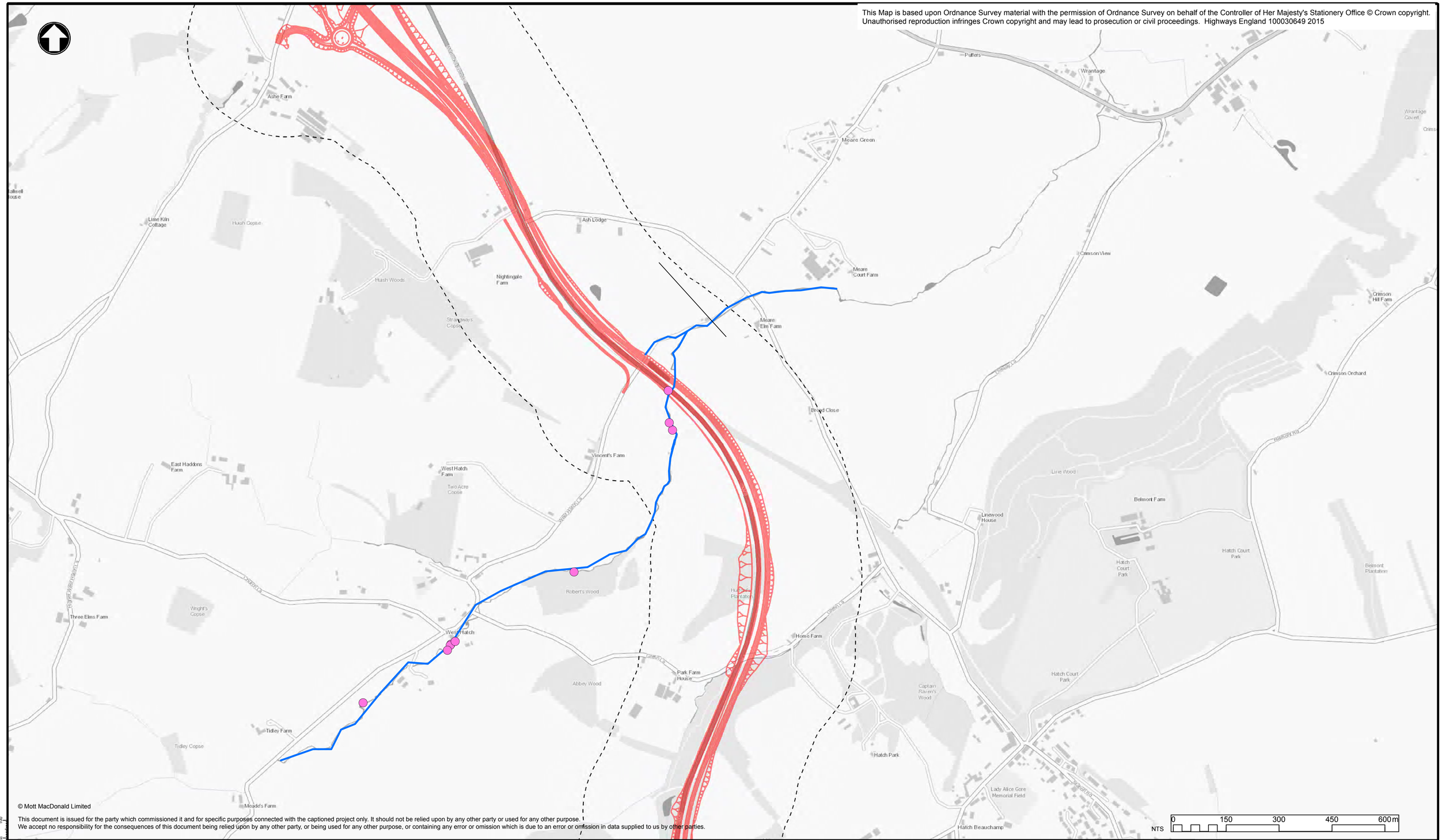
Project Title: A358 Taunton to Southfields

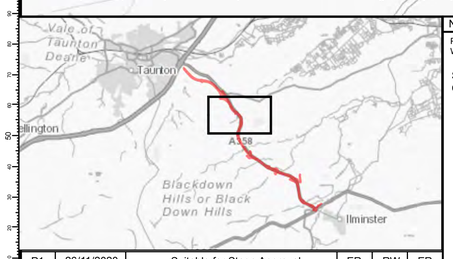
Drawing Title: Water vole field signs watercourse: 24
Page 5 of 8

Scale	Designed	Drawn	Checked	Approved
NTS	KG	ER	KG	ER
Original Size	**Date**	**Date**	**Date**	**Date**
A1	26/11/2020	26/11/2020	26/11/2020	26/11/2020

Drawing Number
HE P/N | Originator | Volume | Location | Type | Role | Number | Project Ref. No. | Revision

HE551508 - MMSJV - EBD - 000 - DR - LB - 0118 | 370774 | P1





REV.	DATE	AMENDMENT DETAILS	ORIG	CHK'D	APP'D
P1	26/11/2020	Suitable for Stage Approval	ER	RW	ER

Notes

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Key to symbols

Pink modified scheme option

Watercourse

250m buffer

Record

Burrow

References drawings

Drawing Status	Suitability
Suitable for Stage Approval	S4

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Project Title: A358 Taunton to Southfields

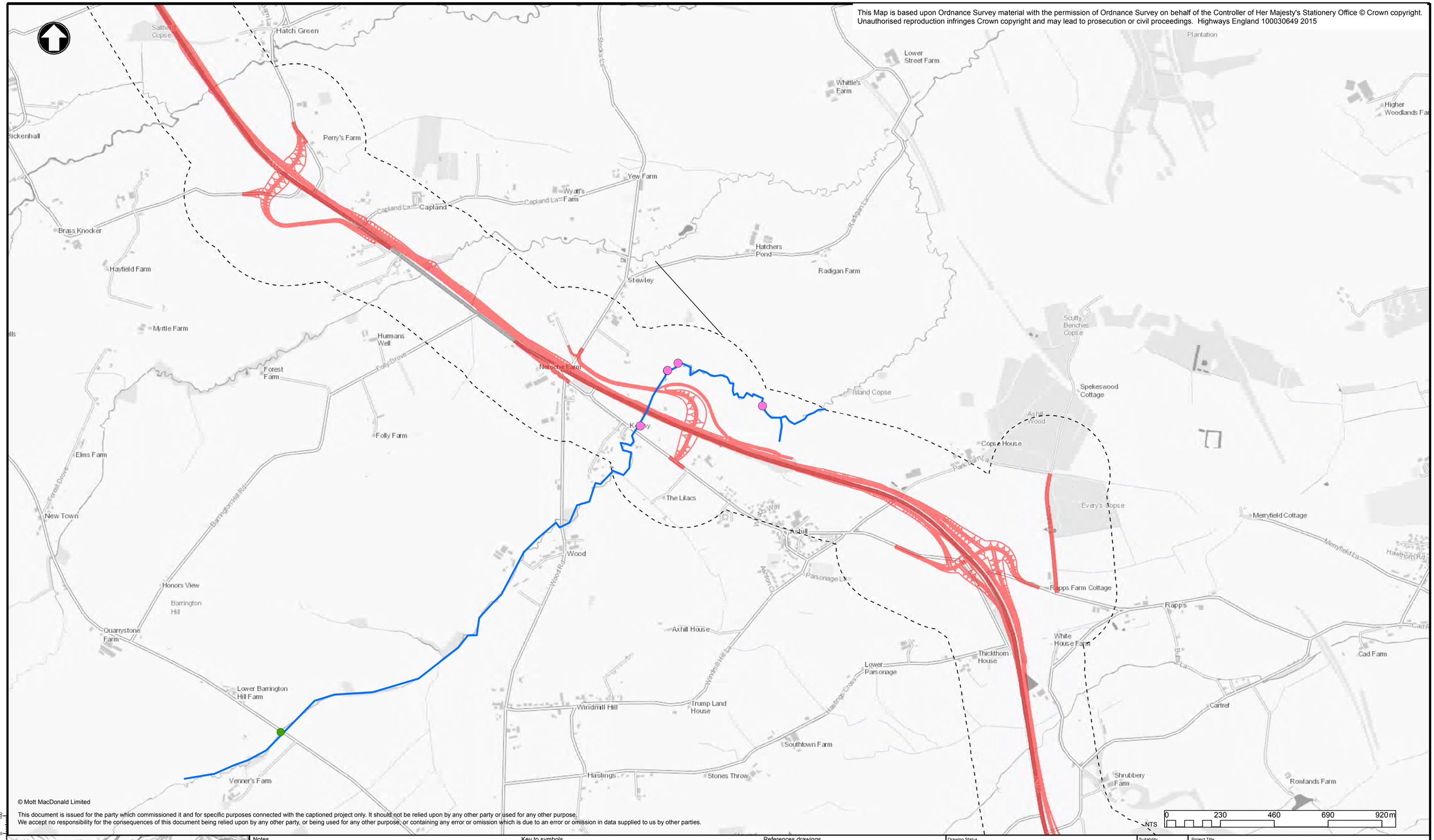
Drawing Title: Water vole field signs watercourse: 30
Page 6 of 8

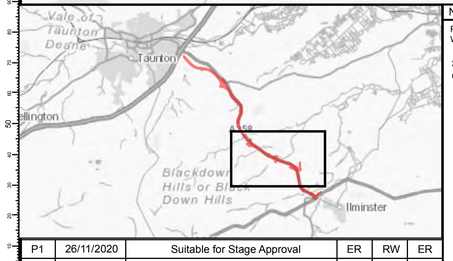
Scale	Designed	Drawn	Checked	Approved
NTS	KG	ER	KG	ER
Original Size	Date	Date	Date	Date
A1	26/11/2020	26/11/2020	26/11/2020	26/11/2020

Drawing Number: HE551508 - MMSJV - EBD - 000 - DR - LB - 0119
(HE PIN | Originator | Volume | Location | Type | Role | Number)

Project Ref. No.: 370774

Revision: P1





REV.	DATE	AMENDMENT DETAILS	ORIG	CHK'D	APP'D
P1	26/11/2020	Suitable for Stage Approval	ER	RW	ER

Notes

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Key to symbols

Pink modified scheme option
Watercourse
250m buffer

Record

Burrow
Footprint

References drawings

Drawing Status: Suitable for Stage Approval
Suitability: S4

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Project Title: A358 Taunton to Southfields

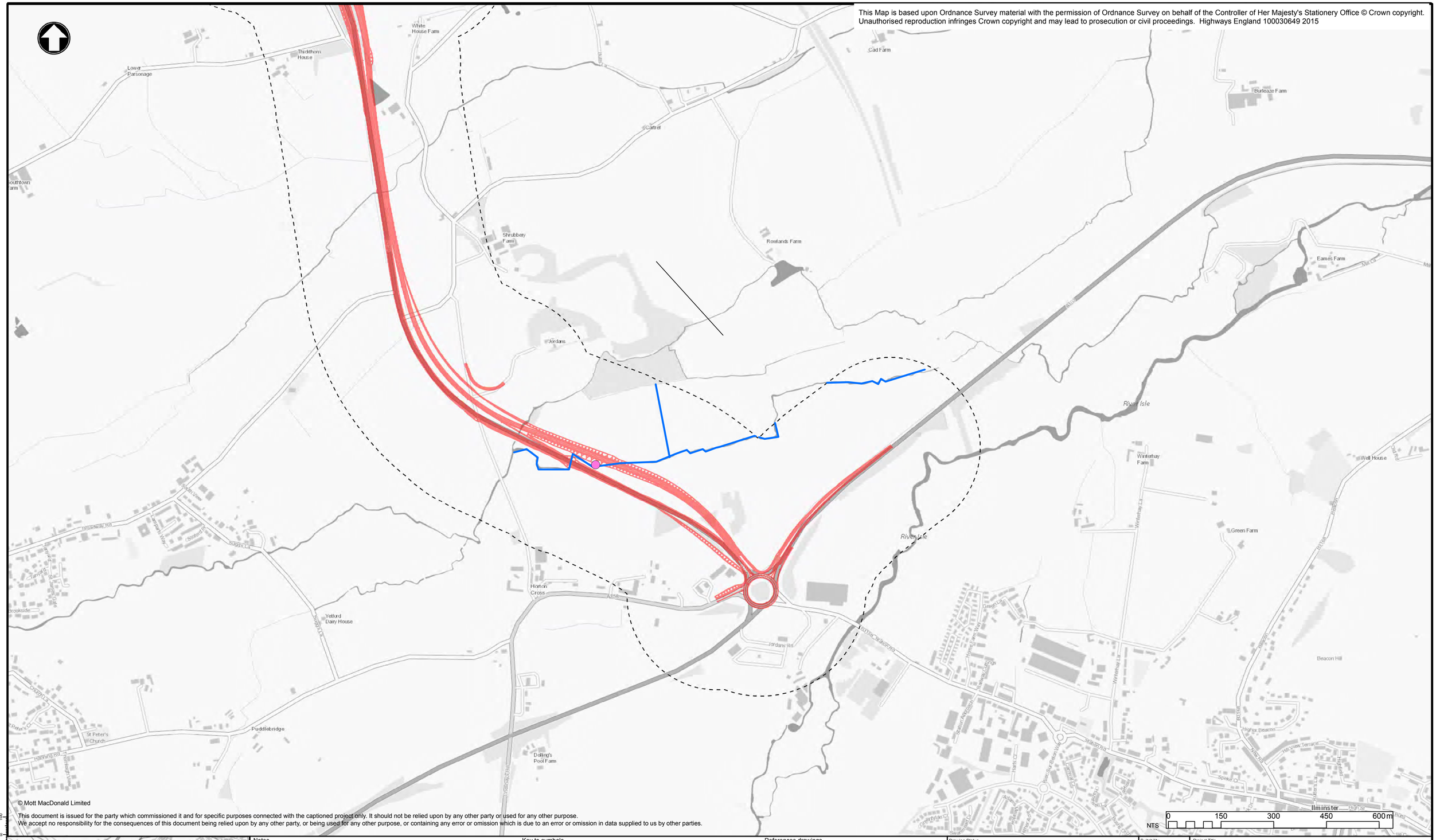
Drawing Title: Water vole field signs watercourse: 39
Page 7 of 8

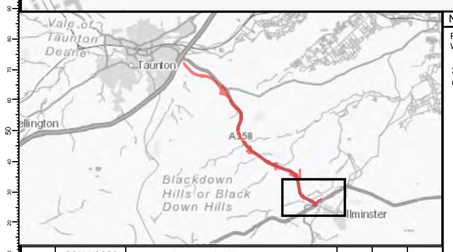
Scale	Designed	Drawn	Checked	Approved
NTS	KG	ER	KG	ER
Original Size: A1	Date: 26/11/2020	Date: 26/11/2020	Date: 26/11/2020	Date: 26/11/2020

Drawing Number: HE551508 - MMSJV - EBD - 000 - DR - LB - 0120
(Originator: MMSJV | Volume: EBD | Location: 000 | Type: DR | Role: LB | Number: 0120)

Project Ref. No.: 370774

Revision: P1





REV.	DATE	AMENDMENT DETAILS	ORIG	CHK'D	APP'D
P1	26/11/2020	Suitable for Stage Approval	ER	RW	ER

Notes

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Key to symbols

Pink modified scheme option
Watercourse
250m buffer

Record

Burrow

References drawings

Drawing Status	Suitable for Stage Approval
Suitability	S4

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Project Title: A358 Taunton to Southfields

Drawing Title: Water vole field signs watercourse: 55
Page 8 of 8

Scale	Designed	Drawn	Checked	Approved
NTS	KG	ER	KG	ER
Original Size	**Date**	**Date**	**Date**	**Date**
A1	26/11/2020	26/11/2020	26/11/2020	26/11/2020

Drawing Number: HE551508 - MMSJV - EBD - 000 - DR - LB - 0121
(HE PIN | Originator | Volume | Location | Type | Role | Number)

Project Ref. No.: 370774

Revision: P1

Appendix D. Water vole field sign survey results

	Early season survey (April to June)								Late season survey (July to September)							
Water course	Date	Burrow	Latrine	Feeding remains	Heard 'plop' sound	Foot-prints	Mink field signs	Notes	Date	Burrow	Latrine	Feeding remains	Heard 'plop' sound	Footprints	Mink field signs	Notes
14a	29/06/17 06/07/17 20/07/17	4	-	-	-	-	Yes	Scoped out - outside 250m buffer	15/09/17	-	-	-	-	-	-	Scoped out - outside 250m buffer.
15a	20/05/19	-	-	-	-	-	-	Water vole field signs found at ST25929 25313 (outside 250m buffer)								No access from September 2019 due to construction works but scoped out as now outside 250m buffer.
17	27/06/17 23/05/18	19 4	6 2	2 8	3 -	- 2	- -	Many water vole signs identified	12/09/17	6	-	-	-	-	-	Additional incidental record of water vole burrow with mown lawn on 21/02/20.
19	03/07/17 22/05/19	- -	- -	- -	- -	- -	- -	2017 - no access to section south of Stock Road 2019 - whole watercourse surveyed – water vole field signs found outside 250m buffer	14/09/17 12/09/19	- 2	- -	- -	1 -	- -	- -	Footprints thought to be rat. 'Plop' noise isn't necessarily water vole. Disused burrows – more likely to be rat given lack of other field signs.
20	23/05/18 24/06/19	- -	- -	- -	- -	1 -	- -	Water vole print under bridge at ST26323 24024	12/09/19	-	-	Y	-	-	-	Feeding signs near where footprint was identified in survey 1.
21	20/06/17 08/05/18	- -	- -	- -	- -	- -	- -	Rat burrow and footprints identified								Two early season surveys (and no late season surveys) undertaken due to access restrictions.
24	01/05/19 23/05/19 04/06/19	- - -	- - -	- - -	- - -	- - -	- - -	Northern section (3x burrows, all now outside buffer) Southern section Middle section (Thornwater cottage)	14/09/17 11/09/19	- 1	- -	- -	- -	- -	- -	Watercourse dry. To north outside buffer - water vole spotted and feeding stations & footprints.
24a	23/05/19 10/06/20	- 1	- -	- Y	- -	- -	- -	No field signs recorded Multiple feeding stations, possible burrow	11/09/19 11/08/20	1 -	- -	1 -	- -	- -	- -	Well used burrow & feeding station.
24b	09/06/20	-	-	-	-	-	-	No field signs recorded	11/08/20	-	-	-	-	-	-	No field signs recorded.
30	09/05/19 04/06/19 09/06/20	- Y -	- - -	- - -	- - -	- - -	- - -	Middle section West of A358 – several potential burrows East of A358 (burrow found outside 250m buffer)	11/09/17 12/09/19 11/08/20	- 2 -	- - -	- - -	- - -	- - -	- - -	2017 - two burrows outside buffer. 2019 - disused burrows on west side. 2020 - potential burrows found to south outside buffer.
31	21/05/19	-	-	-	-	-	-	Rat droppings and burrows identified	10/09/19	-	-	-	-	-	-	No field signs recorded.
34	09/05/18	-	-	-	-	-	-	No field signs recorded	04/09/19	-	-	-	-	-	-	No field signs recorded.
36	23/06/17	-	-	-	-	-	Yes	Disused and collapsed burrow. No water vole field signs recorded. Signs of active mink	02/09/19	-	-	-	-	-	-	Habitat assessed as unsuitable for water voles.
39	10/05/18 10/06/20	2 3	- -	- -	- -	- -	- -	Footprint identified to south outside buffer Burrows in middle section not surveyed in 2018	05/07/17 27/09/17 03/09/19 13/08/20	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	Only part surveyed. Whole watercourse. North of A358. South of A358.
52	25/06/19	-	-	-	-	-	-	No field signs recorded	19/09/17	-	-	-	-	-	-	No field signs recorded.
55	27/06/19	1	-	-	-	-	-	Possible water vole burrow, no other field signs	29/09/17	-	-	-	-	-	-	No field signs recorded.
57	29/06/17 19/07/17	- -	- -	- -	- -	- -	- -	No field signs recorded	26/09/17	-	-	-	-	-	-	No field signs recorded.

Appendix E. Location of water vole field signs

Watercourse	Date	Easting	Northing	Feature	Notes	Photo
14a	29/06/17	324987	122666	Burrow	Four burrows in close proximity Whole watercourse now outside 250m buffer	
15a	20/05/19	325929	125313	Unknown	Water vole field signs found at ST25929 25313 (outside 250m buffer)	N/A
17	27/06/17	325954	123803	Burrow	Two burrows on west bank	

Watercourse	Date	Easting	Northing	Feature	Notes	Photo
17	27/06/17	325958	123813	Feeding remains		
17	27/06/17	325963	123819	Latrine	Latrine situated on west bank	N/A
17	27/06/17	325969	123837	Burrow	Burrow situated on west bank	N/A
17	27/06/17	325984	123867	Latrine	Latrine situated on west bank	
17	27/06/17	325990	123879	Feeding remains		

Watercourse	Date	Easting	Northing	Feature	Notes	Photo
17	27/06/17	325987	123872	Burrow	Two burrows on west bank	
17	27/06/17	325996	123892	Burrow	Two burrows on west bank	
17	27/06/17	326001	123908	Burrow	Two burrows on west bank	
17	27/06/17	326001	123908	Latrine	Latrine situated on west bank	
17	27/06/17	326033	123979	Latrine	Two latrines on west bank	
17	27/06/17	326033	123979	Burrow	Two burrows on west bank	N/A
17	27/06/17	326046	124017	Burrow	Two burrows on west bank	N/A
17	27/06/17	325875	123588	Burrow	Two burrows	N/A
17	27/06/17	325871	123582	Burrow		N/A
17	27/06/17	325868	123587	Burrow		N/A
17	27/06/17	325835	123452	Burrow		N/A
17	27/06/17	325830	123445	Latrine		N/A
17	27/06/17	325831	123422	Other	Plop sound heard	N/A
17	27/06/17	325825	123399	Other	Plop sound x2	N/A
17	27/06/17	325826	123385	Burrow		N/A
17	23/05/18	325839	123354	Burrow		N/A
17	23/05/18	325837	123359	Other	Feeding station	N/A
17	23/05/18	325832	123369	Other	Three feeding stations	N/A
17	23/05/18	325829	123374	Latrine	Seven pellets, fresh, feeding station opposite	N/A
17	23/05/18	325825	123380	Other	Feeding remains	N/A
17	23/05/18	325824	123412	Other	Two feeding stations	N/A
17	23/05/18	325824	123423	Footprint	Possible water vole footprints	N/A
17	23/05/18	325848	124510	Other	Very large feeding station, possible borrow nearby, not possible to confirm	N/A
17	23/05/18	325908	123683	Other	Small feeding station	N/A

Watercourse	Date	Easting	Northing	Feature	Notes	Photo
17	23/05/18	325953	123799	Burrow	West side, mown lawn outside	
17	23/05/18	325974	123840	Burrow	West side of watercourse	N/A
17	23/05/18	326021	123954	Burrow	Located on the west side, well mown lawn around hole, plus feeding station	N/A
17	23/05/18	326022	123951	Latrine	Three piles, 11 pellets in total, fresh	N/A
17	23/05/18	326031	123918	Footprint	Likely water vole footprints	N/A
17	12/09/17	325880	123589	Burrow	At water level	

Watercourse	Date	Easting	Northing	Feature	Notes	Photo
17	12/09/17	325952	123778	Burrow	At water level	
17	12/09/17	325957	123801	Burrow	Numerous burrows at water level	
17	12/09/17	326038	124012	Burrow	Numerous burrows at ground level	

Watercourse	Date	Easting	Northing	Feature	Notes	Photo
17	12/09/17	325830	123435	Burrow	At water level	
17	12/09/17	325832	123382	Burrow	At water level	

Watercourse	Date	Easting	Northing	Feature	Notes	Photo
17	21/02/20	Burrow	325994	124135	Burrow with mown lawn	
19	14/09/17	326399	123957	Other	"Plop" sound heard by both surveyors	N/A
19	12/09/19	326210	124140	Burrow	More likely to be rat given lack of other field signs	

Watercourse	Date	Easting	Northing	Feature	Notes	Photo
19	12/09/19	326516	123838	Burrow		
20	23/05/18	326323	124024	Footprint	Found under footbridge	
20	12/09/19	326298	123991	Feeding remains	Feeding signs within fool's watercress, likely water vole although too far to confirm fully - near where footprint was identified	

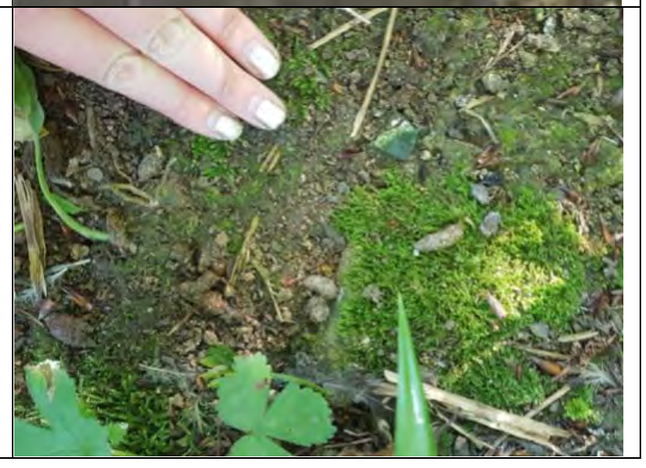
Watercourse	Date	Easting	Northing	Feature	Notes	Photo
21	20/06/17	N/A	N/A	Other	Rat burrow and footprints identified	
24	01/05/19	327609	123927	Burrow	Not within 250m buffer	
24	01/05/19	327691	124230	Burrow	Multiple possible burrows on denuded stream bank. Not within 250m buffer	
24	01/05/19	327641	124035	Burrow	Potential burrow but recent excavation of bank visible and entrance is damaged Not within 250m buffer	

Watercourse	Date	Easting	Northing	Feature	Notes	Photo
24	11/09/19	327555	123661	Burrow	One potential burrow on waterline, west bank	
24	11/09/19	327681	124123	Feeding remains	Not within 250m buffer	
24	11/09/19	327681	124135	Water vole sighting	Water vole seen running from vegetation during survey Feeding station with mown lawn and grass eaten at 45 degree angle Not within 250m buffer	

Watercourse	Date	Easting	Northing	Feature	Notes	Photo
24	11/09/19	327689	124163	Footprints	Water vole prints under bridge Not within 250m buffer	
24a	13/09/19	327702	123114	Feeding signs	Vegetation eaten to 45 degree angle	
24a	11/09/19	327644	123230	Burrow	Well used, just above waterline	

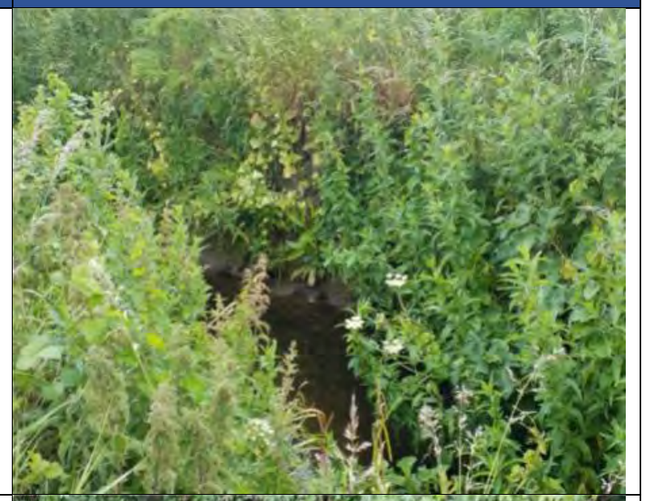
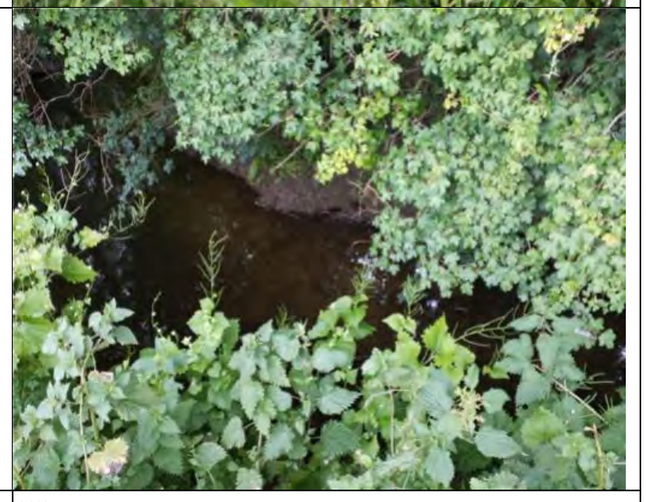
Watercourse	Date	Easting	Northing	Feature	Notes	Photo
24a	10/06/20	327715	123090	Feeding signs	Feeding signs, multiple feeding signs in water, vegetation eaten at 45 degree angle	
24a	10/06/20	327715	123090	Burrow	Small hole in bank	
30	11/09/17	328369	120684	Burrow	Outside 250m buffer. Possible water vole burrow x2 (one presumed disused). No other signs.	
30	04/06/19	329234	121569	Burrow	Various potential water vole burrows along the soil banks of the watercourse	N/A

Watercourse	Date	Easting	Northing	Feature	Notes	Photo
30	12/09/19	329246	121457	Burrow	Possible burrow on waterline, no other field signs	
30	12/09/19	329237	121478	Burrow	Possible burrow on waterline	
30	09/06/20	328967	121055	Burrow	Possible water vole burrow in bank, approximately 10cm wide	

Watercourse	Date	Easting	Northing	Feature	Notes	Photo
30	11/08/20	328618 328616 328608 328630	120850 120847 120833 120858	Burrows	Several potential burrows found to south outside buffer Not within 250m buffer	 
31	21/05/19	329882	121194	Other	Rat droppings and burrows identified	

Watercourse	Date	Easting	Northing	Feature	Notes	Photo
						
36	23/06/17			Other	Mink scat	
39	10/05/18	332067	117933	Burrow	Potential water vole burrow with slipway. No adjacent field signs - disused.	

Watercourse	Date	Easting	Northing	Feature	Notes	Photo
39	10/05/18	331545	117848	Burrow	Potential water vole burrow with cut grass above and further tunnel entrance below the water	
39	10/05/18	330007	116539	Footprint	Footprint identified to south (outside buffer)	
39	10/06/20	331661	118084	Burrow	Possible water vole burrow, can't get close enough to investigate	

Watercourse	Date	Easting	Northing	Feature	Notes	Photo
39	10/06/20	331662	118085	Burrow	Possible burrow, can't get close enough to investigate	
39	10/06/20	331706	118116	Burrow	Small burrow close to water surface - possible water vole	
55	27/06/19	333830	115692	Burrow	Possible water vole burrow, no other field signs	N/A