highways england

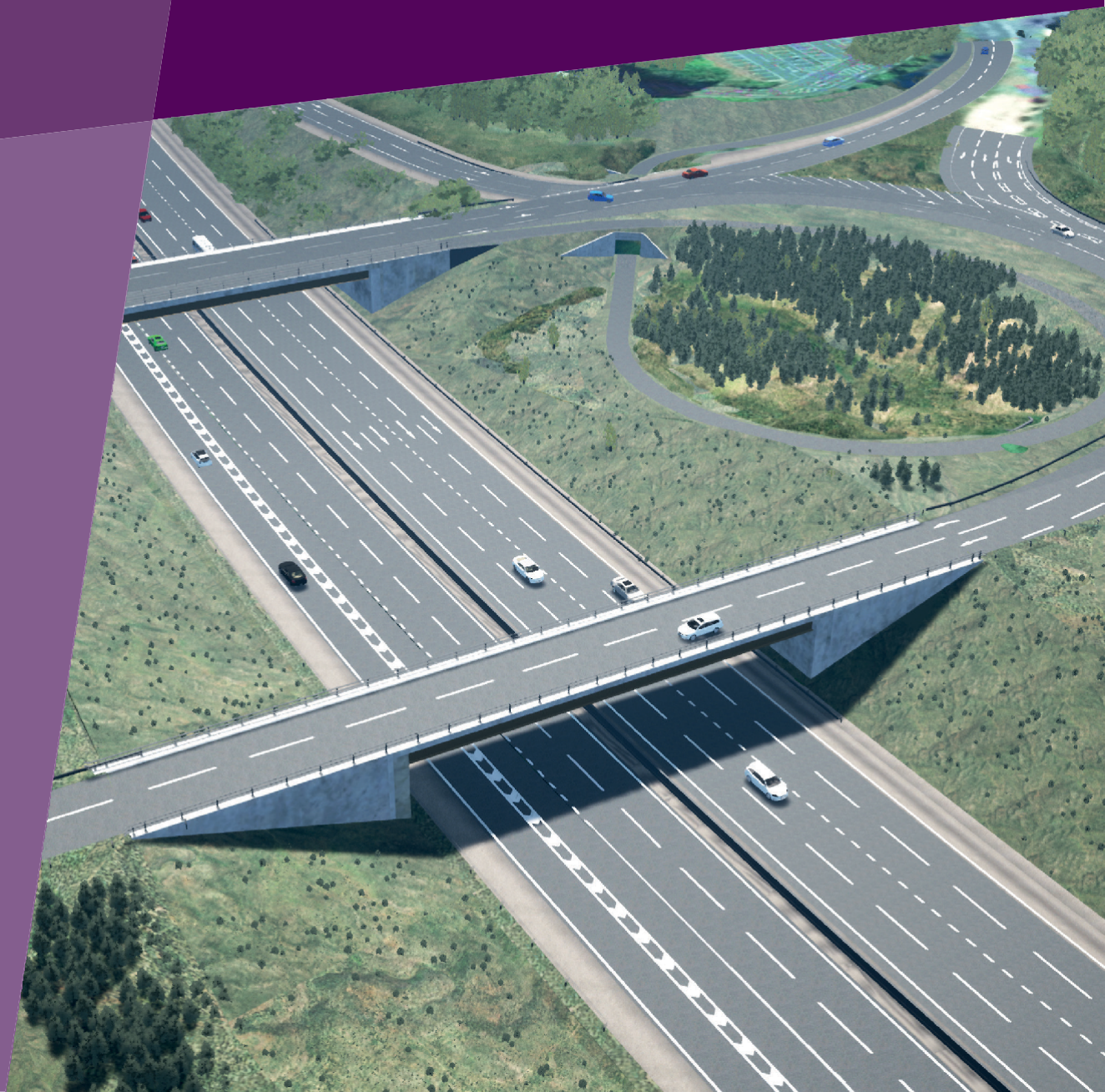
M3

junction 9 improvement scheme

Preliminary Environmental Information Report

Appendix 8.2 – Baseline Reports (Part 5 of 5)

May 2021



N

LEGEND

- Proposed Order Limits
- Survey Area

Notable Plants

- Anthemis cotula
- Anthyllis vulneraria
- Blackstonia perfoliata
- Cirsium acaule
- Euphorbia exigua
- Fragaria vesca
- Hypericum maculatum
- Knautia arvensis
- Onobrychis viciifolia
- Orobanche elatior
- Orobanche minor
- Viola hirta

INNS

- Aster
- Cornus sericea
- Cotoneaster horizontalis
- Cotoneaster simonsii
- Galega officinalis
- Rubus armeniacus

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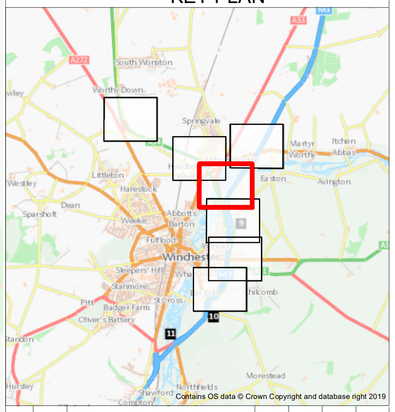
SCALE 1:3,000

KEY PLAN



Rev.	Date	Description of revision	Drawn	Checked	Review'd	Approv'd
P01	05/08/20	Initial Issue	MK	LG	LW	HR

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www.jacobs.com

SCHEME TITLE

M3 JUNCTION 9 IMPROVEMENTS

DRAWING TITLE

FIGURE 4
NOTABLE PLANTS AND INVASIVE NON-NATIVE SPECIES (PLANTS)

Sheet 4 of 7

DRAWING UNITS U.N.O.
ALL DIMENSIONS IN METRES UNLESS STATED OTHERWISE

SCALE AT A1 (841 x 594mm)
1:3000

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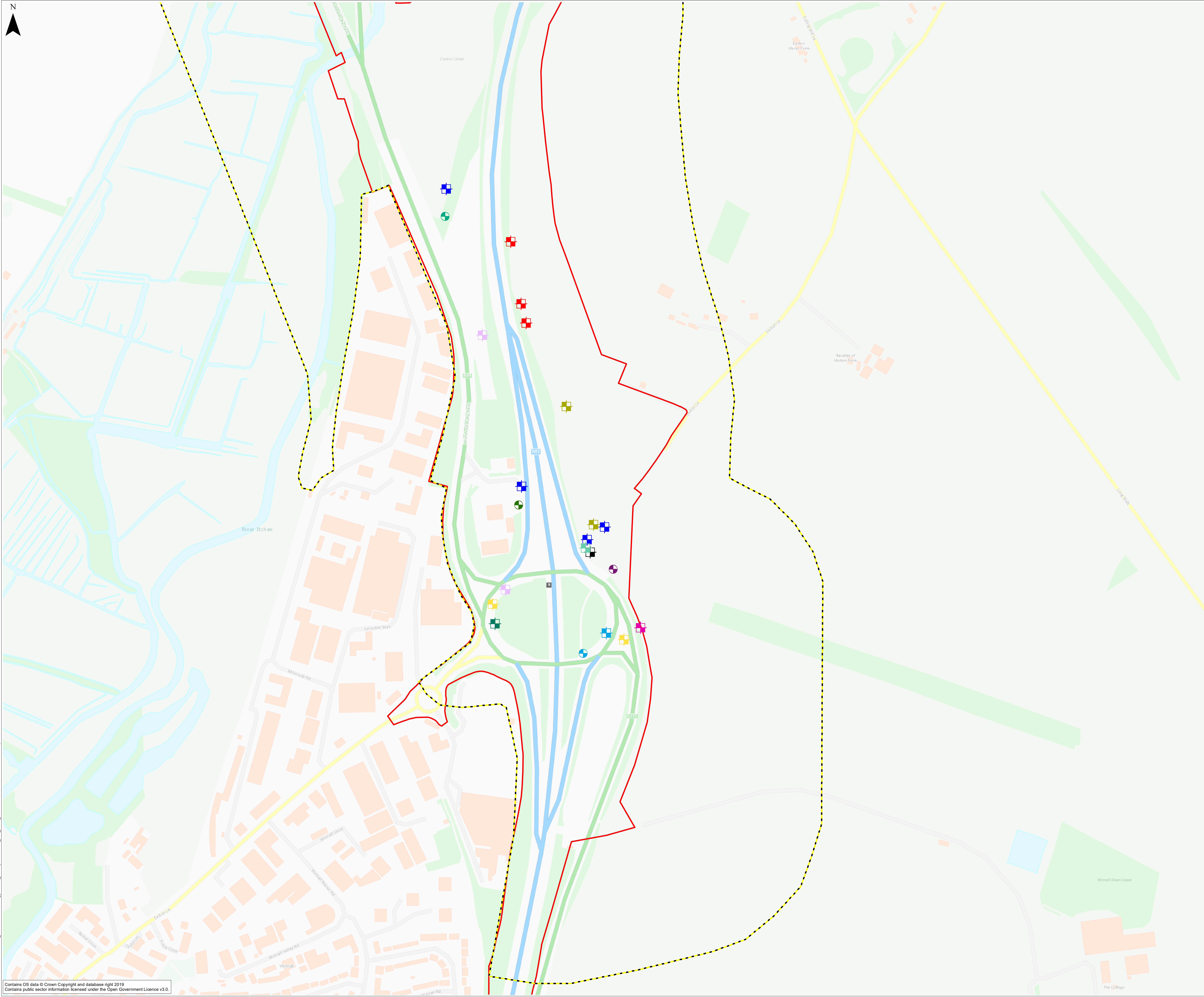

LEGEND

Proposed Order Limits
Survey Area

Notable Plants

- Anthemis cotula
- Anthyllis vulneraria
- Blackstonia perfoliata
- Cirsium acaule
- Euphorbia exigua
- Fragaria vesca
- Hypericum maculatum
- Knautia arvensis
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INNS

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- Cotoneaster horizontalis
- Cotoneaster simonsii
- Galega officinalis
- Rubus armeniacus

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SCALE 1:3,000

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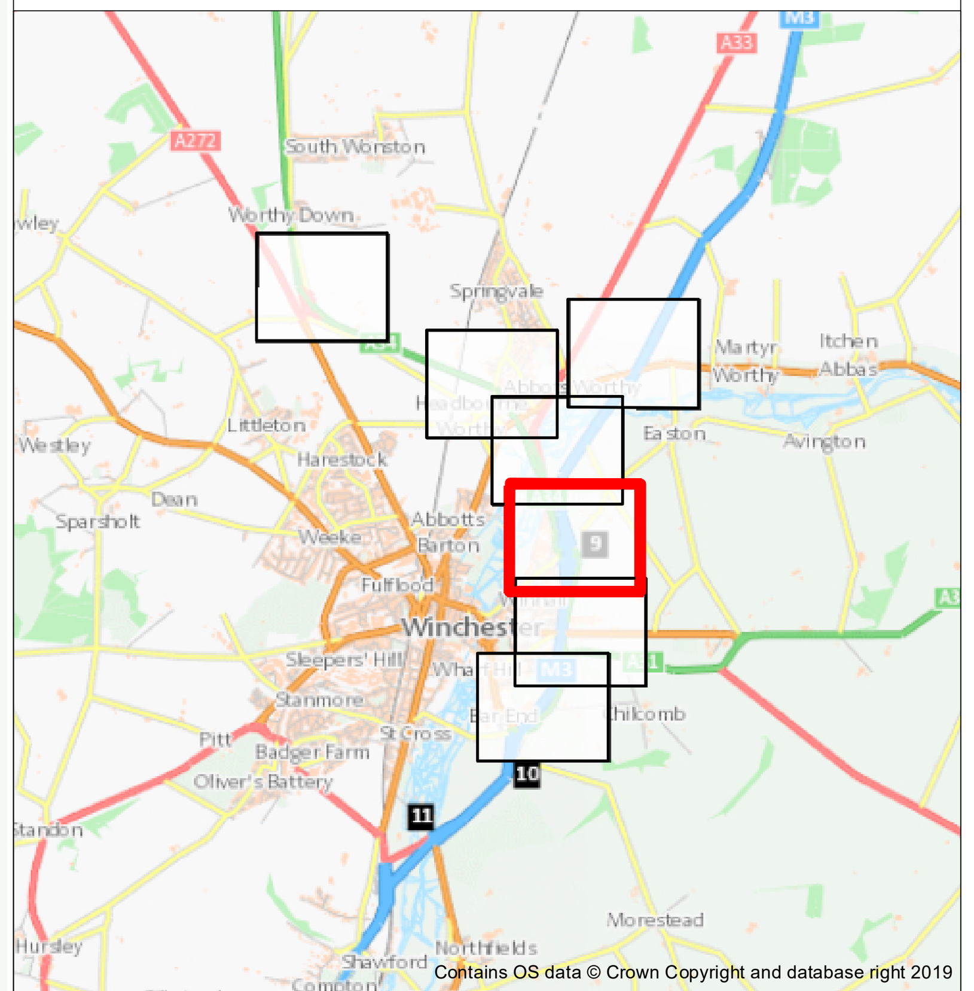

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DRAWING TITLE

FIGURE 4
NOTABLE PLANTS AND INVASIVE NON-NATIVE SPECIES (PLANTS)

Sheet 5 of 7

DRAWING UNITS U.N.O.
ALL DIMENSIONS IN METRES UNLESS STATED OTHERWISE

SCALE AT A1 (841 x 594mm)
1:3000

DRAWING No.
HE551511-JAC-EGN-0_00_00-DR-GI-0039

REV.
P01

N

LEGEND

- Proposed Order Limits
- Survey Area

Notable Plants

- Anthemis cotula
- Anthyllis vulneraria
- Blackstonia perfoliata
- Cirsium acaule
- Euphorbia exigua
- Fragaria vesca
- Hypericum maculatum
- Knautia arvensis
- Onobrychis viciifolia
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INNS

- Aster
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- Galega officinalis
- Rubus armeniacus

0 50 100 200 300 m

SCALE 1:3,000

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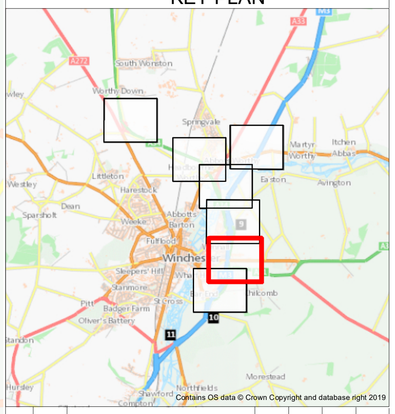

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DRAWING TITLE

FIGURE 4
NOTABLE PLANTS AND INVASIVE NON-NATIVE SPECIES (PLANTS)

Sheet 6 of 7

DRAWING UNITS U.N.O.
ALL DIMENSIONS IN METRES UNLESS STATED OTHERWISE

SCALE AT A1 (841 x 594mm)
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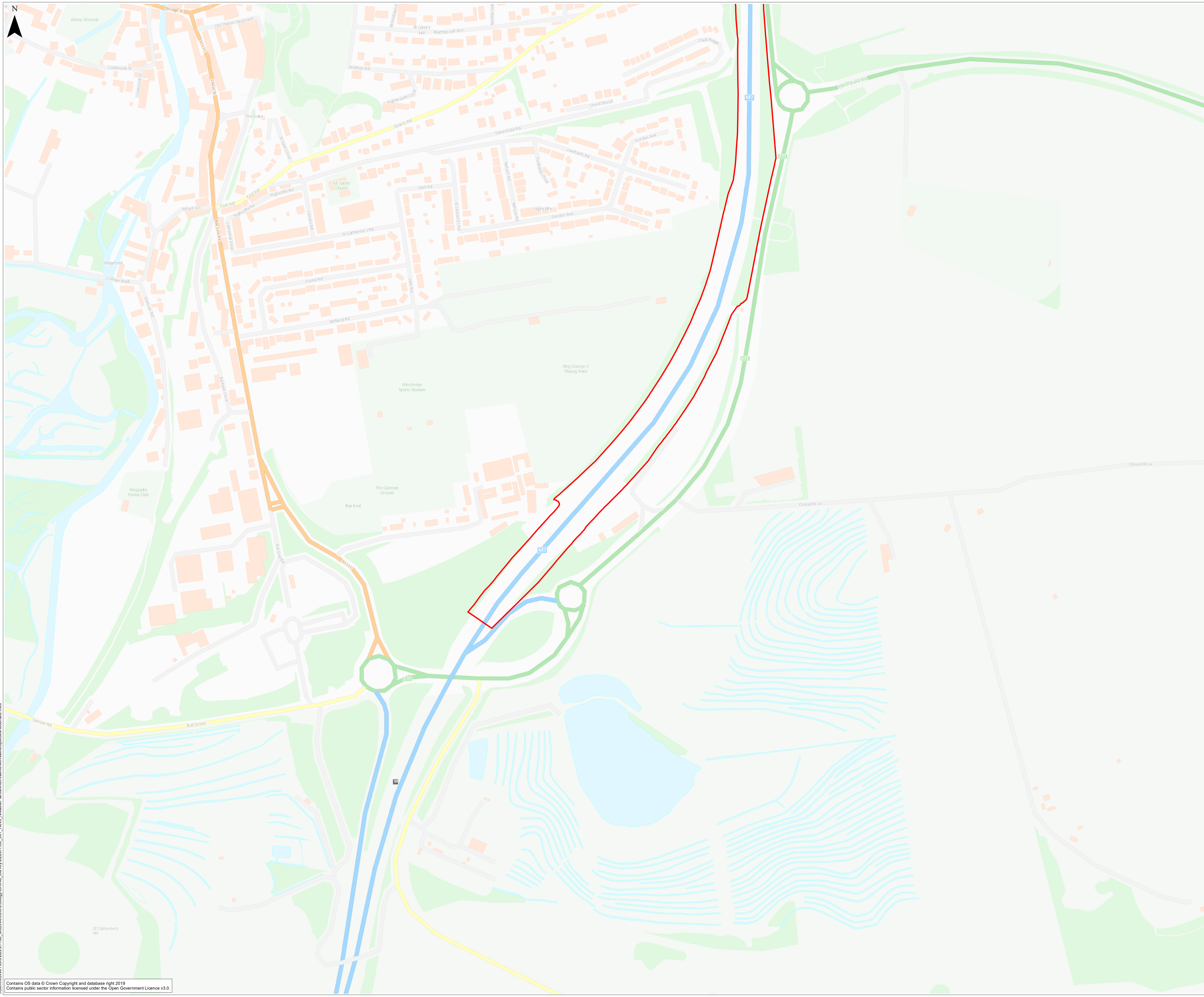
HE551511-JAC-EGN-0_00_00-DR-GI-0040

REV.
P01



LEGEND

- Proposed Order Limits
- Survey Area

Notable Plants

- Anthemis cotula
- Anthyllis vulneraria
- Blackstonia perfoliata
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- Euphorbia exigua
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0 50 100 200 300 m

SCALE 1:3,000

KEY PLAN

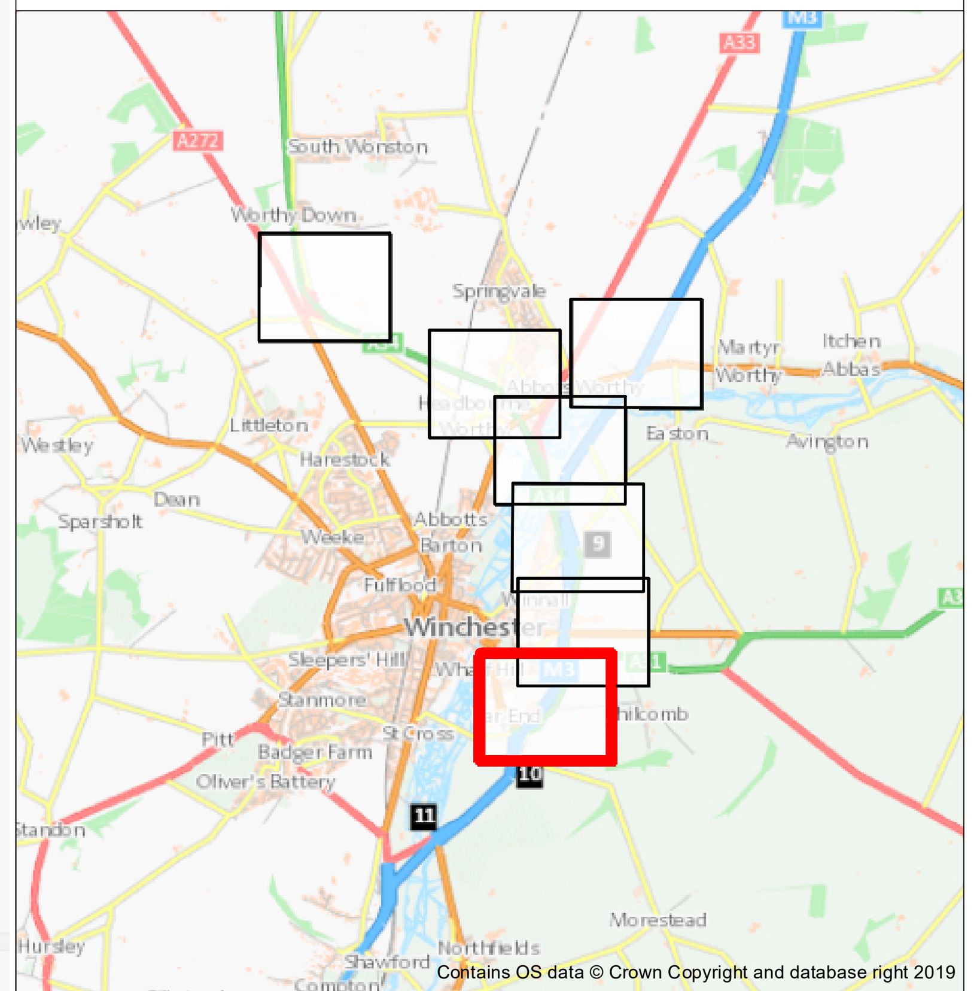

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FIGURE 4
NOTABLE PLANTS AND INVASIVE NON-NATIVE SPECIES (PLANTS)

Sheet 7 of 7

DRAWING UNITS U.N.O.
ALL DIMENSIONS IN METRES UNLESS STATED OTHERWISE

SCALE AT A1 (841 x 594mm) 1:3000

DRAWING No. HE551511-JAC-EGN-0_00_00-DR-GI-0041

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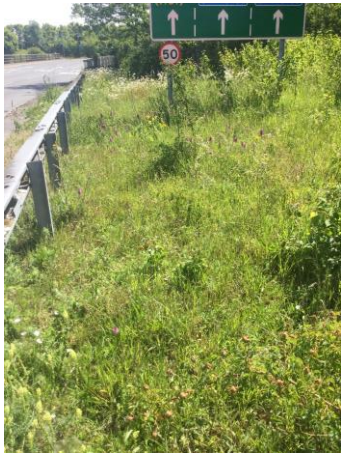
Appendix A. Target notes

Table A.1 Target notes recorded during habitat verification and orchid survey

Target Note	Photo(s) – see Appendix B	Description
1		Planted stand of beech (*Fagus sylvatica*) trees in the Tesco supermarket car park in Winnall.
2		Short calcareous grassland by entrance to Tesco supermarket off Easton Lane, with calcicoles such as bee orchid (*Ophrys apifera*), early forget-me-not (*Myosotis ramosissima*), fairy-flax (*Linum catharticum*), ploughman's-spikenard (*Inula conyzae*), rough hawkbit (*Leontodon hispidus*) and wild basil (*Conopodium vulgare*).
3	NA	Species-poor grassland on roundabout, dominated by false oat-grass, with small population of pyramidal orchid (*Anacamptis pyramidalis*).

Target Note	Photo(s) – see Appendix B	Description
4		Calcareous grassland on the verge to the north of the Easton Lane Highways England depot.
5		Neutral grassland on the western side of the roundabout of M3 J9. Dominated by false oat-grass (*Arrhenatherum elatius*) and ruderal tall herb species such as Mugwort (*Artemisia vulgaris*) and rosebay willowherb (*Chamerion angustifolium*). Chalk fragrant-orchid (*Gymnadenia conopsea*) was recorded here from the edge of this grassland, next to the footpath (right hand side as shown in photo 5).

Target Note	Photo(s) – see Appendix B	Description
6		Calcareous grassland on the north side of the roundabout of M3 J9. Dominated by false oat-grass (*Arrhenatherum elatius*) with abundant pyramidal orchid (*Anacamptis pyramidalis*).
7		Tall rank neutral grassland dominated by false oat-grass (*Arrhenatherum elatius*), on the traffic island at the junction of the A34 and M3 J9 roundabout.

Target Note	Photo(s) – see Appendix B	Description
8		Calcareous grassland on the eastern side of the M3 J9 roundabout, with abundant goat's-rue (*Galega officinalis*), an invasive non-native species.
9		Neutral grassland on the east side of the roundabout of M3 J9, on the traffic island at the junction with the A272. Grassland with abundant common broomrape (*Orobanche minor*) and oxeye daisy (*Leucanthemum vulgare*).
10	NA	Narrow stand of calcareous grassland on eastern verge of A272, with calcicoles such as greater knapweed (*Centaurea scabiosa*), kidney vetch (*Anthyllis vulneraria*) and wild basil (*Clinopodium vulgare*).

Target Note	Photo(s) – see Appendix B	Description
11		Species-rich parallel hedgerows along Easton Lane, with occasional ash (*Fraxinus excelsior*) trees. The following woody species were recorded from both hedgerows: blackthorn (*Prunus spinosa*); bramble (*Rubus fruticosus* agg.); buckthorn (*Rhamnus cathartica*); damson (*Prunus domestica* subsp. *intersita*); dog rose (*Rosa canina*); dogwood (*Cornus sanguinea*); English elm (*Ulmus procera*); hawthorn (*Crataegus monogyna*); spindle (*Euonymus europaeus*); sweet briar (*Rosa rubiginosa*); and wild privet (*Ligustrum vulgare*). The banks of the hedgerows supported tall herb typical of hedgerows and scrub edges on Chalk, with species such as bladder campion (*Silene vulgaris*), field scabious (*Knautia arvensis*), greater knapweed (*Centaurea scabiosa*) and wood false-brome (*Brachypodium sylvaticum*).
12		Rough grassland dominated by false oat-grass (*Arrhenatherum elatius*) and young plantation woodland in corner of arable field.

Target Note	Photo(s) – see Appendix B	Description
13		Stand of broadleaved semi-natural woodland on terrace of Rive Itchen. Dominated by ash (*Fraxinus excelsior*) and hazel (*Corylus avellana*), with a grove of yew (*Taxus baccata*) on steep chalky ground toward the north-east. Ground flora with abundant ferns. Constitutes Lowland Mixed Deciduous Woodland priority habitat.
14	NA	Narrow stand of wet woodland by the River Itchen, situated below river terrace and public footpath. Dominated by alder (*Alnus glutinosa*) and crack willow (*Salix fragilis*), with understorey of greater pond-sedge (*Carex riparia*), constituting Wet Woodland priority habitat and the Annex I habitat '91E0 Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion*, *Alnion incanae*, *Salicion albae*)'.
15		Species-poor neutral grassland, dominated by false oat-grass (*Arrhenatherum elatius*), Yorkshire fog (*Holcus lanatus*) and other coarse grasses.

Target Note	Photo(s) – see Appendix B	Description
16	NA	Broadleaved woodland plantation on embankment of M3, dominated by field maple (*Acer campestre*).
17	NA	Species-poor neutral grassland, dominated by false oat-grass (*Arrhenatherum elatius*), Yorkshire fog (*Holcus lanatus*) and other coarse grasses. Disturbed areas with some species of richer grassland, including stands of oxeye daisy (*Leucanthemum vulgare*) in sites of former archaeological trial trenches, and small amounts of upright brome (*Bromopsis erecta*) in some areas.
18		Neutral grassland with richer flora than field to north (target note 17), dominated by false oat-grass (*Arrhenatherum elatius*). More species-rich areas concentrated around western and eastern edges of the field, with calcicolous species such as hairy violet (*Viola hirta*), hedge bedstraw (*Galium album*), hoary ragwort (*Senecio erucifolius*), perforate St John's-wort (*Hypericum perforatum*) and pyramidal orchid (*Anacamptis pyramidalis*). Stands of oxeye daisy (*Leucanthemum vulgare*) in sites of former archaeological trial trenches.

Target Note	Photo(s) – see Appendix B	Description
19		Large stand of stinking chamomile (*Anthemis cotula*) and other arable weeds in fallow corner of arable field, around new borehole.
20		Part of Unit 58 of River Itchen SSSI, comprised of a cattle-grazed pasture to the south, and a meadow to the north of a small stream. The pasture comprised of a mosaic of tall herb fen dominated by lesser pond-sedge (*Carex acutiformis*), yellow-flag (*Iris pseudacorus*) and other wetland tall herb species in low-lying areas along existing and former river channels, and neutral grassland on higher ground. The tall herb fen constitutes Lowland Fens priority habitat. The neutral grassland was mostly species-poor, but there were small areas along the edges of channels supporting relatively richer Lowland Meadows priority habitat, with vegetation referable to the NVC plant community MG8 *Cynosurus cristatus-Caltha palustris* grassland (unmapped). The grassland to the north comprised of neutral grassland largely dominated by false oat-grass (*Arrhenatherum elatius*), with species-rich Lowland Meadows priority habitat in lower-lying areas, with vegetation referable to MG8 *Cynosurus cristatus-Caltha palustris* grassland.

Target Note	Photo(s) – see Appendix B	Description
21		Broadleaved semi-natural woodland dominated by mature alder (*Alnus glutinosa*) trees, constituting Wet Woodland priority habitat and the Annex I habitat '91E0 Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion*, *Alnion incanae*, *Salicion albae*)'.
22		Mixed woodland plantation along St Swithun's Way footpath and A34, dominated by hybrid poplar (*Populus x canadensis*) and leylandii (x *Cuprocyparis leylandii*) plants in parallel strips. Bank of the A34 with abundant sycamore (*Acer pseudoplatanus*). Understorey dominated by the invasive non-native giant bramble (*Rubus armeniacus*).

Target Note	Photo(s) – see Appendix B	Description
23		Verges of the A33, mostly dominated by false oat-grass (*Arrhenatherum elatius*) and species-poor. The verge at location of target note was forb-rich and damper than verges to the north-east, with abundant agrimony (*Agrimonia eupatoria*), oxeye daisy (*Leucanthemum vulgare*) and tufted vetch (*Vicia cracca*), frequent wild carrot (*Daucus carota*) and a range of other forbs, including angelica (*Angelica sylvestris*), fleabane (*Pulicaria dysenterica*), hedge bedstraw (*Galium album*), hemp-agrimony (*Eupatoria cannabinum*), hoary ragwort (*Senecio erucifolius*), knapweed (*Centaurea nigra s.l.*), perforate St John's-wort (*Hypericum perforatum*), ribwort plantain (*Plantago lanceolata*), spike sedge (*Carex spicata*), teasel (*Dipsacus fullonum*) and yarrow (*Achillea millefolium*).
24		Field mown shortly before survey but based on remaining vegetation likely to be improved grassland.
25	NA	Field within unit 60 of River Itchen SSSI. Undermanaged, comprised of a mosaic of neutral grassland and tall herb fen, with the latter becoming predominant toward the south-east, where fen habitat is developed. Neutral grassland comprised vegetation referable to the NVC plant community MG8 *Cynosurus cristatus-Caltha palustris* grassland, and tall herb fen of M27 *Filipendula ulmaria-Angelica sylvestris* mire, with species typical of the previous grassland plant

Target Note	Photo(s) – see Appendix B	Description
		community persisting abundantly. Field constitutes Lowland Meadows priority habitat, reflecting value and undermanaged condition.
26		Field within unit 60 of River Itchen SSSI, comprised of complex mosaic of species-rich neutral grassland and rush-dominated vegetation in lower-lying areas, constituting Lowland Meadows priority habitat. Neutral grassland comprised vegetation referable to the NVC plant community MG8 *Cynosurus cristatus-Caltha palustris* grassland, and rush-dominated vegetation to M22 *Juncus subnodulosus-Cirsium palustre* fen meadow.
27		Tall herb fen in unmanaged areas along the River Itchen, within units 60 and 123 of River Itchen SSSI, with stands dominated by common reed (*Phragmites australis*) and reed canary-grass (*Phalaris arundinacea*), with abundant wetland tall herb forbs such as common comfrey (*Symphytum officinale*) and hemlock water-dropwort (*Oenanthe crocata*). Constitutes Lowland Fens priority habitat.

Target Note	Photo(s) – see Appendix B	Description
28		Stands of eutrophic tall herb fen along the River Itchen, within unit 63 of River Itchen SSSI. Dominated by reed sweet-grass (*Glyceria maxima*) and reedmace (*Typha latifolia*), with abundant wetland tall herb forbs such as common comfrey (*Symphytum officinale*) and water dock (*Rumex hydrolapathum*). Constitutes Lowland Fens priority habitat.
29		Broadleaved semi-natural woodland along the River Itchen and below Industrial Estate to east, within unit 63 of River Itchen SSSI. Not accessed, viewed from footpath to east. Comprised of stands of woodland dominated by hazel (*Corylus avellana*) on higher ground and occasional trees and, below low terrace above the river, woodland dominated by grey willow (*S. cinerea*) and crack willow (*Salix fragilis*). Ground flora of former stand species-poor, dominated by ivy (*Hedera helix*), and of latter by tufted-sedge (*Carex elata*) and other wetland species. Lower-lying woodland constitutes Wet Woodland priority habitat and Annex I habitat '91E0 Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion*, *Alnion incanae*, *Salicion albae*)'.
30	NA	Stand of common reed (*Phragmites australis*), constituting Reedbeds priority habitat, within unit 63 of River Itchen SSSI. Not accessed, viewed from footpath to east.
31	NA	Stand of secondary broadleaved semi-natural woodland dominated by sycamore (*Acer pseudoplatanus*), on higher ground above River Itchen SSSI, south-west of A34.

Target Note	Photo(s) – see Appendix B	Description
32		Off-road motorcycle course, with mosaic of bare and sparsely vegetated ground. Surrounding embankments with dense scrub dominated by giant bramble (*Rubus armeniacus*).
33		Area on higher ground above embankment of off-road motorcycle course, comprised of mosaic of open and dense scrub, forb-rich neutral grassland grazed by rabbits and taller coarser grassland.

Target Note	Photo(s) – see Appendix B	Description
34		Stand of mature hybrid poplar (*Populus x canadensis*) trees planted along boundary of pasture, and tall herb fen along River Itchen.

Appendix B. Additional Photographs

Table B.1 Photographs collected from vantage points

Description	Photograph	Description	Photograph
M3 Alresford Road bridge, south		M3 Alresford Road bridge, north	
M3 South Downs Way footbridge, south		M3 South Downs Way footbridge, north	

Description	Photograph	Description	Photograph
M3 B3404 bridge, north		M3 B3404 bridge, south	

Appendix C. UKHab secondary codes

Table C.1 UKHab secondary codes recorded

UKHab secondary code	Label
10	Scattered scrub
14	Scattered rushes
16	Tall herb
17	Ruderal/ ephemeral
36	Plantation
38	Secondary woodland
48	Non-native
51	Coppice
59	Cattle grazed
64	Mown
65	Hay
66	Frequently mown
111	Road
144	Chalk rivers
174	Tall fen
1160	Introduced shrub

M3 Junction 9 Improvements

Terrestrial Invertebrate Survey And Southern Damselfly Habitat Assessment

HE551511-JAC-EGN-0_00_00-RP-LE-0029 | P02
17/09/20

Registered office Bridge House, 1 Walnut Tree Close, Guildford, GU1 4LZ

Highways England Company Limited registered in England and Wales number 09346363

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Project Manager:	Paul McKay
Originator (Company):	Jacobs
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PCF Stage:	3

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Revision	Date	Description	By	Check	Review	Approved
P02	17/09/20	FOR REVIEW	LG	NP	LW	HR
P01	07/09/20	FOR REVIEW	LG	NP	LW	HR

Contents

1. Introduction

1.1 Proposed Scheme

M3 Junction 9 is a key transport interchange which connects South Hampshire and the wider sub-region, with London via the M3 and the Midlands/North via the A34. A significant volume of traffic currently uses the grade separated, partially signalised gyratory (approximately 6,000 vehicles per hour during the peak periods) which acts as a bottleneck on the local highway network and causes significant delay throughout the day. Northbound and southbound movements between the M3 and A34 are particularly intensive, with downstream queues on the northbound off-slip of the M3 often resulting in safety concerns during peak periods.

On 22nd August 2019, post Project Control Framework (PCF) Stage 3 consultation, the M3 Junction 9 Improvements scheme ('the Proposed Scheme') entered a design review period following concerns of risks significant enough to likely impact a successful outcome of a Development Consent Order (DCO) application. The key issues impacting the Proposed Scheme are local stakeholder safety perception concerns, traffic capacity, operational safety and the DCO process.

An integrated design workshop was held on 22nd October 2019 to discuss alternative design solutions for four keys areas, aimed at removing or reducing these risks and issues. The workshop identified various potential design solutions in each of the four key areas which require further investigation to determine:

- whether there is a permutation of those solutions that leads to a viable option which addresses the risks; and
- what is an adequate and acceptable permutation that leads to a successful DCO application, and also meets project objectives in relation to budget and programme as best as possible?

The recommendation for the Proposed Scheme was to proceed with PCF Stage 3 preliminary design in two further phases are detailed below and were endorsed at a Highways England Major Projects Investment Decision Committee on 16th December 2019.

Highways England commissioned Jacobs in February 2020 to undertake Stage 3A, which involves an assessment of the potential design solutions and a review of the viability of the design solutions, taking cognisance of the key issues identified during PCF Stage 3.

On the basis of the Stage 3A solutions assessment process, the outcome was that Solution 2 was the best performing solution overall and recommended that it be taken forward as the preferred solution for the Proposed Scheme.

1.2 Background

A terrestrial invertebrate walkover of the Proposed Scheme was undertaken in 2017 (Highways England, 2017) to evaluate the potential conservation value of the Survey Area for invertebrate assemblages. The walkover identified several areas of high potential for important invertebrate assemblages including: two wet meadows to the west of the A34; two areas of dry grassland associated with woodland; and scrub margins and the verges of Easton Lane. The walkover report recommended further surveys be conducted within these high potential areas where they were likely to be impacted by the Proposed Scheme.

Terrestrial invertebrate surveys were commissioned and undertaken between June and July 2020. Due to changes in the extent of the Proposed Scheme the surveys focused on the two areas of dry grassland associated with woodland, scrub margins within the area enclosed by the roundabout at Junction 9, and the verges of Easton Lane.

Solution 2 of the Proposed Scheme included a new Stage 3A Walking Cycling Horse-riding river crossing over the River Itchen Special Area of Conservation (SAC). The new proposed river crossing is not consistent with the Scoping Report and these surveys are therefore considered to be outside of the existing Scoping Opinion from the Planning Inspectorate.

It should be noted, the existing Scoping Report (Highways England, 2019) states the M3 Junction 9 Improvements scheme has been “specifically designed to avoid any impact on the River Itchen floodplain, thus avoiding the requirement for flood compensation and potential increased environmental mitigation”. As such, a habitat assessment for southern damselfly (*Coenagrion mercuriale*), a qualifying feature of the River Itchen SAC, was also commissioned and undertaken in July 2020.

1.3 Purpose of this Report and Survey Objectives

The purpose of this report is to present the results of the terrestrial invertebrate surveys and southern damselfly habitat assessment undertaken for the Proposed Scheme.

The objective of the terrestrial invertebrate surveys was to identify protected, notable or priority terrestrial invertebrate species within the areas identified in the terrestrial invertebrate walkover.

The objective of the southern damselfly habitat assessment was to identify and map areas of low, moderate, or high habitat suitability potentially capable of supporting southern damselfly populations.

2. Methodology

2.1 Survey Timing

The terrestrial invertebrate surveys were carried out between 08:00 and 17:00 on the 23rd, 24th, and 25rd of June 2020, and on the 21st and 23rd July 2020. The southern damselfly habitat assessment was carried out on the 22nd July. All surveys were led by Senior Ecologist and invertebrate specialist Catherine Burton. Where identification in the field was not possible invertebrate samples were collected and sent for identification to an experienced entomologist, Scotty Dodd.

2.2 Survey Area

The terrestrial invertebrate survey area comprised habitats enclosed by the roundabout of Junction 9, the verges of Easton Lane, and grassland to the south-east of Easton Lane (see Figure 1).

The southern damselfly habitat assessment comprised river, riparian and adjacent habitats within parts of units 55-64, 107, 123 and 124 of River Itchen Site of Special Scientific Interest (SSSI) and Winnall Moors, a nature reserve owned by Hampshire and Isle of Wight Wildlife Trust. The central reservations and verges of the A34 and M3 were not accessed for safety reasons. Where available, these were viewed from bridges and other vantage points using binoculars.

2.3 Terrestrial Invertebrate Survey

The sampling methods for each habitat compartment followed those proposed by Drake et al. (2007) and included spot searching, sweep netting, beating, hand searching, and pan trapping. Each survey area was initially subject to a visual appraisal with one or more sampling areas selected for direct survey. The number of sampling areas was decided according to the size of the compartment, variety of habitats, and the likely species present.

All samples were timed to ensure that analysis by Natural England's Pantheon system could be undertaken if required, as outlined in Drake et al. (2007). The Pantheon system, a tool developed by Natural England and the Centre for Ecology and Hydrology to analyse invertebrate sample data, is used to allocate species to assemblage types and to allow a standardised comparison of the habitats of importance at sites.

Spot searching, beating, and hand searching were each undertaken for 30 minutes within each sampling area. Sweep-netting was undertaken for 20 minutes within each sampling area. Ten yellow twin-sets of pan traps (18cm diameter) were filled with water and a few drops of non-toxic detergent were installed, to at least 2m intervals, within each compartment and remained in place throughout the survey periods from 23rd to 25th June and 21st to 23rd July in line with Natural England guidelines: NERR005 Surveying terrestrial and freshwater invertebrates for conservation evaluation (Drake et al., 2007).

Surveys were completed in sunny conditions for all survey areas with weather generally considered to be optimal for all site visits. During the first survey temperatures ranged from 18 to 21℃ with approximately 10 to 30 % cloud cover and little wind. During the second survey temperatures ranged from 18 to 23℃ with approximately 40% cloud cover and little wind.

The results within this report reflect the condition of survey areas at the time of survey. Many invertebrates can disperse large distances overland to colonise new aquatic and terrestrial habitats. Therefore, colonisation of new areas is possible within a relatively short timescale.

Consequently, if the construction of the proposed development is delayed for an extended period of time, the survey results would be less reliable and the surveys may need to be repeated in order to provide an up to date assessment.

2.4 Southern Damselfly Habitat Assessment

A walkover survey was conducted to identify areas of habitat with negligible to low, moderate, and high suitability to support southern damselfly populations. Southern damselfly populations require a mid-successional, management dependent habitat. Three broad habitat types are required namely unpolluted, base-rich, shallow streams with constant, moderate flow rate and relatively high water temperatures. Shaded sites from dense scrub and woodland are considered unsuitable for supporting southern damselfly populations as heavy shading reduces water temperature. Dense vegetation can also impede dispersal.

Habitat was assessed for key attributes (as recommended in the British Dragonfly Society Southern Damselfly Management Handbook (Dalley, 2016)):

- Stream flow-rate;
- Stream substrate;
- Degree of shading;
- Pollution;
- Marginal vegetation (type and percentage cover);
- Livestock poaching of bank edges; and
- Adjacent land-use.

Any damselflies present during the survey were examined through close-focusing binoculars to determine species present.

2.5 Limitations

2.5.1 Terrestrial Invertebrate Survey

Vegetation within the west verge of the island enclosed by the roundabout of Junction 9 (Compartment E as shown in Figure 1) had been cut shortly before the first terrestrial invertebrate survey in June 2020. This would have negatively impacted the number of invertebrate species present within the compartment during the first survey and, to a lesser extent, during the second survey in July 2020. However similar habitat was present within the east verge of the island (Compartment A as shown in Figure 1) which had not been cut. Therefore, the invertebrate species assemblage recorded is deemed likely to fairly reflect the assemblage of both verges.

Passive trapping methods such as pitfall trapping were not used due to the survey area being within a publicly accessible area. Pitfall traps would be vulnerable to vandalism and were deemed hazardous due to the necessity of using chemical preservative. Travel restrictions during the COVID-19 pandemic limited the extent to which such traps could be monitored and were therefore deemed a risk to small mammals and domestic animals. Ground-searching effort was increased to compensate for the absence of pitfall trapping. This is likely to have increased the number of less mobile, root-dwelling invertebrates sampled such as weevils (Curculionidae) but the number of highly mobile invertebrates sampled such as ground beetles (Carabidae) is likely to have been negatively impacted.

2.5.2 Southern Damselfly Habitat Assessment

The following land within the southern damselfly habitat assessment area could not be accessed during the surveys:

- Dense vegetation immediately to the east of the A34 and the central reservations and verges of the A34 and M3 were not accessed for safety reasons but were viewed from bridges and other vantage points where available, shown in Figure 2.
- Livestock present within a field west of the A34 precluded access for survey. However, habitat was assessed from adjacent tracks, shown in Figure 2.

3. Results

3.1 Terrestrial Invertebrate Survey

3.1.1 Species recorded

A total of 280 species were recorded in the survey area comprising compartments A to E. The greatest number of species recorded comprised the beetles (Coleoptera) with 63 species. True bugs (Hemiptera) and bees, ants and wasps (Aculeate Hymenoptera) were the next most common groups with 50 species recorded in each. Two-winged flies (Diptera) followed with 41 species and spiders (Araneae) with 40 species. Eighteen butterfly and moth species (Lepidoptera) were recorded comprising 10 butterflies and eight moths. Other groups with a small number of species recorded (less than five) were slugs and snails (Pulmonata), woodlice (Isopoda), dragonflies and damselflies (Odonata), harvestmen (Opiliones), grasshoppers, crickets and groundhoppers (Orthoptera), lacewings (Neuroptera), book lice and bark lice (Psocoptera), and thrips (Thysanoptera). A table of all recorded species, including the compartment in which they were found, and their protected or notable status is included in Appendix C.

The high biomass of samples collected using pan traps is of note and is indicative of the abundance of terrestrial invertebrates living or foraging within the survey area.

3.1.2 Species protected / notable status

The term “Nationally Scarce” is frequently referred to throughout this report and is applied to species that are known to occur in 16 to 100 ten-km squares. This is a Great Britain specific category based on restricted distribution rather than risk and is often used alongside IUCN Red List criteria, such as “Least Concern” which are more concerned with assessing threat than distribution. Another status category of “Local” is also frequently referred to which refers to locally distributed or abundant species known to occur in 101 to 300 ten-km squares.

See Appendix E for more details of the IUCN Red List and GB Rarity Status Categories and additional status definitions.

3.1.3 Compartment A (central grid reference: SU49783047)

Compartment A (see Figure 1 and Appendix A) comprised calcareous grassland within the east verge of the island enclosed by the roundabout of Junction 9. The grassland was dominated by calcicolous forbs, including greater knapweed (*Centaurea scabiosa*), wild basil (*Clinopodium vulgare*) and wild marjoram (*Origanum vulgare*), with abundant pyramidal orchid (*Anacamptis pyramidalis*) around the roundabout.

3.1.3.1 Protected and Notable Species

Six protected / notable terrestrial invertebrate species were found within Compartment A as detailed in the following section.

In addition, 11 species regarded as Local were recorded within this compartment; namely *Cryptocephalus moraei*, *Hedychridium roseum*, spined mason bee (*Hoplitis spinulosa*), *Longitarsus membranaceus*, pale-footed pipiza hoverfly (*Pipiza luteitarsis*), iridescent centurion soldierfly (*Sargus iridatus*), shothole borer (*Scolytus rugulosus*), *Sicus ferrugineus*, *Sitona humeralis*, small beegrabber (*Thecophora atra*), and large tiphia wasp (*Tiphia femorata*).

3.1.3.1.1 *Bembecia ichneumoniformis* (Nationally Scarce):

Commonly known as the six-belted clearwing, this moth can be found on habitats such as chalk downs, rough grassland and quarries. Caterpillars of this species typically feed on common bird's foot trefoil (*Lotus corniculatus*) but also feeds on kidney vetch (*Anthyllis vulneraria*) and possibly horseshoe vetch (*Hippocrepis comosa*). It can be found on the wing from June to August predominantly within southern Britain (Newland et al., 2013).

3.1.3.1.2 *Liparus coronatus* (Nationally Scarce):

A large weevil associated with various umbelliferous plants such as cow parsley (*Anthriscus sylvestris*) and hogweed. The larvae feed in the rhizomes and are generally found around their roots. It is often found on calcareous soils, is very local and generally scarce (Duff, 2020).

3.1.3.1.3 *Nigma puella* (Nationally Scarce - Least Concern):

A spider which occurs on low broad-leaved bushes and shrubs and spins a small web on the surface of leaves. Adults occur throughout Spring and Summer (Roberts, 1996). The spider's occurrence can be very local but frequent in some areas. Females are creamy-white with a conspicuous red cardiac mark on the abdomen (Bee, Oxford, & Smith, 2017).

3.1.3.1.4 *Nomada fucata* (Nationally Scarce[1]):

A cuckoo bee known as the painted nomad bee which has two generations along with its host species the yellow-legged mining bee (*Andrena flavipes*) (also recorded in Compartments A and E). The spring generation flies from April to June and the summer generation in July and August. The species is most frequently found on soft rock cliffs, chalk downland, and brownfield sites. The bee collects pollen from spring-flowering shrubs, composites, buttercups (*Ranunculus* spp.) and cinquefoils (*Potentilla* spp.). It is one of the UK's most rapidly expanding bees following the expansion of its host. Its current abundance suggests that its nationally scarce status should be revised (Falk, 2015).

3.1.3.1.5 *Trachys scrobiculatus* (Nationally Scarce – Least Concern):

This ground-ivy jewel beetle develops inside ground-ivy (*Glechoma hederacea*) leaves. The species can be found predominantly throughout the Midlands to southern England (Alexander, 2014).

[1] Current status does not reflect the recent expansion of this species and is due for revision.

3.1.3.1.6 *Variimorda villosa* (Nationally Scarce - Least Concern):

A tumbling flower beetle usually found on umbellifers or members of the daisy family from June to August. Such small beetles are very distinctive with an extended pygidium (hind segment) which resembles a sting. Adults are characteristically found curled up in flowers, where they feed on pollen. When disturbed, their escape mechanism is to tumble on to the ground hence their vernacular name. The species' occurrence is local and mainly restricted to the southern half of England.

3.1.4 Compartment B (central grid reference: SU49753047)

Compartment B (see Figure 1 and Appendix A) consisted of a footpath adjacent to the east verge of the island enclosed by the roundabout of Junction 9 bordered by scattered and dense scrub, patches of chalk grassland verge, and bordering dogwood (*Cornus sanguinea*), hawthorn (*Crataegus monogyna*), wayfaring tree (*Viburnum lantana*) and wild privet (*Ligustrum vulgare*). Flower-rich patches of verge consisted of plants such as umbellifers, red clover (*Trifolium pratense*), hawkweeds, and hemp agrimony (*Eupatorium cannabinum*).

3.1.4.1 Protected and Notable Species

Two protected / notable terrestrial invertebrate species were found within Compartment B as detailed in the following section.

In addition, two species regarded as Local were recorded within this compartment; namely *Hedychridium roseum* and a large tiphia wasp.

3.1.4.1.1 *Mordellistena variegata* (Nationally Scarce):

A tumbling flower beetle. Such small beetles are very distinctive with an extended pygidium (hind segment) which resembles a sting. Adults are characteristically found curled up in flowers, where they feed on pollen. When disturbed, their escape mechanism is to tumble on to the ground hence their vernacular name. The larvae develop in decaying wood but no details are known. The adults are typically found at blossom in July and August within the Midlands and South-east England. Sites include woodland glades, wood pastures and open farmland situations with old trees (Alexander, 2019).

3.1.4.1.2 *Variimorda villosa* (Nationally Scarce - Least Concern):

See Compartment A for species account.

3.1.5 Compartment C (central grid reference: SU49773062)

Compartment C (see Figure 1 and Appendix A) comprised parallel hedgerows along Easton Lane to the east of the M3, predominantly bounding arable fields. Both hedgerows were species rich, supporting a diverse range of woody and herbaceous plant species. Verges were flower-rich in places consisting of plants such as common hogweed (*Heracleum sphondylium)* and lady's bedstraw (*Galium verum*).

3.1.5.1 Protected and Notable Species

Eight protected / notable terrestrial invertebrate species were found within Compartment C as detailed in the following section.

In addition, six species regarded as Local were recorded within this compartment; namely stripe-legged robberfly (*Dioctria baumhaueri*), barley flea beetle (*Phyllotreta vittula*), *Psenulus concolor*, *Sitona humeralis*, small beegrabber, and superb ant-hill hoverfly (*Xanthogramma pedissequum*).

3.1.5.1.1 *Andrena fulvago* (Nationally Scarce):

A bee known as hawk's-beard mining bee which has conspicuous orange hairs at the end of the abdomen. The bee has one generation and flies from mid-May to early August. The bee has been recorded from chalk and limestone grassland and also coastal and heathland habitats. As its vernacular name suggests the bee collects pollen from yellow composites such as hawk's-beard species (*Crepis* spp.), hawkbit species (*Leontodon* spp.), mouse-ear-hawkweed (*Hieracium pilosella*), cat's-ear (*Hypochaeris radicata*) and dandelions (*Taraxacum officinale* agg.), and also ragwort (*Jacobaea vulgaris*). The bee nests in light soils and is widespread but generally scarce in England (Falk, 2015).

3.1.5.1.2 *Cassida prasina* (Nationally scarce - Least Concern):

A green leaf beetle which feeds on yarrow (*Achillea millefolium*) and sneezewort (*Achillea ptarmica*). The beetle is widely scattered throughout the UK but with evidence of decline in some areas (Hubble, 2014).

3.1.5.1.3 *Ero aphana* (Nationally scarce - Least Concern):

A spider which occurs on dry lowland heath, garden and brownfield sites. Two pairs of tubercles (rounded projections) present on its abdomen form the four corners of a square. The species is widely scattered but frequent where it occurs in southern England and it appears to be extending its range (Bee et al.,, 2017). Adults occur in Summer and Autumn (Roberts, 1996).

3.1.5.1.4 *Liparus coronatus* (Nationally Scarce):

See Compartment A for species account.

3.1.5.1.5 *Mordellistena variegata* (Nationally Scarce):

See Compartment B for species account.

3.1.5.1.6 *Platynaspis luteorubra* (Nationally Scarce):

A ladybird of low growing vegetation and grassland which lives in association with ants such as the small black ant (*Lasius niger*). The beetle feeds on aphids and is largely restricted to southern England (Roy et al., 2013).

3.1.5.1.7 *Trachys scrobiculatus* (Nationally Scarce – Least Concern):

See Compartment A for species account.

3.1.5.1.8 *Variimorda villosa* (Nationally Scarce - Least Concern):

See Compartment A for species account.

3.1.6 Compartment D (central grid reference: SU49773059)

Compartment D (see Figure 1 and Appendix A) located to the south-east of Easton Lane, was an area of chalk grassland dominated by false oat-grass (*Arrhenatherum elatius*), with abundant yarrow and common ragwort.

3.1.6.1 Protected and Notable Species

Three protected / notable terrestrial invertebrate species were found within Compartment D as detailed below.

3.1.6.1.1 *Asilus crabroniformis* (NERC S41 (Natural Environment and Rural Communities Act 2006); Least Concern (Drake, 2017) ; Hampshire BAP Priority species (2000))

The UK's largest robberfly named the hornet robberfly due to its black and yellow abdomen. It predates large insects such as grasshoppers, beetles, bees and wasps, and other robberflies. Females usually lay their eggs in or under the dry crust of old dung of cows, horses and rabbits and sometimes in adjacent soil. Habitats include heaths, limestone and chalk downs, grassland on commons and unimproved neutral pasture. It is a local species, only rarely reported in large numbers. There are probably only 45-50 sites in England where it breeds. Most populations exist on unimproved pasture where dung has plenty of roughage. The grassland in this compartment is not grazed and therefore unsuitable as a breeding ground for this species however the abundance of invertebrate prey makes this compartment and surrounding habitats in compartments A, B, C and E suitable hunting ground. Adults are on the wing in late summer from late July to early October (Stubbs & Drake, 2014).

3.1.6.1.2 Merzomyia westermanni (Nationally Scarce)

A gallfly, whose larvae form a gall in the flower head of Ragwort (*Senecio* and *Jacobaea* spp.), especially Hoary Ragwort (*Jacobaea erucifolia*) (Clemons, 2004). It has a very local distribution across much of the south of the UK.

3.1.6.1.3 Lygus pratensis (Rare – Red Data Book 3 (RDB3)[1])

A plant bug which has recently undergone a dramatic range expansion. It is now widespread throughout much of southern Britain and is much commoner than its RDB3 status suggests. It is polyphagous, feeding on a variety of herbaceous plants.

3.1.7 Compartment E (central grid reference: SU49603047)

Compartment E (see Figure 1 and Appendix A) comprised calcareous grassland within the west verge of the island enclosed by the roundabout of Junction 9. The grassland had been cut shortly before the first survey in June 2020 but had shown some regrowth by the second survey in July 2020 with yarrow and goldenrod (*Solidago* spp.) providing the main nectar sources for invertebrates.

3.1.7.1 Protected and Notable Species

Two protected / notable terrestrial invertebrate species were found within Compartment E as detailed in the following section.

In addition, seven species regarded as Local were recorded within this compartment; namely *Astata boops*, *Derephysia foliacea*, *Eupteryx origami*, yellow-legged black fly (*Pachygaster leachii*), *Sicus ferrugineus*, large tiphia wasp, and *Tychius junceus*.

3.1.7.1.1 *Trachys scrobiculatus* (Nationally Scarce – least concern - see Appendix E):

See Compartment A for species account.

3.1.7.1.2 *Variimorda villosa* (Nationally Scarce - least concern – see Appendix E):

See Compartment A for species account.

3.2 Southern Damselfly Habitat Assessment

3.2.1 West of the A34: Winnall Moors Reserve (central grid reference: SU49113113)

The area of Winnall Moors Reserve surveyed consists of managed floodplain meadows (TN1 Appendix B & Figure 2). These grazed fen meadows comprise SSSI units 61, 63, 64, and 59.

The River Itchen flows along the east side of the reserve, which is also traversed by a number of ditches and associated sluice mechanisms to control site water levels.

The main stretch of river within the reserve was bordered by a cut grass footway to the west with dense reeds abundant on both sides of the river (TN2 Appendix B & Figure 2). The river, approximately 3 to 4m wide, was slow flowing and deep due to the historical management of dredging (*R. Remnant of Hampshire and Isle of Wight Wildlife Trust pers. comm.*). Tall marginal vegetation was present along the majority of the river bank (T4 Appendix B & Figure 2) but for some small areas of poaching.

To the west of the river, within the main body of the reserve, the fields were composed of freshly cut hay meadow and grazed fen meadows with an abundance of rushes bordered by deep ditches with dense reed margins (TN3 Appendix B & Figure 2).

Wet woodland stretched alongside the western boundary of the reserve, adjacent to the A34, and was predominantly composed of willow (*Salix* spp.) and alder (*Alnus glutinosa*). An area of semi-natural broadleaved woodland was also present to the east of the river where it crossed the A34. This woodland was composed of willow, alder and hawthorn and shaded the adjacent watercourses (TN5 Appendix B & Figure 2).

Overall habitat suitability for southern damselfly is considered suboptimal within the reserve especially due to the intermittent flooding which all the watercourses here are subject to. Poached berms are generally considered suitable habitat with low-lying vegetation and an abundance of aquatic vegetation such as brook lime (*Veronica beccabunga*) (*B. Rushbrook of Hampshire and Isle of Wight Wildlife Trust pers. comm*.). Such habitat was generally lacking within this area. However, the presence of southern damselfly cannot be ruled out as some aspects of this habitat had some suitability such as unshaded stretches of watercourse and good water quality.

Overall habitat suitability: low to moderate.

3.2.2 West of the A34: North of Winnall Moors Reserve (central grid reference: SU49203158)

To the north of Winnall Moors Reserve shallow chalk streams ran adjacent to tall grassland and tall ruderal vegetation (TN6 Appendix B & Figure 2). The adjacent grazed meadow east of the adjacent A34 contained some tall vegetation such as meadowsweet (*Filipendula ulmaria*) and thistles (*Cirsium* spp.) (TN7 Appendix B & Figure 2). The shallow streams here contained abundant marginal aquatic vegetation such as water mint (*Mentha aquatica*). Whilst vegetation and tree cover were dense in most areas there were significant unshaded stretches of stream where azure damselfly (*Coenagrion puella*) were present in abundance.

Overall habitat suitability for southern damselfly is considered suboptimal north of Winnall Moors Reserve in most part due to the high degree of shading. However, some short stretches of stream were considered suitable as they were sun-exposed with suitable marginal vegetation and substrate.

Overall habitat suitability: low to moderate.

3.2.3 East of the A34 (central grid reference: SU49583207)

The area adjacent and east of the A34 was covered in dense vegetation which prohibited detailed survey. However, the density of such vegetation provided shading over all watercourses present in that section thus rendering such habitat of low suitability for southern damselfly.

Further west towards Abbots Worthy Mill the River Itchen and shallow chalk streams were predominantly bordered by dense tall ruderal vegetation, reeds and hemp agrimony. However, in some unshaded areas marginal vegetation graded down in to the water's edge with abundant water mint and water starwort (*Callitriche palustris*) (TN10 Appendix B & Figure 2).

At Abbot's Worthy Ford the watercourse was fast flowing and shallow, with a rock and sediment substrate. The stream narrowed from approximately 5 to 2m with some low-lying vegetation grading in to the stream but white poplar (*Populus alba*), sycamore (*Acer pseudoplantus*) and hawthorn provided dense shading (TN9 Appendix B & Figure 2).

Further south and adjacent to the A34 the River was shaded by woodland. To the east of the River where it crossed the A34, a grazed pasture provided a large area of un-shaded grassland with scattered reeds, rushes and tall ruderal vegetation (TN8 Appendix B & Figure 2). However, the river banks themselves were heavily shaded by sycamore and black poplar (*Populus nigra*).

Overall habitat suitability for southern damselfly is considered suboptimal east of the A34. The majority of the area was heavily shaded which provided unsuitable habitat for southern damselfly.

Overall habitat suitability: negligible to low

4. Discussion

4.1 Terrestrial Invertebrate Survey

Twelve protected / notable terrestrial invertebrate species were present within the entire survey area. A further 35 species were recorded which are regarded as Local.

An overall Pantheon assessment of the total species list found the rich flower resource present within the survey area to be in favourable condition with 17 species of bee and wasp utilising the survey area for this resource. The scrub edge assemblage type also scored as favourable, although the species quality index (SQI) of this assemblage was calculated using less than the Pantheon threshold of 15 species. Nevertheless, this is a good indicator of the habitat quality of scrub and woodland edge present on site. The scrub edge assemblage was composed of spiders, beetles, two-winged flies, bees and wasps, and crickets.

The grass verges surrounded by the roundabout at M3 J9 (Compartments A and E) were floristically rich and diverse and provided a major contribution to the high-quality flower-rich habitat of the survey area. Notable species recorded here such as the six-belted clearwing moth and tumbling flower beetle *Variimorda villosa* rely on nectaring and pollen sources. The painted nomad bee recorded in Compartment A also depends upon the presence of its host the yellow-legged mining bee which was recorded on both verges, and undoubtedly benefits from this flower-rich habitat as a pollen and nectaring source.

The species-rich footpath verge (Compartment B), hedgerow (Compartment C) and adjacent chalk grassland site (Compartment D) also provided a rich floristic resource for notable species such as hawk's-beard mining bee, leaf beetle *Cassida prasina*, tumbling flower beetles *Variimorda villosa* and *Mordellistena variegata*, weevil *Liparus coronatus*, ladybird *Platynaspis luteorubra* and gallfly *Merzomyia westermanni*.

The scrub margins of each compartment also provided valuable habitat for terrestrial invertebrates with notable spider species such as *Ero aphana* and *Nigma puella* present. The notable ground-ivy jewel beetle, dependent upon ground-ivy for its larval development was found in both the east verge (Compartment A) and hedgerow (Compartment C) and benefits from the presence of this plant present along the woodland and hedgerow margins.

The abundance of terrestrial invertebrates recorded within the survey area is reflected in the large volume of samples collected from pan trapping. The survey area is likely to provide valuable feeding grounds for predatory invertebrate species such as the notable, Hampshire BAP Priority hornet robberfly. Nearby grazing habitat may provide breeding opportunities for this species.

4.2 Southern Damselfly Habitat Assessment

The majority of the southern damselfly habitat assessment area was considered sub-optimal to support a southern damselfly population. To the west of the A34 at Winnall Moors Reserve the watercourses are subject to intermittent flooding which is generally regarded as unsuitable for southern damselfly. North of Winnall Moors Reserve, habitat was again considered sub-optimal due to predominant shading of watercourses. However, some short stretches of watercourse within and to the north of the reserve were considered suitable due to good sun-exposure, water quality, and suitable aquatic and marginal vegetation. Therefore, the presence of southern damselfly cannot be entirely precluded from the area west of the A34.

To the east of the A34, the majority of watercourses were heavily shaded which is considered unsuitable for southern damselfly. One small area of grassland to the south of the eastern

assessment area provided good, sun-exposed adjacent habitat however the river itself which runs under the A34 at this point was heavily shaded and surrounded by dense scrub. Therefore, the area to the east of the A34 is unlikely to support a southern damselfly population.

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6. Figures

N

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D

9

E

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A

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LEGEND

Pan Trap Locations

Survey Areas (A-E)

KEY PLAN

Rev.	Date	Description of revision	Drawn	Checked	Review'd	Approv'd
P01	07/09/20	Initial Issue	AC	NS	AB	MZ

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FIGURE 1
Terrestrial Invertebrate Survey Areas

DRAWING UNITS U.N.O.
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SCALE AT A1 (841 x 594mm)
1:500

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HE551511-JAC-EGN-0_00_00-DR-GI-0048

REV.
P01

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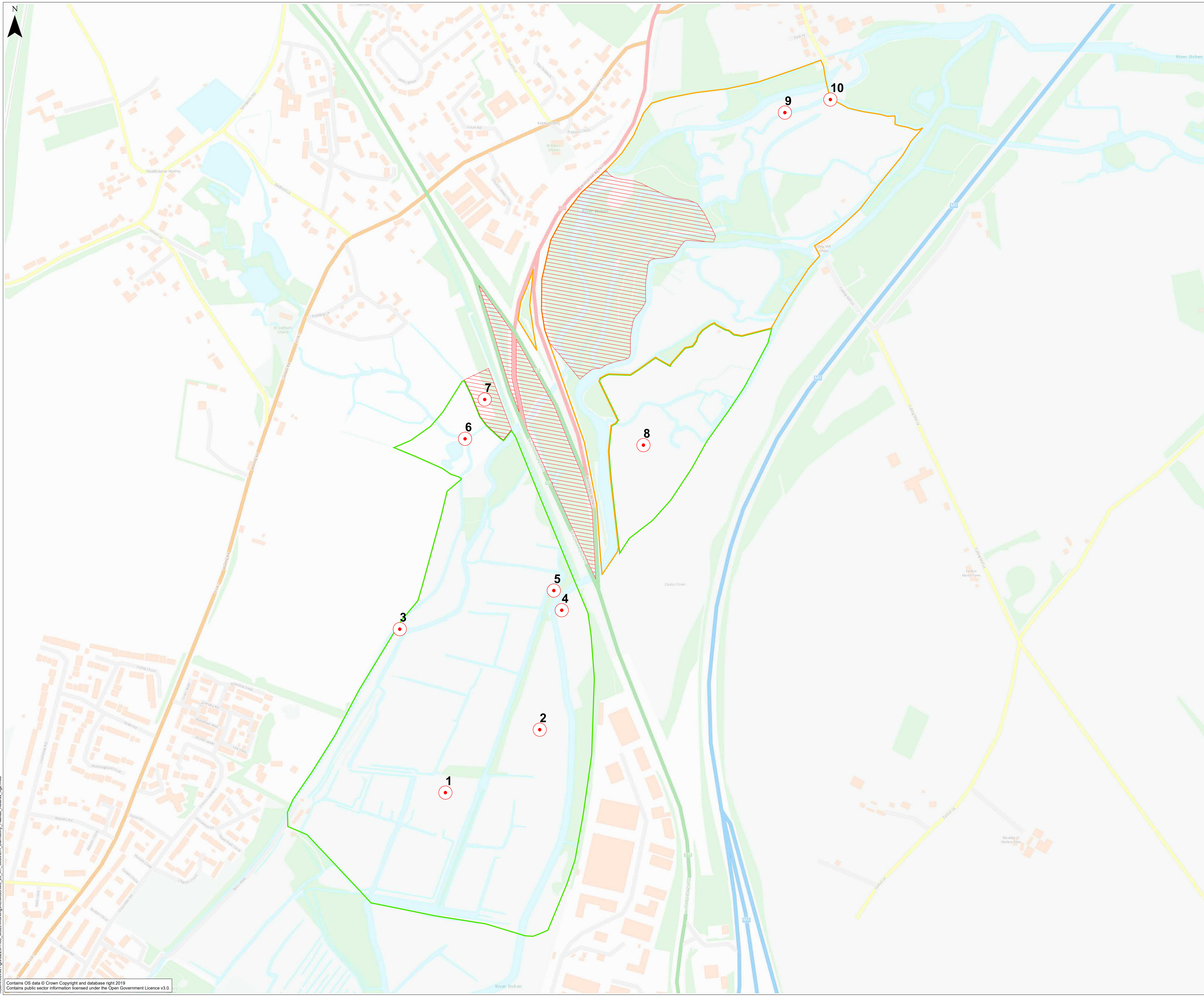

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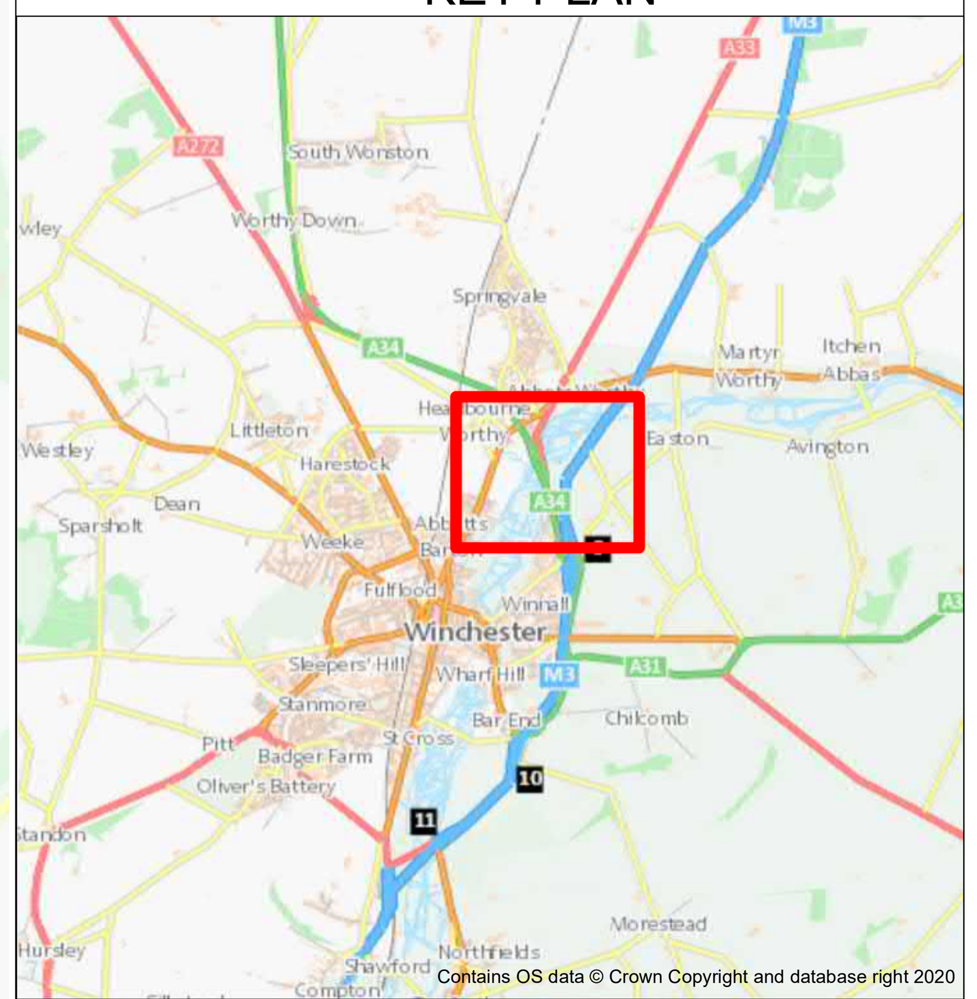
LEGEND

- Target notes

Habitat assessment

- Moderate habitat suitability
- Low habitat suitability
- Not accessible

KEY PLAN



Rev.	Date	Description of revision	Drawn	Checked	Review'd	Approv'd
P01	07/09/20	Initial Issue	RW	NS	AB	MZ

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FIGURE 2
Southern Damselfly Habitat Assessment

DRAWING UNITS U.N.O.
ALL DIMENSIONS IN METRES UNLESS STATED OTHERWISE

SCALE AT A1 (841 x 594mm)
1:3500

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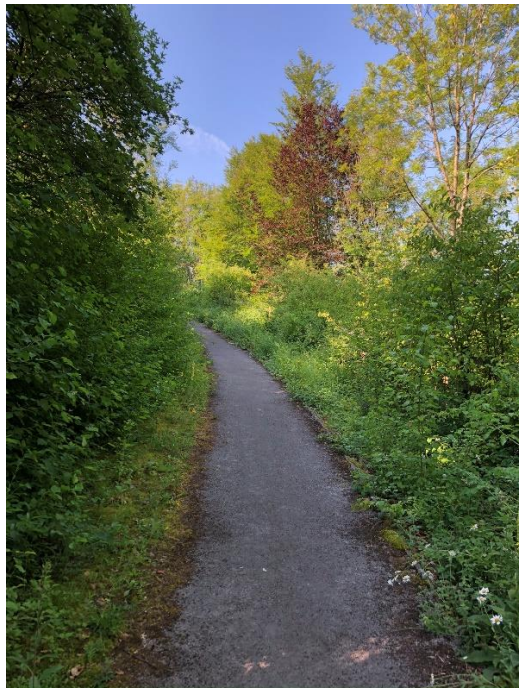
7. Appendices

Appendix A. Terrestrial Invertebrate Photographs

Table A.1 Photographs collected during Terrestrial Invertebrate Survey

Description	Photograph	
Compartment A		Compartment A was composed of calcareous grassland verge within the east verge of the island enclosed by the roundabout of Junction 9. The grassland was dominated by calcicolous forbs, including greater knapweed (*Centaurea scabiosa*), wild basil (*Clinopodium vulgare*) and wild marjoram (*Origanum vulgare*), with abundant pyramidal orchid (*Anacamptis pyramidalis*) around the roundabout. The verge bordered an area of heavily shaded broad-leaved woodland predominantly composed of dogwood (*Cornus sanguinea*) and ground-ivy understorey.

Compartment B		Compartment B consisted of a footpath adjacent to the east verge of the island enclosed by the roundabout of Junction 9 bordered by scattered, and dense scrub, patches of chalk grassland verge, and bordering dogwood (*Cornus sanguinea*), hawthorn (*Crataegus monogyna*), wayfaring tree (*Viburnum lantana*) and wild privet (*Ligustrum vulgare*). Flower-rich patches of verge consisted of plants such as umbellifers, red clover (*Trifolium pratense*), oxeye daisy (*Leucanthemum vulgare*) hawkweeds (*Hieracium* spp.), and hemp agrimony (*Eupatorium cannabinum*).

Compartment C		Compartment C comprised parallel hedgerows along Easton lane to the east of the M3 predominantly bounding arable fields. Both hedgerows were species rich, supporting a diverse range of woody and herbaceous plant species such as blackthorn (*Prunus spinosa*), hawthorn, bramble (*Rubus fruticosus* agg.) and dog rose (*Rosa canina* agg.). Verges were flower-rich in places consisting of plants such as common hogweed (*Heracleum sphondylium*), lady's bedstraw (*Galium verum*), hedge bindweed (*Calystegia sepium*), and field scabious (*Knautia arvensis*).

Compartment D		Compartment D located, to the south-east of Easton Lane, was an area of grassland dominated by false oat-grass (*Arrhenatherum elatius*), with abundant yarrow (*Achillea millefolium*) and common ragwort (*Jacobaea vulgaris*).

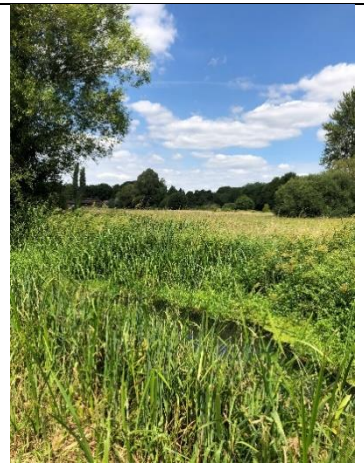
Compartment E		Compartment E was composed of calcareous grassland verge within the west verge of the island enclosed by the roundabout of Junction 9. The grassland had been cut shortly before the first survey in June 2020 but had shown some regrowth by the second survey in July 2020 with yarrow and goldenrod (*Solidago virgaurea*) and early goldenrod (*Solidago gigantea*) providing the main nectar sources. The verge bordered an area of heavily shaded broad-leaved woodland predominantly composed of dogwood (*Cornus sanguinea*).

Appendix B. Target notes for Southern Damselfly Habitat Assessment

Table B.1 Target notes recorded during Southern Damselfly Habitat Assessment

Target Note	Photo(s)	Description
1		Freshly cut hay meadow common throughout the reserve. Winnall Moors reserve is a managed flood meadow with water levels controlled through a series of sluice mechanisms. Watercourses on the reserve are therefore subject to intermittent flooding.
2	 	Fen meadow and adjacent river. A cut grass footway lies to the western side of the River Itchen and tall reeds (*Phragmites australis*) dominate both banks. Willow (*Salix* spp.) and alder (*Alnus glutinosa*) woodland lies behind the stream adjacent to the A34 boundary.

Target Note	Photo(s)	Description
3		Freshly cut hay meadow to the west of the reserve traversed by a series of slow-flowing ditches dominated by common reed and reed sweet grass (*Glyceria maxima*).
4	 	Unshaded, deep stretches of the River Itchen east of the reserve with banks dominated by common reed, and abundant meadowsweet (*Filipendula ulmaria*) and occasional purple loosestrife (*Lythrum salicaria*). The river has been historically dredged. Bankside vegetation is predominantly tall along the river's edge although there are occasional areas of poaching and shorter vegetation.

Target Note	Photo(s)	Description
5		Shaded woodland of willow, alder, and hawthorn (*Crataegus monogyna*) adjacent to the area where the River Itchen crosses the A34. Shaded watercourses are deemed sub-optimal habitat for southern damselfly.
6	 	Shallow, sun-exposed, slow-flowing stretch of stream north of Winnall Moors reserve and east of the A34. Vegetation gradually grades in to the stream such as water mint (*Mentha aquatica*) and reeds. Adjacent land comprises a cut grass path, tall ruderal and dense scrub, and grazed pasture. Azure damselflies (*Coenagrion puella*) were abundant resting in marginal vegetation.

Target Note	Photo(s)	Description
7		Cattle grazed pasture between stream north of Winnall Moors Reserve and west of the A34 boundary.
8		Grazed grassland adjacent to the River Itchen to the east of the A34. This unshaded grassland with scattered tall vegetation such as scattered hawthorn may provide damselfly basking opportunities. The River adjacent is heavily shaded by sycamore (*Acer pseudoplatanus*) and black poplar (*Populus nigra*).

Target Note	Photo(s)	Description
9		Shaded stretch of the River Itchen to the east of the A34. The majority of river channels within this area are shallow and fast-flowing but heavily shaded by sycamore, black poplar and hawthorn. Shaded watercourses are deemed sub-optimal habitat for southern damselfly.
10		Shallow, fast-flowing stretch of the River Itchen at Abbots Worthy Mill. The river width narrows from approximately 5m to 2m with a gravel and fine sediment bottom. This sun-exposed stretch may provide basking opportunities for damselflies however the majority of the area is heavily shaded by woodland and scrub providing unsuitable habitat for southern damselfly.

Appendix C: Species List

				Compartment				
Taxon group	Species Name	Vernacular Name	Status (see Appendix D & E)	East Verge (A)	East Footpath (B)	Hedgerow (C)	Field adjacent to hedgerow (D)	West Verge (E)
Araneae	*Agalenatea redii*	An orbweaver spider	Local	X			X	
Araneae	*Anelosimus vittatus*					X		
Araneae	*Araneus diadematus*					X		X
Araneae	*Argiope bruennichi*	Wasp spider	Local				X	
Araneae	*Bathyphantes gracilis*					X		

				Compartment				
Taxon group	Species Name	Vernacular Name	Status (see Appendix D & E)	East Verge (A)	East Footpath (B)	Hedgerow (C)	Field adjacent to hedgerow (D)	West Verge (E)
Araneae	*Cheiracanthium erraticum*						X	
Araneae	*Clubiona comta*			X		X		
Araneae	*Clubiona terrestris*					X		
Araneae	*Dictyna arundinacea*			X		X		
Araneae	*Dictyna uncinata*					X		
Araneae	*Enoplognatha ovata*	Common candy-striped spider		X	X	X	X	X

				Compartment				
Taxon group	Species Name	Vernacular Name	Status (see Appendix D & E)	East Verge (A)	East Footpath (B)	Hedgerow (C)	Field adjacent to hedgerow (D)	West Verge (E)
Araneae	*Erigone atra*					X		
Araneae	*Erigone dentipalpis*						X	
Araneae	*Ero aphana*		Nationally scarce – least concern (2017)			X		
Araneae	*Heliophanus cupreus*	Copper sun-jumper			X	X		X
Araneae	*Heliophanus flavipes*			X	X	X	X	X
Araneae	*Ixodes ricinus*					X		

				Compartment				
Taxon group	Species Name	Vernacular Name	Status (see Appendix D & E)	East Verge (A)	East Footpath (B)	Hedgerow (C)	Field adjacent to hedgerow (D)	West Verge (E)
Araneae	*Lepthyphantes tenuis*					X		X
Araneae	*Lepthyphantes zimmermanni*					X		
Araneae	*Mangora acalypha*			X				
Araneae	*Meioneta rurestris*					X		
Araneae	*Metellina mengei*			X				
Araneae	*Micaria pulicaria*	Glossy ant spider				X		

				Compartment				
Taxon group	Species Name	Vernacular Name	Status (see Appendix D & E)	East Verge (A)	East Footpath (B)	Hedgerow (C)	Field adjacent to hedgerow (D)	West Verge (E)
Araneae	*Microlinyphia pusilla*							X
Araneae	*Neon reticulatus*					X		
Araneae	*Nigma puella*		Nationally scarce – least concern (2017)	X				
Araneae	*Ozyptila praticola*					X		
Araneae	*Pardosa nigriceps*			X				X
Araneae	*Pardosa palustris*			X		X		

				Compartment				
Taxon group	Species Name	Vernacular Name	Status (see Appendix D & E)	East Verge (A)	East Footpath (B)	Hedgerow (C)	Field adjacent to hedgerow (D)	West Verge (E)
Araneae	*Pardosa pullata*			X	X	X		X
Araneae	*Pardosa saltans*					X		
Araneae	*Philodromus cespitum*	Turf-running spider		X		X		X
Araneae	*Pisaura mirabilis*	Nursery web spider		X				X
Araneae	*Salticus scenicus*	Zebra spider						X
Araneae	*Theridion sisyphium*	Mothercare spider		X				X

				Compartment				
Taxon group	Species Name	Vernacular Name	Status (see Appendix D & E)	East Verge (A)	East Footpath (B)	Hedgerow (C)	Field adjacent to hedgerow (D)	West Verge (E)
Araneae	*Theridion varians*			X				
Araneae	*Tibellus oblongus*					X	X	X
Araneae	*Xysticus cristatus*	Common crab spider		X		X	X	
Araneae	*Xysticus ulmi*	Swamp crab spider	Local	X				
Araneae	*Zelotes latreillei*		Local	X				
Coleoptera	*Agriotes sputator*	Common click beetle						X

				Compartment				
Taxon group	Species Name	Vernacular Name	Status (see Appendix D & E)	East Verge (A)	East Footpath (B)	Hedgerow (C)	Field adjacent to hedgerow (D)	West Verge (E)
Coleoptera	*Amara familiaris*				X			
Coleoptera	*Amara ovata*					X		
Coleoptera	*Amphimallon solstitiale*	Summer chafer	Local	X				
Coleoptera	*Anaspis fasciata*			X				
Coleoptera	*Anaspis rufilabris*					X		
Coleoptera	*Anthonomus rubi*					X		

				Compartment				
Taxon group	Species Name	Vernacular Name	Status (see Appendix D & E)	East Verge (A)	East Footpath (B)	Hedgerow (C)	Field adjacent to hedgerow (D)	West Verge (E)
Coleoptera	*Athous bicolor*	A click beetle	Local	X				X
Coleoptera	*Athous haemorrhoidalis*					X		
Coleoptera	*Barypeithes pellucidus*	Hairy spider weevil		X	X	X		X
Coleoptera	*Batophila aerata*					X		
Coleoptera	*Bruchidius imbricornis*			X				
Coleoptera	*Calathus fuscipes*			X				

				Compartment				
Taxon group	Species Name	Vernacular Name	Status (see Appendix D & E)	East Verge (A)	East Footpath (B)	Hedgerow (C)	Field adjacent to hedgerow (D)	West Verge (E)
Coleoptera	*Carabus violaceus*	Violet ground beetle				X		
Coleoptera	*Ceutorhynchus obstrictus*			X	X	X		X
Coleoptera	*Chaetocnema hortensis*	A flea beetle		X	X			X
Coleoptera	*Cionus hortulanus*	A weevil		X				
Coleoptera	*Coccinella septempunctata*	Seven-spot ladybird		X	X			
Coleoptera	*Cordylepherus viridis*						X	X

				Compartment				
Taxon group	Species Name	Vernacular Name	Status (see Appendix D & E)	East Verge (A)	East Footpath (B)	Hedgerow (C)	Field adjacent to hedgerow (D)	West Verge (E)
Coleoptera	*Cortinicara gibbosa*					X		
Coleoptera	*Cryptocephalus moraei*		Local	X				
Coleoptera	*Dromius linearis*					X		
Coleoptera	*Grammoptera ruficornis*	A longhorn beetle		X				X
Coleoptera	*Gymnetron pascuorum*	A weevil		X	X			
Coleoptera	*Halyzia sedecimguttata*	Orange ladybird		X				

				Compartment				
Taxon group	Species Name	Vernacular Name	Status (see Appendix D & E)	East Verge (A)	East Footpath (B)	Hedgerow (C)	Field adjacent to hedgerow (D)	West Verge (E)
Coleoptera	*Harmonia axyridis*	Harlequin ladybird		X	X	X		
Coleoptera	*Harpalus rufipes*	Strawberry seed beetle				X		
Coleoptera	*Hoplia philanthus*	Welsh chafer	Local	X				
Coleoptera	*Leiosoma deflexum*	A weevil		X	X			
Coleoptera	*Liparus coronatus*	A weevil	Nationally scarce (1992)	X		X		
Coleoptera	*Longitarsus membranaceus*		Local	X				

				Compartment				
Taxon group	Species Name	Vernacular Name	Status (see Appendix D & E)	East Verge (A)	East Footpath (B)	Hedgerow (C)	Field adjacent to hedgerow (D)	West Verge (E)
Coleoptera	*Malthinus seriepunctatus*		Local	X				
Coleoptera	*Mecinus pascuorum*			X				
Coleoptera	*Meligethes aeneus*	Common pollen beetle		X	X	X	X	X
Coleoptera	*Mordellistena variegata*	A tumbling flower beetle	Nationally scarce – least concern (2014)		X	X		
Coleoptera	*Oedemera lurida*			X	X	X	X	X
Coleoptera	*Oedemera nobilis*	Swollen-thighed beetle		X	X	X	X	X

				Compartment				
Taxon group	Species Name	Vernacular Name	Status (see Appendix D & E)	East Verge (A)	East Footpath (B)	Hedgerow (C)	Field adjacent to hedgerow (D)	West Verge (E)
Coleoptera	*Otiorhynchus singularis*	Raspberry weevil		X				
Coleoptera	*Paederus littoralis*	A rove beetle		X		X		
Coleoptera	*Phyllobius argentatus*	Silver-green leaf weevil				X		
Coleoptera	*Phyllotreta nigripes*	Turnip flea beetle						
Coleoptera	*Phyllotreta vittula*	Barley flea beetle	Local			X		
Coleoptera	*Platynaspis luteorubra*	A ladybird	Nationally scarce	X				

				Compartment				
Taxon group	Species Name	Vernacular Name	Status (see Appendix D & E)	East Verge (A)	East Footpath (B)	Hedgerow (C)	Field adjacent to hedgerow (D)	West Verge (E)
Coleoptera	*Propylea quattuordecimpunctata*	Fourteen-spot ladybird		X	X		X	
Coleoptera	*Psyllobora vigintiduopunctata*	Twenty-two-spot ladybird		X	X	X		
Coleoptera	*Psylliodes chrysocephala*	Cabbage-stem flea beetle		X				
Coleoptera	*Pterostichus madidus*	Black clock beetle		X		X	X	
Coleoptera	*Rhagonycha fulva*	Common red soldier beetle		X	X	X	X	
Coleoptera	*Rhagonycha lignosa*					X		

				Compartment				
Taxon group	Species Name	Vernacular Name	Status (see Appendix D & E)	East Verge (A)	East Footpath (B)	Hedgerow (C)	Field adjacent to hedgerow (D)	West Verge (E)
Coleoptera	*Rhyzobius chrysomeloides*					X		
Coleoptera	*Scolytus rugulosus*	Shothole borer	Local	X				
Coleoptera	*Scymnus frontalis*	A ladybird		X				X
Coleoptera	*Sitona hispidulus*	Clover-root weevil		X				
Coleoptera	*Sitona humeralis*	A weevil	Local	X		X		
Coleoptera	*Sitona lineatus*			X		X	X	

				Compartment				
Taxon group	Species Name	Vernacular Name	Status (see Appendix D & E)	East Verge (A)	East Footpath (B)	Hedgerow (C)	Field adjacent to hedgerow (D)	West Verge (E)
Coleoptera	*Sphaeroderma testaceum*	Artichoke beetle		X				X
Coleoptera	*Subcoccinella vigintiquattuorpunctata*	Twenty-four-spot ladybird						X
Coleoptera	*Trachys scrobiculatus*	Ground-ivy jewel beetle	Nationally scarce	X		X		X
Coleoptera	*Trechus quadristriatus*					X		X
Coleoptera	*Trichosirocalus troglodytes*	A weevil						X
Coleoptera	*Tytthaspis sedecimpunctata*	Sixteen-spot ladybird				X	X	

				Compartment				
Taxon group	Species Name	Vernacular Name	Status (see Appendix D & E)	East Verge (A)	East Footpath (B)	Hedgerow (C)	Field adjacent to hedgerow (D)	West Verge (E)
Coleoptera	*Tychius junceus*	A weevil	Local					X
Coleoptera	*Variimorda villosa*	A tumbling flower beetle	Nationally scarce – least concern (2014)	X	X	X		X
Dermaptera	*Forficula auricularia*	Common earwig			X			X
Diptera	*Asilus crabroniformis*	Hornet robberfly	S41 (Natural Environment and Rural Communities Act 2006) Hampshire BAP Priority (2000)				X	

				Compartment				
Taxon group	Species Name	Vernacular Name	Status (see Appendix D & E)	East Verge (A)	East Footpath (B)	Hedgerow (C)	Field adjacent to hedgerow (D)	West Verge (E)
Diptera	*Baccha elongata*	Gossamer hoverfly		X	X			X
Diptera	*Calliphora vicina*	Common bluebottle						X
Diptera	*Cheilosia soror*				X			X
Diptera	*Chloromyia formosa*	Broad centurion		X				X
Diptera	*Chrysotoxum bicinctum*	Two-banded wasp hoverfly	Local			X		
Diptera	*Coenosia tigrina*							X

				Compartment				
Taxon group	Species Name	Vernacular Name	Status (see Appendix D & E)	East Verge (A)	East Footpath (B)	Hedgerow (C)	Field adjacent to hedgerow (D)	West Verge (E)
Diptera	*Coremacera marginata*			X				
Diptera	*Didea fasciata*					X		
Diptera	*Dioctria baumhaueri*	Stripe-legged robberfly	Local			X		
Diptera	*Episyrphus balteatus*	Marmalade hoverfly		X	X	X	X	X
Diptera	*Eriothrix rufomaculata*					X		X
Diptera	*Eumerus funeralis*	Lesser bulb-fly			X			

				Compartment				
Taxon group	Species Name	Vernacular Name	Status (see Appendix D & E)	East Verge (A)	East Footpath (B)	Hedgerow (C)	Field adjacent to hedgerow (D)	West Verge (E)
Diptera	*Helophilus pendulus*	The footballer hoverfly		X	X	X		
Diptera	*Limnia unguicornis*			X	X	X	X	
Diptera	*Lucilia sericata*	Common green bottle fly		X				X
Diptera	*Machimus atricapillus*	Kite-tailed robberfly		X	X			
Diptera	*Melanostoma mellinum*	Short melanostoma hoverfly		X		X		X
Diptera	*Melanostoma scalare*	Chequered hoverfly				X	X	

				Compartment				
Taxon group	Species Name	Vernacular Name	Status (see Appendix D & E)	East Verge (A)	East Footpath (B)	Hedgerow (C)	Field adjacent to hedgerow (D)	West Verge (E)
Dipetra	*Merodon equestris*	Greater bulb-fly		X		X		
Diptera	*Merzomyia westermanni*		Nationally scarce (1998)				X	
Diptera	*Myathropa florea*	Batman hoverfly		X		X		X
Diptera	*Musca autumnalis*	Autumn fly						X
Diptera	*Nephrotoma quadrifaria*	A crane fly		X				
Diptera	*Pachygaster atra*	Dark-winged black fly						X

				Compartment				
Taxon group	Species Name	Vernacular Name	Status (see Appendix D & E)	East Verge (A)	East Footpath (B)	Hedgerow (C)	Field adjacent to hedgerow (D)	West Verge (E)
Diptera	*Pachygaster leachii*	Yellow-legged black fly	Local					X
Diptera	*Phaonia pallida*	Orange muscid fly				X		
Diptera	*Pipiza luteitarsis*	Pale-footed pipiza hoverfly	Local	X				
Diptera	*Pipizella viduata*	A hoverfly		X	X			X
Diptera	*Poecilobothrus nobilitatus*	Semaphore fly				X		
Diptera	*Sarcophaga carnaria*	Common flesh fly		X	X	X	X	X

				Compartment				
Taxon group	Species Name	Vernacular Name	Status (see Appendix D & E)	East Verge (A)	East Footpath (B)	Hedgerow (C)	Field adjacent to hedgerow (D)	West Verge (E)
Diptera	*Sargus iridatus*	Iridescent centurion soldierfly	Local	X				
Diptera	*Sicus ferrugineus*		Local	X				X
Diptera	*Sphaerophoria scripta*	Long hoverfly		X	X	X		
Diptera	*Syrphus ribesii*	Humming syrphus hoverfly		X				X
Diptera	*Syrphus vitripennis*	Glass-winged syrphus hoverfly		X				
Diptera	*Thecophora atra*	Small beegrabber	Local	X		X		

				Compartment				
Taxon group	Species Name	Vernacular Name	Status (see Appendix D & E)	East Verge (A)	East Footpath (B)	Hedgerow (C)	Field adjacent to hedgerow (D)	West Verge (E)
Diptera	*Thereva nobilitata*	Common stiletto fly						X
Diptera	*Trypetoptera punctulata*	Picture winged snail-killer			X	X		X
Diptera	*Vollucela pellucens*	Pellucid fly						X
Diptera	*Xanthogramma pedissequum*	Superb ant-hill hoverfly	Local			X		
Hemiptera	*Acalypta parvula*			X				X
Hemiptera	*Agallia consobrina*			X		X		

				Compartment				
Taxon group	Species Name	Vernacular Name	Status (see Appendix D & E)	East Verge (A)	East Footpath (B)	Hedgerow (C)	Field adjacent to hedgerow (D)	West Verge (E)
Hemiptera	*Anaceratagallia ribauti*					X	X	X
Hemiptera	*Anthocoris confusus*					X		
Hemiptera	*Aphrodes makarovi*			X	X	X		X
Hemiptera	*Aphrophora alni*			X				
Hemiptera	*Atractotomus mali*					X		
Hemiptera	*Campyloneura virgula*			X		X		

				Compartment				
Taxon group	Species Name	Vernacular Name	Status (see Appendix D & E)	East Verge (A)	East Footpath (B)	Hedgerow (C)	Field adjacent to hedgerow (D)	West Verge (E)
Hemiptera	*Capsus ater*					X		
Hemiptera	*Cicadella viridis*	Green leafhopper					X	X
Hemiptera	*Cicadula persimilis*	A leafhopper				X		
Hemiptera	*Coreus marginatus*						X	
Hemiptera	*Coriomeris denticulatus*			X				
Hemiptera	*Deraeocoris flavilinea*					X		

				Compartment				
Taxon group	Species Name	Vernacular Name	Status (see Appendix D & E)	East Verge (A)	East Footpath (B)	Hedgerow (C)	Field adjacent to hedgerow (D)	West Verge (E)
Hemiptera	*Deraeocoris ruber*					X		
Hemiptera	*Derephysia foliacea*	A lace bug	Local					X
Hemiptera	*Dicyphus errans*					X		
Hemiptera	*Dolycoris baccarum*	Hairy shieldbug		X			X	
Hemiptera	*Doratura stylata*				X			
Hemiptera	*Eurydema oleracea*					X	X	

				Compartment				
Taxon group	Species Name	Vernacular Name	Status (see Appendix D & E)	East Verge (A)	East Footpath (B)	Hedgerow (C)	Field adjacent to hedgerow (D)	West Verge (E)
Hemiptera	*Eurygaster testudinaria*						X	
Hemiptera	*Eupteryx origani*		Local					X
Hemiptera	*Euscelis incisus*			X				X
Hemiptera	*Gonocerus acuteangulatus*	Box bug	Local			X		
Hemiptera	*Heterotoma planicornis*			X		X		
Hemiptera	*Himacerus apterus*	Tree damsel bug				X		

				Compartment				
Taxon group	Species Name	Vernacular Name	Status (see Appendix D & E)	East Verge (A)	East Footpath (B)	Hedgerow (C)	Field adjacent to hedgerow (D)	West Verge (E)
Hemiptera	*Himacerus mirmicoides*	Ant damsel bug		X				X
Hemiptera	*Ischnodemus sabuleti*	European cinchbug					X	
Hemiptera	*Issus coleoptratus*					X		
Hemiptera	*Javesella pellucida*							X
Hemiptera	*Legnotus limbosus*	Bordered shieldbug				X		
Hemiptera	*Leptopterna dolabrata*			X		X		X

				Compartment				
Taxon group	Species Name	Vernacular Name	Status (see Appendix D & E)	East Verge (A)	East Footpath (B)	Hedgerow (C)	Field adjacent to hedgerow (D)	West Verge (E)
Hemiptera	*Lygus pratensis*		RDB3 (1992)[1]				X	
Hemiptera	*Lygus rugulipennis*						X	
Hemiptera	*Megophthalmus scabripennis*			X		X		
Hemiptera	*Nabis rugosus*	Common damsel bug		X		X		
Hemiptera	*Nysius huttoni*	Wheat bug		X				X
Hemiptera	*Orthonotus rufifrons*					X		

				Compartment				
Taxon group	Species Name	Vernacular Name	Status (see Appendix D & E)	East Verge (A)	East Footpath (B)	Hedgerow (C)	Field adjacent to hedgerow (D)	West Verge (E)
Hemiptera	*Orthops campestris*					X		
Hemiptera	*Palomena prasina*			X	X	X		
Hemiptera	*Palomena prasina*	Common green shieldbug			X	X		
Hemiptera	*Philaenus spumarius*	Common froghopper		X		X		
Hemiptera	*Phytocoris ulmi*					X		X
Hemiptera	*Phytocoris varipes*			X			X	X

				Compartment				
Taxon group	Species Name	Vernacular Name	Status (see Appendix D & E)	East Verge (A)	East Footpath (B)	Hedgerow (C)	Field adjacent to hedgerow (D)	West Verge (E)
Hemiptera	*Plagiognathus arbustorum*			X		X		X
Hemiptera	*Podops inuncta*	Turtle shieldbug				X		
Hemiptera	*Scolopostethus affinis*			X				X
Hemiptera	*Sehirus luctuosus*	Forget-me-not shieldbug	Local					X
Hemiptera	*Stenodema laevigata*					X		X
Hemiptera	*Stictopleurus punctatonervosus*		Local	X			X	

				Compartment				
Taxon group	Species Name	Vernacular Name	Status (see Appendix D & E)	East Verge (A)	East Footpath (B)	Hedgerow (C)	Field adjacent to hedgerow (D)	West Verge (E)
Hymenoptera	*Ancistrocerus gazella*				X			X
Hymenoptera	*Andrena flavipes*	Yellow-legged mining bee		X				X
Hymenoptera	*Andrena fulvago*	Hawk's-beard mining bee				X		
Hymenoptera	*Andrena minutula*	Common mini-mining bee				X		
Hymenoptera	*Apis mellifera*	Honeybee		X	X	X	X	X
Hymenoptera	*Arge ochropus*	Rose sawfly		X				

				Compartment				
Taxon group	Species Name	Vernacular Name	Status (see Appendix D & E)	East Verge (A)	East Footpath (B)	Hedgerow (C)	Field adjacent to hedgerow (D)	West Verge (E)
Hymenoptera	*Arge pagana*	Large rose sawfly		X	X			X
Hymenoptera	*Astata boops*	A wasp	Local					X
Hymenoptera	*Bethylus fuscicornis*	A parasitoid wasp	Local			X		
Hymenoptera	*Bombus hypnorum*	Tree bumblebee		X				
Hymenoptera	*Bombus lapidarius*	Red-tailed bumblebee		X	X			X
Hymenoptera	*Bombus lucorum agg.*	White-tailed bumblebee		X				

				Compartment				
Taxon group	Species Name	Vernacular Name	Status (see Appendix D & E)	East Verge (A)	East Footpath (B)	Hedgerow (C)	Field adjacent to hedgerow (D)	West Verge (E)
Hymenoptera	*Bombus pascuorum*	Common carder bee		X	X	X		X
Hymenoptera	*Bombus pratorum*	Early bumblebee		X	X			
Hymenoptera	*Bombus terrestris*	Buff-tailed bumblebee		X	X	X		
Hymenoptera	*Bombus vestalis*	Vestal cuckoo bee			X			
Hymenoptera	*Cerceris rybyensis*	Ornate-tailed digger wasp		X	X	X		
Hymenoptera	*Entomognathus brevis*	A wasp			X			

				Compartment				
Taxon group	Species Name	Vernacular Name	Status (see Appendix D & E)	East Verge (A)	East Footpath (B)	Hedgerow (C)	Field adjacent to hedgerow (D)	West Verge (E)
Hymenoptera	*Eutomostethus ephippium*	A sawfly				X		
Hymenoptera	*Gasteruption jaculator*	A parasitoid wasp				X		
Hymenoptera	*Halictus rubicundus*	Orange-legged furrow bee		X	X			
Hymenoptera	*Halictus tumulorum*	Bronze furrow bee		X	X	X		X
Hymenoptera	*Hedychridium roseum*	A cuckoo wasp	Local	X	X			
Hymenoptera	*Hoplitis spinulosa*	Spined mason bee	Local	X	X	X		X

				Compartment				
Taxon group	Species Name	Vernacular Name	Status (see Appendix D & E)	East Verge (A)	East Footpath (B)	Hedgerow (C)	Field adjacent to hedgerow (D)	West Verge (E)
Hymenoptera	*Hylaeus communis*	Common yellow face bee			X	X		
Hymenoptera	*Hylaeus confusus*	White-jawed yellow face bee				X		
Hymenoptera	*Lasiogossum calceatum*	Common furrow bee						X
Hymenoptera	*Lasioglossum morio*	Common green furrow bee		X	X	X		
Hymenoptera	*Lasioglossum smeathmanellum*	Smeathman's furrow bee		X				
Hymenoptera	*Lasius flavus*	Yellow meadow ant		X				X

				Compartment				
Taxon group	Species Name	Vernacular Name	Status (see Appendix D & E)	East Verge (A)	East Footpath (B)	Hedgerow (C)	Field adjacent to hedgerow (D)	West Verge (E)
Hymenoptera	*Lasius niger*	Black garden ant		X	X	X		X
Hymenoptera	*Lasius platythorax*	An ant						X
Hymenoptera	*Myrmecina graminicola*	An ant	Local	X				
Hymenoptera	*Myrmica ruginodis*	An ant				X		
Hymenoptera	*Myrmica scabrinodis*			X				
Hymenoptera	*Nomada fabriciana*	Fabricius' nomad bee		X				X

				Compartment				
Taxon group	Species Name	Vernacular Name	Status (see Appendix D & E)	East Verge (A)	East Footpath (B)	Hedgerow (C)	Field adjacent to hedgerow (D)	West Verge (E)
Hymenoptera	*Nomada flavoguttata*	Small nomad bee		X	X			X
Hymenoptera	*Nomada fucata*	Painted nomad bee	Nationally scarce[1]	X				
Hymenoptera	*Osmia spinulosa*			X				
Hymenoptera	*Pemphredon inornata*	Shuckard's wasp			X			X
Hymenoptera	*Psenulus concolor*	A wasp	Local			X		
Hymenoptera	*Pseudomalus auratus*	A cuckoo wasp			X			

				Compartment				
Taxon group	Species Name	Vernacular Name	Status (see Appendix D & E)	East Verge (A)	East Footpath (B)	Hedgerow (C)	Field adjacent to hedgerow (D)	West Verge (E)
Hymeoptera	*Sphecodes monilicornis*	Box-headed blood bee						X
Hymenoptera	*Temnothorax nylanderi*	An ant	Local					X
Hymenoptera	*Tiphia femorata*	Large tiphia wasp	Local	X	X			X
Hymenoptera	*Trychnosoma punctipleura*				X			
Hymenoptera	*Trypoxylon attenuatum*	Slender wood borer wasp				X		
Hymenoptera	*Trypoxylon clavicerum*	Club horned wood borer wasp			X	X		X

				Compartment				
Taxon group	Species Name	Vernacular Name	Status (see Appendix D & E)	East Verge (A)	East Footpath (B)	Hedgerow (C)	Field adjacent to hedgerow (D)	West Verge (E)
Hymenoptera	*Vespula germanica*	German wasp						X
Hymenoptera	*Vespula vulgaris*	Common wasp		X	X	X	X	X
Isopoda	*Armadillidium vulgare*	Pill woodlouse		X				X
Isopoda	*Philoscia muscorum*	Common striped woodlouse		X	X	X		X
Isopoda	*Platyarthrus hoffmannseggii*	Ant woodlouse						X
Isopoda	*Porcellio scaber*	Common rough woodlouse		X	X	X		X

				Compartment				
Taxon group	Species Name	Vernacular Name	Status (see Appendix D & E)	East Verge (A)	East Footpath (B)	Hedgerow (C)	Field adjacent to hedgerow (D)	West Verge (E)
Lepidoptera (butterfly)	*Aglais io*	Peacock butterfly			X	X		
Lepidoptera (butterfly)	*Gonepteryx rhamni*	Brimstone		X				
Lepidoptera (butterfly)	*Maniola jurtina*	Meadow brown			X	X	X	
Lepidoptera (butterfly)	*Melanargia galathea*	Marbled white				X	X	
Lepidoptera (butterfly)	*Pieris brassicae*	Large white				X	X	X
Lepidoptera (butterfly)	*Polygonia c-album*	Comma				X	X	

				Compartment				
Taxon group	Species Name	Vernacular Name	Status (see Appendix D & E)	East Verge (A)	East Footpath (B)	Hedgerow (C)	Field adjacent to hedgerow (D)	West Verge (E)
Lepidoptera (butterfly)	*Polyommatus icarus*	Common blue		X				
Lepidoptera (butterfly)	*Pyronia tithonus*	Gatekeeper		X	X	X		X
Lepidoptera (butterfly)	*Thymelicus sylvestris*	Small skipper		X				
Lepidoptera (butterfly)	*Vanessa atalanta*	Red admiral			X	X		
Lepidoptera (moth)	*Bembecia ichneumoniformis*	Six-belted clearwing	Nationally scarce	X				
Lepidoptera (moth)	*Hellinsia osteodactylus*	Small goldenrod plume			X			

				Compartment				
Taxon group	Species Name	Vernacular Name	Status (see Appendix D & E)	East Verge (A)	East Footpath (B)	Hedgerow (C)	Field adjacent to hedgerow (D)	West Verge (E)
Lepidoptera (moth)	*Mormo maura*	Old lady						Subway underpass near E
Lepidoptera (moth)	*Pterophorus pentadactyla*	White plume			X			
Lepidoptera (moth)	*Pyrausta aurata*	Mint moth		X				
Lepidoptera (moth)	*Rivula sericealis*	Straw dot				X		
Lepidoptera (moth)	*Tyria jacobaea*	Cinnabar moth	S41 (Research Only)[2]				X	

[2] Section 41 (Research Only) species are not assessed as Protected or Notable species. They are not currently considered scarce or threatened; their status was assigned to encourage research in to the species.

				Compartment				
Taxon group	Species Name	Vernacular Name	Status (see Appendix D & E)	East Verge (A)	East Footpath (B)	Hedgerow (C)	Field adjacent to hedgerow (D)	West Verge (E)
Lepidoptera (moth)	*Zygaena filipendulae*	Six-spot burnet		X				
Neuroptera	*Chrysoperla carnea*	Common green lacewing			X	X	X	
Odonata	*Aeshna cyanea*	Southern hawker			X	X		
Odonata	*Calopteryx splendens*	Banded demoiselle			X	X	X	
Opiliones	*Mitopus morio*	A harvestman		X		X		
Opiliones	*Phalangium opilio*	A harvestman		X				X

				Compartment				
Taxon group	Species Name	Vernacular Name	Status (see Appendix D & E)	East Verge (A)	East Footpath (B)	Hedgerow (C)	Field adjacent to hedgerow (D)	West Verge (E)
Orthoptera	*Chorthippus parallelus*	Meadow grasshopper		X	X	X	X	
Orthoptera	*Leptophyes punctatissima*	Speckled bush cricket		X		X		
Psocoptera	*Ectopsocus petersi*			X				
Pulmonata	*Cochlicopa lubrica agg.*					X		
Pulmonata	*Monacha cantiana*	Kentish snail				X		
Pulmonata	*Trichia hispida*	Hairy snail		X				

				Compartment				
Taxon group	Species Name	Vernacular Name	Status (see Appendix D & E)	East Verge (A)	East Footpath (B)	Hedgerow (C)	Field adjacent to hedgerow (D)	West Verge (E)
Pulmonata	*Trochulus hispidus*			X				
Thysanoptera	*Aeolothrips versicolor*	A thrip		X		X		

Appendix D. Legislative and Planning Context

The Habitats Regulations, and Wildlife and Countryside Act 1981 (as amended) (WCA)

The Habitat Regulations transpose Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora (EC Habitats Directive) into UK law. The Regulations provide for the designation and protection of 'European Sites', the protection of 'European Protected Species' (EPS), and the adaptation of planning and other controls for the protection of European Sites. EPS are listed on Schedule 2 of the Conservation Regulations.

Under the combined measures included in the Habitats Regulations and WCA it is an offence to:

- deliberately capture, injure or kill any wild animal listed as an EPS;
- deliberately disturb wild animals of any such species in such a way as to be likely to impair their ability:
    - to survive, to breed or reproduce, or to rear or nurture their young; or
    - in the case of animals of a hibernating or migratory species, to hibernate or migrate;
- to affect significantly the local distribution or abundance of the species to which they belong;
- deliberately take or destroy the eggs of such an animal; or
- damage or destroy a breeding site or resting place of such an animal.

Natural Environment and Rural Communities Act 2006 (NERC 2006)

Section 40 of the Act concerns biodiversity and states: "*Every public authority must, in exercising its functions, have regard, so far as is consistent with the proper exercise of those functions, to the purpose of conserving biodiversity*."

Section 41 of the NERC Act sates that: "*The Secretary of State must, as respects England, publish a list of the living organisms and types of habitat which in the Secretary of State's opinion are of principal importance for the purpose of conserving biodiversity*". Many terrestrial invertebrate species are categorised as 'Species of Principal Importance' under the NERC Act. The list of species can be downloaded from the natural England website at:

http://www.naturalengland.org.uk/ourwork/conservation/biodiversity/protectandmanage/habsandspeciesimportance.aspx

The Act stresses that "*it is important that public authorities seek not only to protect important habitats and species, but actively seek opportunities to enhance biodiversity through development proposals, where appropriate. Incorporating enhancement opportunities into projects may help applicants to achieve planning permission*."

A full list of UK Invertebrate Species protected by the Habitats Regulations, WCA and NERC Act (2006) can be found at: http://jncc.defra.gov.uk/page-3408

Appendix E. IUCN Red List and GB Rarity Status Categories

IUCN Red List:

Extinct (EX)

A taxon is Extinct when there is no reasonable doubt that the last individual has died. Extensive surveys in the taxon's known and / or expected habitat have failed to record an individual.

Extinct in the Wild (EW)

A taxon is Extinct in the Wild when it is known to only survive in cultivation, captivity or as a naturalised population/s well outside its past range. A taxon is Extinct in the Wild when extensive surveys in the taxon's known and / or expected habitat have failed to record an individual.

Critically Endangered (CR)

A taxon is Critically Endangered when it is considered to be facing an extremely high risk of extinction in the wild. The taxon must meet any of the following criteria:

- Reduction in population size based on any of the following:
  - population size reduction of ≥90% over the last 10 years of three generations, whichever is the longer, where the causes are clearly reversible, understood and ceased.
  - population size reduction ≥80% over the last 10 years or three generations, whichever is the longer, where the reduction or its causes may NOT be reversible, understood or ceased.
  - projected population size reduction ≥80% to be met within the next 10 years or three generations, whichever is the longer (up to a maximum of 100 years).
  - observed or projected population size reduction ≥80% over any 10 year or three generation period, whichever is the longer (up to a maximum of 100 years in the future). The time period must include the past and future and the reduction or its causes may not be reversible, understood or ceased.

- Extent of occurrence is estimated to be less than 100 km^2 or area of occupancy is estimated to be less than 10 km^2 and indicates at least two of: severe fragmentation, continuing decline (observed or projected) and/or extreme fluctuations.

- Population size is estimated to be fewer than 250 mature individuals and either:
  - an estimated decline of at least 25% within three years or one generation whichever is the longer (up to a maximum of 100 years in the future).
  - a continuing decline, observed or projected with no subpopulation estimated to contain more than 50 mature individuals or at least 90% of mature individuals are in one subpopulation.

- Population size estimated to be fewer than 50 mature individuals.

- Probability of extinction in the wild is at least 50% within the next 10 years or three generations, whichever is the longer (up to a maximum of 100 years).

More details of these criteria can be found in the IUCN Red List Categories and Criteria report (IUCN)

Endangered (EN)

A taxon is Endangered when it is considered to be facing an extremely high risk of extinction in the wild. The taxon must meet any of the following criteria:

- Reduction in population size based on any of the following:

- population size reduction of ≥70% over the last 10 years of three generations, whichever is the longer, where the causes are clearly reversible, understood and ceased.
- population size reduction ≥50% over the last 10 years or three generations, whichever is the longer, where the reduction or its causes may NOT be reversible, understood or ceased.
- projected population size reduction ≥50% to be met within the next 10 years or three generations, whichever is the longer (up to a maximum of 100 years).
- observed or projected population size reduction ≥50% over any 10 year or three generation period, whichever is the longer (up to a maximum of 100 years in the future). The time period must include the past and future and the reduction or its causes may not be reversible, understood or ceased.

- Extent of occurrence is estimated to be less than 5000 km^2 or area of occupancy is estimated to be less than 500 km^2 and indicates at least two of: severe fragmentation, continuing decline (observed or projected) and/or extreme fluctuations.

- Population size is estimated to be fewer than 2500 mature individuals and either:
  - an estimated decline of at least 20% within five years or two generations whichever is the longer (up to a maximum of 100 years in the future).
  - A continuing decline, observed or projected with no subpopulation estimated to contain more than 250 mature individuals or at least 95% of mature individuals are in one subpopulation.

- Population size estimated to be fewer than 250 mature individuals.

- Probability of extinction in the wild is at least 20% within the next 20 years or five generations, whichever is the longer (up to a maximum of 100 years).

More details of these criteria can be found in the IUCN Red List Categories and Criteria report (IUCN)

Vulnerable (VU)

A taxon is Vulnerable when it is considered to be facing an extremely high risk of extinction in the wild. The taxon must meet any of the following criteria:

- Reduction in population size based on any of the following:
  - population size reduction of ≥50% over the last 10 years of three generations, whichever is the longer, where the causes are clearly reversible, understood and ceased.
  - population size reduction ≥30% over the last 10 years or three generations, whichever is the longer, where the reduction or its causes may NOT be reversible, understood or ceased.
  - projected population size reduction ≥30% to be met within the next 10 years or three generations, whichever is the longer (up to a maximum of 100 years).
  - observed or projected population size reduction ≥30% over any 10 year or three generation period, whichever is the longer (up to a maximum of 100 years in the future). The time period must include the past and future and the reduction or its causes may not be reversible, understood or ceased.

- Extent of occurrence is estimated to be less than 20 000 km^2 or area of occupancy is estimated to be less than 2000 km^2 and indicates at least two of: severe fragmentation, continuing decline (observed or projected) and/or extreme fluctuations.

- Population size is estimated to be fewer than 10 000 mature individuals and either:
  - an estimated decline of at least 10% within 10 years or three generations whichever is the longer (up to a maximum of 100 years in the future).
  - A continuing decline, observed or projected with no subpopulation estimated to contain more than 1000 mature individuals or 100% of mature individuals are in one subpopulation.

- Population size estimated to be fewer than 1000 mature individuals and with a very restricted area of occupancy or number of locations.

- Probability of extinction in the wild is at least 10% within the next 100 years.

More details of these criteria can be found in the IUCN Red List Categories and Criteria report (IUCN)

Near Threatened (NT)

A taxon is Near Threatened when it has been evaluated against the Red List criteria but does not qualify for any of the above threatened categories but is close to qualifying for or is likely to qualify for a threatened category in the near future.

Least Concern (LC)

A taxon is Least Concern when it does not qualify for the above criteria. Widespread and abundant taxa are included in this category.

Data Deficient (DD)

A taxon is Data Deficient when there is inadequate information to make an assessment of its risk of extinction based on its distribution and/or population status.

Not Evaluated (NE)

A taxon is Not Evaluated having not yet been evaluated against the Red List criteria.

GB Rarity Status Categories

At the national level countries are permitted to refine the definitions for non-threatened categories and define categories of their own. Nationally Rare and Nationally Scarce categories are unique to Great Britain.

Nationally Rare

Taxa which occur in 15 or fewer hectads (10 km squares) in Great Britain

Nationally Scarce

Taxa which are recorded in 16 – 100 hectads (10 km squares) in Great Britain but are not included in one of the Red List Categories

Red Data Book

Taxa occurring in fewer than 16 10km squares of the National Grid, divided as:

- endangered (Red Data Book 1), for species known from a single population or in continuous recent decline and now known from five or fewer 10km squares;
- vulnerable (Red Data Book 2), likely to become endangered (Red Data Book 1) if causal factors continue;
- rare (Red Data Book 3), species at risk but not qualifying as vulnerable; and
- Red Data Book K, species insufficiently known but likely to qualify at least as rare;

Other Categories

Local

A species may be limited to a local distribution or abundance rather than being common and widespread. These species are known to occur in 101 to 300 ten-km squares.

M3 Junction 9 Improvements

Advanced Bat Surveys

December 2020

Doc Ref: HE551511-VFK-EBD-X_XXXX_XX-RP-LE-0002
Revision: P01

Registered office Bridge House, 1 Walnut Tree Close, Guildford, GU1 4LZ
Highways England Company Limited registered in England and Wales number 09346363

M3 Junction 9 Improvement

Advanced Bat Surveys

HE551511-VFK-EBD-X_XXXX_XX-RP-LE-0002

On behalf of **Highways England**

Project Ref: 48176 | Rev: P01 | Date: December 2020

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Report Title: **Advanced Bat Surveys**

Doc Ref: **HE551511-VFK-EBD-X_XXXX_XX-RP-LE-0002**

Date: **02 December 2020**

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For and on behalf of Stantec UK Limited				

Revision	Date	Description	Prepared	Reviewed	Approved

Contents

Figures

Appendices

1 Introduction

1.1 Background

1.1.1 Stantec UK have been commissioned by Volker Fitzpatrick to undertake advance bat surveys for the M3 Junction 9 Improvement Scheme (the Site). Highways England are progressing with the Proposed Scheme to the east of Winchester in Hampshire.

1.1.2 The surveys were commissioned following acoustic bat activity surveys in the summer of 2017 which recommended further surveys to determine which species of Myotis bat are using the Site (WSP, 2017).

1.1.3 Although acoustic surveys have many advantages, they have limitations in determining the identification of certain species groups such as Myotis. This genus includes both some of the most abundant species (Myotis daubentonii/Myotis nattereri) and some of the UK's rarest species (Myotis bechsteinii/Myotis alcathoe), all these species have overlapping echolocation call parameters i.e. they can be very similar. Both of the latter rare species are known to occur in Hampshire.

1.1.4 Davidson-Watts Ecology Ltd were commissioned by Stantec to undertake advanced (trapping) surveys of areas of woodland at Junction 9, M3 near Winchester, with the aim of catching and identifying any Myotis bats that might be present.

1.2 Survey Location and Broad Description

1.2.1 Surveys were focused on an area of agricultural land to the south of the River Itchen corridor, and between the A34 and M3 (see **Figure 1**) where elevated levels of Myotis bats had been recorded during 2017.

1.2.2 The approximate central grid reference of this areas is SU495310. The areas comprise pasture fields with some boundary features including linear tree lines and woodland.

1.3 Report Aims

1.3.1 The report presents the results of the advance bat surveys along with an evaluation and recommendations. Methods used for the survey are also provided.

2 Methods

2.1 Approach

2.1.1 Due to the difficult nature of determining the identification of some species by bat detectors, the primary approach to meeting the project aims was to trap free-flying bats to determine species, sex and breeding status using harp traps and mist nets (Collins, 2016).

2.2 Survey Schedule 2020

2.2.1 Two trapping surveys were undertaken on:

- 28th August 2020 (2 x trapping sites)
- 24th September 2020 (3 x trapping sites)

2.3 Trapping Methods

2.3.1 Up to three acoustic lures (Sussex Autobat) were used to improve catch efficiency in woodland (Hill and Greenaway 2005). The lures were programmed to emit synthesised or recorded bat social calls. The lures were placed next to mist nets or harp traps and left for up to 15 minutes following which they were be 'walked' between trapping locations/nets/traps for a further 10 minutes. The trapping locations are shown on **Figure 1**. Trapping surveys started at dusk and continued to approximately 02:00-03:00hrs, depending on capture success, bat activity and weather conditions.

2.4 Licencing Requirements and Personnel

2.4.1 Surveys were undertaken by David Hill (licence registration Level 3 - 2016-22696-CLS-CLS Level 4 - 2016-23453-CLS) who is currently licensed to catch bats under a Natural England Class 3 and 4 licence (mist nets and harp traps) in England.

2.5 Limitations to Methods

The survey on 28th August was constrained due to intermittent showers which were residual conditions from a very poor weather week. The survey of 24th September was curtailed due to night-time temperatures falling below 8°C after midnight, however this was an expected set of conditions at the end of the September.

3 Results

3.1.1 Trapping locations area shown on Figure 1.

3.1.2 No bats were captured during the surveys in August and September 2020. Some low levels of bat activity were incidentally recorded during the survey on the 28th August (noting the survey was focused on trapping of bats), most pipistrelle species. No bats were detected at all on the 24th September.

4 Discussion and Recommended Next Steps

4.1.1 No bats were captured on either survey, which is unusual for the trapping techniques employed at the time of year[1]. A low level of bat activity was detected during the August survey using hand-held detectors and these were identified as pipistrelle species. No Myotis bats were detected during either survey.

4.1.2 Artificial light levels appeared to be particularly high in the survey area and this may have deterred Myotis bats (a light adverse species group) from the area generally or may have made the traps more conspicuous enabling bats to avoid them.

4.1.3 The time of year was also limited to August and September and this may have been a contributing factor, although these months are still optimal periods in the year to catch bats of this and other species groups. However, it is recognised that chalk river habitats are particularly productive in relation to bat insect prey (i.e. Mayfly emergence) in late spring and early summer and this may be related to bat activity levels.

4.1.4 Weather conditions during the August survey were acceptable, however the days leading up to the surveys were not consistently good weather for bat activity and there were intermittent rain showers during the survey. These factors may also have subdued bat activity generally on the night of the survey.

4.1.5 It is not clear whether lighting levels have changed within the last three years to affect the behaviour of bats, nor does the WSP (2017) report analyse or provide monthly breakdown of bat activity which would provide an indication of whether the site is more likely to have greater levels of bat activity at other times of the year.

4.1.6 On this basis it would be prudent to undertake trapping surveys in the early/mid part of the bat active season during 2021, as the 2020 trapping surveys were undertaken following the core maternity season and higher levels of bat activity could have occurred earlier in the summer.

[1] Surveyors noted high levels of bat captures on different (unrelated) projects elsewhere during the same period.

5 References

Collins (ed) (2016) Bat Surveys: Good Practice Guidelines, 3rd Edition, Bat Conservation Trust.

HMSO The Conservation of Habitats and Species Regulations 2017 (ass amended)

HMSO The Countryside and Rights of Way Act 2000.

HMSO Wildlife and Countryside Act 1981 (as amended)

WSP (2017). M3 Junction 9 Improvement Scheme Bat Activity Survey Report. Report prepared for Highways England.

6 Figures

KEY

- Indicative Application Boundary
- August Trap Location
- September Trap Location

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
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Figure Status: FOR INFORMATION	Project Title: M3 JUNCTION 9 IMPROVEMENT
VolkerFitzpatrick	Figure Title: BAT TRAPPING LOCATIONS 2020
Client: highways england	Scale: 1:5,000 · Designed: TL · Drawn: TL · Checked: DM · Approved: DM
	Original Size: A3 · Date: 01/12/2020 · Date: 01/12/2020 · Date: 01/12/2020 · Date: 01/12/2020
FIGURE 1	Project Ref No. 48176 · Revision: A

Document Path: Z:\Projects\48176\02_mxd\Ecology\48176_BatTrappingLocations.mxd

Appendix A Relevant Legislation

A.1.1 In England, Scotland and Wales all bat species are fully protected under the Wildlife and Countryside Act 1981 (WCA) (as amended) through inclusion in Schedule 5. In England and Wales, this Act has been further amended by the Countryside and Rights of Way Act 2000 (CRoW).

A.1.2 All bats are also included in Schedule 2 of The Conservation of Habitats and Species Regulations 2017, (the Habitats Regulations), which defines 'European protected species (EPS) of animals'. These various pieces of legislation almost parallel each other, with a few small differences in wording. The legal significance of these differences has not yet been fully established and so the following account attempts to combine them to provide a simplified summary of the relevant provisions. Taken together, the Act and Regulations make it illegal to:

- intentionally or deliberately kill, injure or capture (or take) an EPS;
- deliberately disturb an EPS;
- recklessly disturb an EPS or obstruct access to breeding site or place of shelter (England & Wales only); and
- damage or destroy 'any structure or place which any EPS uses for shelter or protection.

A.1.3 European Union Directive on the Conservation of Natural Habitats and of Wild Fauna and Flora (Habitats and Species Directive) places a legal requirement on all Member States of the European Union to protect specified habitats and species through their own domestic legislation. In the UK this has been implemented by the Conservation of Habitats and Species Regulations (2017). All species of bats are on Annex IV ('European protected species (EPS) of animal'), which requires that they are given full protection.

A.1.4 The Natural Environment and Rural Communities (NERC) Act came into force on 1st Oct 2006. Section 41 (S41) of the Act requires the Secretary of State to publish a list of habitats and species which are of principal importance for the conservation of biodiversity in England. The S41 list is used to guide decision-makers such as public bodies, including local and regional authorities, in implementing their duty under section 40 of the Natural Environment and Rural Communities Act 2006, to have regard to the conservation of biodiversity in England, when carrying out their normal functions. Fifty-six habitats of principal importance and 943 species of principal importance are included on the S41 list. These are all the habitats and species in England that were identified as requiring action in the UK Biodiversity Action Plan (UK BAP) and continue to be regarded as conservation priorities in the subsequent UK Post-2010 Biodiversity Framework. Bat species included on S41 include barbastelle, brown long-eared bat and soprano pipistrelle Pipistrellus pygmaeus bat.

M3 Junction 9 Improvements

Water Vole Survey Report

December 2020

Doc Ref: HE551511-VFK-EBD-X_XXXX_XX-RP-LE-0004
Revision: P01

Registered office Bridge House, 1 Walnut Tree Close, Guildford, GU1 4LZ
Highways England Company Limited registered in England and Wales number 09346363

M3 Junction 9 Improvement

Water Vole Survey Report

HE551511-VFK-EBD-X_XXXX_XX-RP-LE-0004

On behalf of **Highways England**

Project Ref: 48176 | Rev: P01 | Date: December 2020

Registered Office: Buckingham Court Kingsmead Business Park, London Road, High Wycombe, Buckinghamshire, HP11 1JU
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Document Control Sheet

Project Name: M3 Junction 9 Improvement Scheme

Project Ref: 48176/3001

Report Title: Water Vole Survey Report

Doc Ref: HE551511-VFK-EBD-X_XXXX_XX-RP-LE-0004

Date: 02 December 2020

	Name	Position	Signature	Date
Prepared by:	Alison Johnson	Ecological Consultant	AJ	November 2020
Reviewed by:	Duncan McLaughlin	Associate Ecologist	DM	24/11/20
Approved by:	Malcolm Fillingham	Director	MF	29/11/20
For and on behalf of Stantec UK Limited				

Revision	Date	Description	Prepared	Reviewed	Approved

Contents

Appendices

1 Introduction

1.1 Background

1.1.1 Stantec UK has been commissioned by Volker Fitzpatrick to undertake a water vole survey of a stretch of the River Itchen, which flows beneath two road bridges, which fall within the footprint of the M3 Junction 9 Improvement Scheme. The two road bridges, the Itchen Bridge and Kingsworthy Bridge, carry the A34 over the River Itchen. The bridges and the stretch of the River Itchen may be affected by the proposals.

1.1.2 The footprint of the proposed scheme will be referred to 'the Site' and the area subject to survey will be referred to as 'the Survey Area' throughout this report.

1.1.3 The Site is located to the north-east of Winchester and includes proposed improvements to Junction 9 of the M3 and the A34 around an approximate central grid reference of SU496308.

1.1.4 The Survey Area is the stretch of the River Itchen from grid reference SU493311 to the west of the bridges to grid reference SU493316 to the east and is shown on **Figure 1 Water vole survey locations**.

1.2 Project Description

1.2.1 M3 Junction 9 is a key transport interchange which connects South Hampshire and the wider sub-region, with London via the M3 and the Midlands/North via the A34. A significant volume of traffic currently uses the grade separated, partially signalised gyratory (approximately 6,000 vehicles per hour during the peak periods) which acts as a bottleneck on the local highway network and causes significant delay throughout the day.

1.2.2 Highways England is looking to reconfigure the junction to improve the situation for vehicle traffic and non-motorised users.

1.3 Context

1.3.1 An Environmental Impact Assessment Scoping Report was produced by Highways England in January 2019 (Highways England, 2019), accompanied by a number of baseline ecological surveys, including a water vole survey carried out in 2017 by WSP (Highways England, 2017).

1.3.2 In order to inform the scheme design, the need for additional ecological surveys was identified following a review of the reports and design information available. This report provides the findings of an update of the water vole survey for part of the area covered by the 2017 survey, with a brief evaluation and recommended next steps to inform the detailed design and mitigation strategy for the proposed works.

1.3.3 The 2017 Water Vole Survey Report (Highways England, 2017) included the results of a desk study, which identified 357 water vole records within a 2km search area and a Phase 1 habitat survey, which identified habitats suitable for water vole, including the channels of the River Itchen and associated ditches and reedbeds and presence/likely absence surveys found water voles to be present within the survey area.

1.4 Purpose and Scope of the 2020 Surveys

1.4.1 The purpose of the 2020 surveys was to provide an update of the 2017 surveys for the area upstream and downstream of Itchen Bridge and Kingsworthy Bridge and to update recommendations made in 2017, as appropriate, depending on the findings of the surveys.

1.4.2 The scope of the survey comprised:

- A review of the 2017 water vole survey report
- Surveys to establish whether the habitats present within the survey area were still suitable for water voles
- Surveys for water vole presence/likely absence within the Survey Area

2 Methods

2.1 Desk Study

2.1.1 The 2017 Water Vole Report was reviewed.

2.2 Field Survey

2.2.1 To determine whether water voles were present or likely absent from the survey area, a survey was completed in line with current good practice guidance (Strachan *et al,* 2011).

2.2.2 The survey comprised one visit, within the recommended season for water vole survey (late April to early October). The Survey Area is shown on **Figure 1**. The survey included the following:

- The river bank on both sides was walked in order to carry out a visual inspection of the banks up to 5m from the water for water voles and their field signs (droppings, latrines, feeding remains, burrows, lawns, nests, footprints or runways through vegetation). In places this was aided by the use of binoculars to see the opposite bank
- The recording of habitat type and features which help to establish suitability for water voles (habitat type, shore substrate, bank substrate, surrounding land use, vegetation type, level of disturbance, bank profile, water depth)
- The recording of any incidental observations of other wildlife, such as otter, mink, brown rat, or wetland birds

2.2.3 The survey was carried out on 30th September 2020. The weather was 11°C, cloudy with a light wind at the time of the survey.

2.3 Personnel

2.3.1 The survey was undertaken by Alison Johnson BSc MSc MCIEEM CEnv, with assistance from Richard Law. Alison has over eighteen years of commercial ecological experience and Richard has over ten years of commercial ecological survey experience. Both have experience of conducting many protected species surveys, including water vole habitat assessment and presence/likely absence surveys.

2.4 Limitations

2.4.1 The survey was conducted during the season recommended in the current good practice guidance. Access was possible to both sides of the watercourse to search for field signs of water voles. In places, silty ground or dense vegetation limited access to the banks, but in these areas, the habitat was generally of lower suitability for water voles (due to high levels of shading limiting growth of bankside vegetation) and in these areas the banks could be viewed with binoculars from the opposite side of the river.

2.4.2 Current good practice guidance recommends that two surveys be carried out within the appropriate season for survey (late April to early October) in order to confirm presence/likely absence. In this case, one survey has been carried out so far, in order to update the findings of the 2017 surveys and to identify any changes in habitat since the 2017 surveys. As the habitat remains suitable, a precautionary approach has been taken in assuming that water voles remain present in the areas identified as being suitable. As the detailed design is still under consideration, it is recommended that a further survey is carried out once it is known where the areas of potential impact may be.

3 Results

3.1 Desk Study

3.1.1 The 2017 survey covered suitable habitats within 250m of the proposed works area. Survey visits were undertaken in June 2017 and August 2017, which included a visual search of all wetland habitats along the lengths of ditch and river and within 5m of the bank tops.

3.1.2 Water voles were confirmed to be present within the River Itchen and its associated channels west of the A34. Evidence of water voles included sightings, burrows, latrines, feeding remains and pathways. The river channels west of the A34 form part of Winnall Moors Nature Reserve, an area of wetland habitat managed by the Hampshire and Isle of Wight Wildlife Trust. The majority of channels within this area of springs, flushes and wetland meadows exhibited some water vole activity, although the abundance of activity greatly varied. Limited activity signs were also found along the River Itchen east of the A34 and A33, though the suitability of these habitats was described as limited due to the presence of broadleaved woodland and management relating to angling.

3.1.3

3.2 Field Survey

Habitat Suitability

3.2.1 **Figure 1** shows a map of the 2020 Survey Area divided into sections. Table A.1 in Appendix A provides descriptions of the habitats within each of these section, photographs of each section and each section is classified as Low, Moderate or High Suitability for Water Voles.

3.2.2 The habitats to the west of the A34 bridges (Section 1) provide banks suitable for burrowing and excellent food sources for water vole on the west side of the river. Along the east side there is a reedbed with woodland and overhanging trees lining a silty bank in the southern part of this section with lower suitability for burrowing. Overall this section was classified as having high suitability for water voles.

3.2.3 The section flowing under the A34 bridges (Section 2) comprised shallow banks (in places flat) and canalised sections, unsuitable for water vole burrowing. Woodland and overhanging trees limit the growth of bankside and emergent vegetation, so opportunities for feeding are generally poor, with the exception of the reeds/sedges present immediately to the west of the bridges. Overall this section was classified as having moderate suitability for water voles.

3.2.4 To the north-east of the bridges (Section 3) mature overhanging trees are present on the shallow east bank. Fewer trees are present on the west bank, which is canalised. The central gravel island is vegetated with scrub, reeds and sedges, providing some potential for feeding. Burrowing potential in banks in this section is low. Overall this section was classified as having moderate suitability for water voles.

Evidence of Water Vole

3.2.5 No evidence of water vole was found during the survey.

4 Evaluation and Recommendations

4.1.1 The habitats recorded during the 2020 survey were similar in type and composition to those recorded during the 2017 survey with no material change identified.

4.1.2 Although no water vole signs were found during the survey, as the habitats remain suitable for water voles and evidence of presence was confirmed during the 2017 surveys, a precautionary approach should be taken in assuming that water voles remain present, unless a second survey carried out within the suitable survey season for water voles (late April to early October) indicates likely absence.

4.1.3 If the proposed works will impact on any suitable habitats within 10m of the watercourse and bankside habitats, there would be the potential for impacts to water voles and their habitat. It is therefore recommended that the proposed works avoid the watercourse and river banks and habitats up to 10m from the watercourse if possible.

4.1.4 If this is not possible, it is recommended that a further survey be carried out once it is known where any potential impacts to the watercourse, river banks or bridges will be. If potential for impacts to water voles are identified, a detailed mitigation plan will be required prior to commencement of works.

5 References

- Dean M, Strachan R, Gow D and Andrews R (2016) The Water Vole Mitigation Handbook (The Mammal Society Mitigation Guidance Series). Eds Fiona Matthews and Paul Chanin. The Mammal Society London.
- Hampshire Biodiversity Partnership (undated) Biodiversity Action Plan for Hampshire.
- Highways England (2017) M3 Junction 9 Improvement Scheme PCF Stage 3 – Water Vole Survey Report.
- Highways England (2019) M3 Junction 9 Improvements Environmental Impact Assessment Scoping Report.
- Strachan R, Moorhouse T and Gelling M (2011) Water Vole Conservation Handbook, third edition. The Wildlife Conservation Research Unit, University of Oxford.

6 Figures

N

Section 3

Section 2

Section 1

0 250 500 m

Inset

Springvale
A34
Kings Worthy
Abbots Worthy
Martyr Worthy
Littleton
Harestock
Easton
Weeke
Abbotts Barton
Fulflood
West Hill
Winchester
Sleepers' Hill
Wharf Hill
A31
Stanmore
Chilcomb
St Cross

Scale: 1:75,000

KEY

- Indicative Application
- Survey Extent
- Survey Sections

Figure Status: FOR INFORMATION

VolkerFitzpatrick

Client: highways england

Project Title: M3 JUNCTION 9 IMPROVEMENT

Figure Title: WATER VOLE SURVEY AREA 2020

Scale: 1:5,000	Designed: TL	Drawn: TL	Checked: DM	Approved: DM
Original Size: A3	Date: 01/12/2020	Date: 01/12/2020	Date: 01/12/2020	Date: 01/12/2020

FIGURE 1

Project Ref No. 48176

Revision: A

Document Path: Z:\Projects\48176\02_mxd\Ecology\48176_WaterVoleSurveyArea.mxd

Appendix A Survey Results

Table A.1 Water Vole Survey Results

1.1.1 Section[1]	**2.1.1 1**	**3.1.1 2**	**4.1.1 3**
Habitat	Running Water	Running Water	Running Water
Shore Bank	Earth/Gravel	Earth/Canalised/Reinforced	Earth/Canalised/Reinforced
Bordering Land Use	Permanent/Temporary Grass, Broadleaf Woodland	Broadleaf Woodland/Hard surfaces and footpath under road bridges	Broadleaf Woodland, Permanent/Temporary Grass
Bank Profile	Shallow on north side, flat on south side	Shallow (flat in places)	Vertical canalised bank on north side, flat banks on south side (shallow in places)
Depth	1-2m	1-2m	1-2m
Width	5-10m	5-10m	10-20m
Current	Fast	Fast	Fast
Vegetation Type (DAFOR)[2]	Reeds/Sedges: Frequent Tall Grass: Dominant Short Grass: Occasional Submerged Weed: Occasional	Bankside Trees: Dominant Bushes: Frequent Reeds/Sedges: Frequent Submerged Weed: Occasional	Bankside Trees: Abundant Reeds/Sedges: Frequent Bushes: Frequent Submerged Weed: Occasional Herbs: Occasional
Description	Main channel of the River Itchen to the west of the A34 bridges. This section has a wide, deep channel with banks suitable for burrowing and excellent food sources for water vole on the west side. Along the east side there is a reedbed with woodland and overhanging trees lining a silty bank in the southern part of this section.	Main channel of the River Itchen flowing under the bridges carrying the A34 over the river. This section has a wide, deep channel with shallow banks (in places flat) and canalised sections under the bridges, unsuitable for water vole burrowing. Woodland and overhanging trees in this section limit the growth of bankside and emergent vegetation so opportunities for feeding	Main channel of the River Itchen to the north-east of the A34 bridges. This section has a wide, deep channel with a small vegetated gravel island in the centre. Mature overhanging trees are present on the shallow east bank. Fewer trees are present on the west bank, which is canalised. The central gravel island is

1.1.1 Section[1]	2.1.1 1	3.1.1 2	4.1.1 3
		are generally poor, with the exception of the reeds/sedges present immediately to the west of the bridges.	vegetated with scrub, reeds and sedges, providing some potential for feeding. Burrowing potential in banks in this section is low.
Water Vole Suitability	High	Moderate	Moderate
Evidence of Water Vole	None	None	None
Other Wildlife	Evidence of feeding on tall vegetation by wildfowl. High potential for otters.	None. High potential for otters.	None. High potential for otters.
Photograph			

[1] Refer to Figure 1 Water Vole Survey Area
[2] DAFOR: Cover - Dominant (D) >75%, Abundant (A) 51-75%, Frequent (F) 26-50%, Occasional (O) 11-25%, Rare (R) 1-10%

Appendix B Relevant Legislation

B.1.1 Water vole are fully protected under The Wildlife and Countryside Act (1981) (as amended), meaning: it is an offence to kill, injure or take this species; damage or destroy places of rest or shelter; or disturb this species whilst occupying a place of rest of shelter.

B.1.2 The water vole is also listed as a Species of Principal Importance (SPI) for the Conservation of Biodiversity in England, in accordance with Section 41 of the Natural Environment and Rural Communities (NERC) Act 2006. Under Section 40 of the NERC Act (2006) public bodies (including local planning authorities) have a duty to have regard for the conservation of SPI when carrying out their functions, including determining planning applications.

B.1.3 Water vole is a priority species within the Hampshire Biodiversity Action Plan (BAP) (Hampshire Biodiversity Partnership, undated).