Habitat Enhancement Opportunities for Southern Damselfly

Itchen Valley Country Park

Dr Ben Rushbrook

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Executive Summary

Arcadian Ecology was appointed by Eastleigh Borough Council to conduct a walk over visit of Itchen Valley Country Park and, based on this and information provided by Kevin Young (formerly of Eastleigh Borough Council and who has an in-depth knowledge of the species at this site), identify habitat enhancement and creation opportunities for southern damselfly at the site.

The historic water meadow network at Itchen Valley Country Park forms part of the River Itchen Site of Special Scientific Interest (SSSI) / Special Area of Conservation (SAC), and supports a population of southern damselfly considered to be of national importance. However, recent studies have indicated a potential decline in the strength of the population at Itchen Valley Country Park, and it is considered that urgent conservation action for this species is required at this site.

It is therefore the specific intention of this report to outline habitat enhancement and creation opportunities identified at Itchen Valley Country Park and assess them in terms of their:

a. relative or site-specific value in increasing the distribution, robustness and resilience of the southern damselfly population at Itchen Valley Country Park, and
b. habitat enhancement and creation potential in the context of the wider Itchen Valley metapopulation as set out in the recently published *strategic conservation plan for southern damselfly with in and adjacent to Eastleigh Borough boundary*.

Habitat enhancement opportunities were identified for 16 of the 26 watercourses assessed, with a further two infrastructure improvement opportunities identified, considered to provide benefits for both southern damselfly and for the management / ecology of the wider Itchen Valley Country Park.

It was not considered appropriate to make recommendations for habitat creation at Itchen Valley Country Park, due to the complexity of the historic network of floodplain meadow carrier steams and ditches. It is therefore considered that a detailed hydrological study would be necessary before any notable alterations are made to water level management at the site such as the re-connection of paleo-channels or defunct elements of the historic water meadow network.

It was considered more appropriate and valuable to base the recommendations of potential implementation options on the results of the site-specific prioritisation assessment (rather than strategic assessment) since:

- there is no evidence of an imminent delivery of the recently published *strategic conservation plan for southern damselfly with in and adjacent to Eastleigh Borough boundary*; and
- there was limited variability between options in the strategic assessment with 16 of the 18 assessed to have a high current potential of being delivered.

Four different options for the suite of opportunities that should be included in the future management of Itchen Valley Country Park are provided below, representing the preferred option, preferred (within site) option, an alternative sub-optimal option, and a strongly recommended 'minimum' option.

It is emphasised that these recommendations are provided on the basis that they are delivered in parallel with the general management recommendations provided. Furthermore, irrespective of what programme of works is selected, its delivery must not be unduly rigid, but be subject to continual assessment and responsive to the current habitat characteristics of the relevant watercourse(s). Specifically, where cattle grazing is already creating suitable conditions, it is not recommended that rotational clearance is undertaken, and could instead be re-assigned to another (sections of) watercourse where it is required at that time.

Finally, it is considered that there would be three distinct, but not disconnected, elements of any programme of habitat enhancement and infrastructure improvement works in order to maximise the resulting increase in the distribution, robustness and resilience of the southern damselfly population at Itchen Valley Country Park. Specifically this will include measures that:

1. maintain and strengthen southern damselfly numbers in the important hub in the north of site;
2. provide two-fold benefits for the wider population through works in the centre of the site; and
3. maintain and strengthen southern damselfly numbers supported in the south of the site.

In conclusion, it is strongly recommended that any future programme of works is designed to encompass all three elements outlined above (i.e. as included within the two preferred options outlined in Section 4.2.1). However, where there are insufficient resources and / or it is not feasible to deliver a programme of works that meets all three of these criteria, the programme should be designed to include works that deliver in line with the three elements as prioritised above.

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1. INTRODUCTION

1.1 Background

Arcadian Ecology & Consulting Ltd (hereafter 'Arcadian Ecology') was appointed by Eastleigh Borough Council in 2017 to:

1. investigate the current and potential future distribution of southern damselfly *Coenagrion mercuriale* within and adjacent to the borough boundary (Rushbrook, 2018a); and, based on the findings of study
2. develop a *Strategic Conservation Plan* for southern damselfly across this study area (Rushbrook, 2018b).

Due to the existence of an on-going monitoring study at Itchen Valley Country Park (Map 1), this site was excluded from the survey and habitat assessment study conducted in June and July 2017 (Rushbrook, 2018a). It was therefore considered inappropriate to identify and assess potential habitat enhancement and creation opportunities at this site using the approach outlined in the *Strategic Conservation Plan* (Rushbrook, 2018b). Instead, the current status of the population was assessed using a combination of data collected from the site in 2017 and a long-term monitoring data set provided by Eastleigh Borough Council. Based on this information, it was considered highly likely that the size and / or strength of the southern damselfly population at the site is in decline. It was therefore strongly recommended that a detailed assessment be conducted to determine the potential factors driving the observed downward trend in numbers at the site (Rushbrook, 2018a).

Arcadian Ecology was thereafter appointed by Eastleigh Borough Council to conduct a walk over visit of the site and, based on this and information provided by Kevin Young (formerly of Eastleigh Borough Council and who has an in-depth knowledge of the species at this site), to identify habitat enhancement and creation opportunities for southern damselfly at Itchen Valley Country Park.

1.2 Site Description

Itchen Valley Country Park covers an area of approximately 180ha in West End, near Southampton, Hampshire (Map 1). It comprises a mixture of water meadows, ancient woodland and grazing pasture, with designated footpaths and trails providing access to a large proportion of the site. The site also includes a tree-top adventure course, children's play areas, offices, a café with associated buildings, and areas of hard-standing.

Floodplain meadows to the west of the River Itchen encompass over half of the site and support a network of historic water meadow carriers and ditches. The water meadows are largely publically accessible, managed as a Nature Reserve, and form part of the River Itchen Site of Special Scientific Interest (SSSI) / Special Area of Conservation (SAC). The extent of designation is shown on Map 2.

1.3 Southern Damselfly

1.3.1 Ecology

A detailed description of the ecology of southern damselfly is included in Rushbrook (2018a; 2018b), and a comprehensive account of their habitat requirements on lowland heath and chalk river systems is provided by Rouquette (2005). However, for ease of reference, an outline of the habitat requirements for southern damselfly is provided below.

The specific optimal characteristics of these habitat features vary slightly between adults and larvae (Rouquette, 2005), but key habitat features for sites to support strong numbers of southern damselfly include (illustrated in Figures 1 and 2):

- Shallow, well oxygenated, base-rich water;
- A constant (perennial) slow to moderate flow of water;
- Channel substrate consisting primarily of silt and detritus;
- Presence of a broad fringe of herbaceous emergent dicotyledon plants along margins;
- Presence of some areas of open water; and
- Largely (but not necessarily completely) unshaded by bankside shrubs and trees.

Figure 1: Suitable southern damselfly habitat on a small floodplain ditch at Ashtrim Nursery.

Figure 2: Suitable southern damselfly habitat at the margin of the main River Itchen at Highbridge

1.3.2 Status and Legislation

A detailed account of the status and legal protection afforded to southern damselfly is included in Rushbrook (2018a; 2018b). However, for ease of reference, a summary of this information is provided below.

The southern damselfly is one of Europe's and Britain's rarest and most threatened damselflies (Thompson *et al*., 2003). As a consequence of its global and national decline (Thompson *et al*., 2003; Boudot, 2006), southern damselfly are protected under European and UK legislation.

The UK populations of southern damselfly are considered to comprise a significant proportion of the European total. This species has a fragmented distribution in the UK, restricted to the south and west, with major strongholds in the New Forest, the Preseli Hills in Pembrokeshire, and on the Itchen and Test valleys in Hampshire (Thompson *et al*., 2003; Rouquette, 2005). Smaller colonies exist in Devon, Dorset and the Gower Peninsula, and single populations are present in both Anglesey and Oxfordshire (Thompson *et al*., 2003).

The River Itchen is of national and international significance for this species (Thompson *et al*., 2003; Rouquette, 2005). The importance of this population is reflected by its inclusion in the River Itchen SSSI citation, and its identification as one of the primary reasons for the designation of the River Itchen SAC. However, recent studies have identified an increase in the fragmentation, and an associated decline in the extent and resilience, of the Itchen Valley metapopulation (Rouquette, 2005; Rushbrook, 2018a; 2018b).

Furthermore, the historic water meadow network at Itchen Valley Country Park supports a population of southern damselfly considered to be of national importance (Thompson *et al*., 2003), and with Allington Manor Farm and (to a lesser degree) West Horton Farm, is considered to be a highly important population 'complex' in the lower Itchen Valley (Rouquette, 2005; Rushbrook, 2018b). However, recent studies have indicated a potential decline in the strength of the population at Itchen Valley Country Park, and it is considered that urgent conservation action for this species is required at this site (Rouquette, 2005; Rushbrook, 2018b; 2018c). Therefore, the delivery of habitat enhancement and / or creation works to increase the numbers and distribution of southern damselfly at the site would be highly valuable, both in terms of increasing the strength and resilience of the resident population, but also by its inherent potential value as a source population for the wider Itchen Valley metapopulation.

1.4 Remit and Scope of the Report

This report presents the findings of a study to identify, develop and prioritise potential habitat enhancement and creation opportunities for southern damselfly at Itchen Valley Country Park. It is intended that the opportunities identified within this report will complement habitat enhancement and creation opportunities for southern damselfly identified across and adjacent to the Eastleigh Borough boundary. It is therefore strongly recommended that this report is read in conjunction with a recently developed strategic conservation plan for southern damselfly in that area (Rushbrook, 2018b).

It is therefore the specific intention of this report to outline habitat enhancement and creation opportunities identified at Itchen Valley Country Park and assesses them in terms of their:

a. relative or site-specific value in increasing the distribution, robustness and resilience of the southern damselfly population at Itchen Valley Country Park, and
b. habitat enhancement and creation potential in the context of the wider Itchen Valley metapopulation as set out in Rushbrook (2018b).

It is emphasised that this report represents a summary of the habitat enhancement and creation opportunities identified and discussed during a walk over survey at Itchen Valley Country Park in May 2018, and a subsequent supplementary walk over survey conducted by the author in November 2018, providing an overview of the opportunities present based on the information currently available. It is not intended to provide detailed plans on their design and / or delivery, and some opportunities may in fact require hydrological and topographical studies to be conducted to confirm their feasibility and assess their potential impacts on habitat that is currently supporting southern damselfly.

2. METHODOLOGY

Potential habitat enhancement and creation opportunities were assessed and developed based upon the observations and discussions generated during a walk over survey conducted with staff and representatives of Eastleigh Borough Council in May 2018, and a subsequent supplementary walk over survey conducted by the author in November 2018. This assessment focused on the carrier streams and ditch network associated with the floodplain meadows of Itchen Valley Country Park. Though this assessment focused on these watercourses, a concurrent assessment was conducted of the surrounding habitat in order to facilitate the identification of potential habitat creation opportunities.

However, on completion of the walk over surveys and based on the information currently available to the author, it was not considered appropriate to make recommendations for habitat creation at Itchen Valley Country Park. The historic network of floodplain meadow carrier steams and ditches at this site is complex, and it is therefore considered that a detailed hydrological study would be necessary before any notable alterations are made to water level management at the site (e.g. the re-connection of paleo-channels or defunct elements of the historic water meadow network). This is particularly relevant given (based on on-site discussions in May 2018) the author's understanding that securing sufficient water supply to support perennial flows through the existing network has been challenging in multiple years in the past decade.

Based upon the results of these assessments, habitat enhancement opportunities were identified that would increase the range, density, and / or connectivity of southern damselfly across the floodplain carrier stream and ditch network. Opportunities were then assessed based on the selection criteria and prioritisation processes outlined below and in Rushbrook (2018b), in order to identify the most valuable opportunities based upon:

a. their potential positive effect on the distribution, robustness and resilience of the southern damselfly population at Itchen Valley Country Park;
b. their potential positive effect on southern damselfly population(s) / metapopulation dynamics, and the author's level of confidence in their deliverability.

2.1 Habitat Assessment and Selection of Enhancement Opportunities

Attributes considered when assessing the current suitability of carrier streams and ditches to support southern damselfly included water flow, the presence and level of shading, the presence and composition of emergent and bankside vegetation, and substrate composition. Watercourses wholly or partially characterised by the conditions set out in Section 1.3.1 above were considered of optimal or sub-optimal suitability to support southern damselfly. In contrast, watercourses were considered to be 'unsuitable' for southern damselfly if they were wholly or largely characterised by one or a combination of the following (for detailed explanation see Rushbrook, 2018a):

- Absence of water within the watercourse at the time of survey;
- Watercourse supported water but absence of discernible flow;
- Watercourse was deep and / or fast flowing with little to no emergent marginal herbaceous vegetation for oviposition (egg-laying);
- Watercourse wholly or extensively shaded by bank top / bankside trees and scrub, or tall monocotyledon vegetation; and
- Presence of thick red / ochre layer on the surface of water within one or more sections.

A concurrent assessment of the potential future suitability of carrier streams and ditches to support southern damselfly following habitat enhancement was also conducted. Key over-arching considerations in the selection and assessment of the value and feasibility of all identified habitat enhancement opportunities included:

- the scope of the opportunity and its location relative to the current distribution of southern damselfly at the site;
- the degree of certainty / evidence that a perennial supply of flowing water through the watercourse could be secured;
- that the resources required for its delivery and success were considered to be proportionate to the potential value of the delivered outputs; and

- confidence that the enhancement measures would not result in the loss of habitat / features that are (potentially) of value or importance for other important ecological features / species (potentially) present on site.

2.2 Site-Specific Prioritisation of Habitat Enhancement Opportunities

A number of potential habitat enhancement opportunities were identified at Itchen Valley Country Park based on the key habitat characteristics and over-arching considerations outlined in Section 2.1. However, it must be acknowledged that it is highly unlikely that it will be feasible to deliver all habitat enhancement opportunities identified in their entirety for a number of reasons.

Firstly, it is understood that there is an insufficient supply of water available to the site to achieve the required perennial flow through all potential watercourses identified. Therefore, these opportunities will not only be in competition with each other for this finite supply, but may also have the potential to impact on the supply of water to other watercourses currently supporting (suitable habitat for) southern damselfly.

Furthermore, it is highly likely that any future resources available for the delivery of the identified opportunities will be limited, and would not allow for the delivery of all the opportunities identified even if they were practically feasible. Finally, Itchen Valley Country Park supports a variety of other important flora and fauna; therefore, any individual opportunities proposed must consider the potential impacts on the wider ecological value of the site.

It is therefore crucial that the breadth of opportunities identified can be prioritised to inform any future decisions on habitat enhancement work at the site. This process must allow for the delivery of a programme of work(s) that provides the maximum benefits for southern damselfly, for the most effective and efficient utilisation of the resources available, and with appropriate consideration of the wider ecological value of the site. Therefore, a suite of criteria have been identified that allows for the breadth of opportunities to be directly compared in detail (Table 1).

It is emphasised that these criteria include a combination of objective and subjective measures. Furthermore, the assessments of these criteria were based on the author's knowledge, understanding and experience of the:

- requirements of southern damselfly;
- delivery of such enhancement opportunities;
- status of southern damselfly;
- likelihood of support of relevant persons and organisations for the measures that will be required to deliver the identified opportunities.

Each habitat enhancement opportunity was scored between 1 and 3 for each criteria based on the conditions presented in Table 1, and the mean of these scores was calculated to provide an overall *site-specific score* of the opportunities for southern damselfly. The *site-specific priority score* of the individual opportunities for southern damselfly was then assessed as:

- Low Priority – mean value of scores ≤1.75.
- Medium Priority – mean value of scores >1.75 but ≤2.
- High Priority – mean value of scores >2.

2.3 Strategic Selection Criteria for Habitat Enhancement Opportunities

The Itchen Valley is of national and international significance for southern damselfly, with Itchen Valley Country Park of particular importance both within the local and national context (Thompson *et al*., 2003; Rouquette, 2005; Rushbrook, 2018b).

Therefore, in addition to prioritising the value of the identified opportunities in terms of their relative value in improving the distribution, robustness and resilience of the southern damselfly population at the site, it is considered appropriate to assess them in the context of their relative potential to strengthen these same three elements of the Itchen Valley metapopulation also.

Table 1: Assessment criteria for prioritisation of habitat enhancement opportunities.

Assessment criteria	**Assessment Criteria Score**		
Description	**1**	**2**	**3**
Extent (approximate)	Length of habitat to be enhanced less than 100m	Length of habitat to be enhanced between100m and 200m	Length of habitat to be enhanced greater than 200m
Value	Will enhance the value of a watercourse considered to support strong numbers / required to maintain the value of a watercourse considered to support a low number of southern damselfly	Will enhance the value of watercourse considered to support medium to low numbers / required to maintain the value of a watercourse considered to support medium number of southern damselfly	Provide suitable habitat on a watercourse currently (largely) unsuitable / required to maintain the value of a watercourse considered to support a strong number of southern damselfly
Connectivity*	Unlikely to result in an improvement in the dispersal capability of southern damselfly across the site	Likely to result in a moderate improvement in the dispersal capability of southern damselfly across the site	Likely to result in a considerable improvement in the dispersal capability of southern damselfly across the site
Perennial water flow†	Low certainty that sufficient water supply can be secured and / or that proposals will track existing site topography to provide perennial flow	Moderate certainty that sufficient supply of water can be secured and that proposals will track existing site topography to provide perennial flow	High certainty that perennial flow can be achieved / the manipulation of water level management not included within proposals
Scale of capital works	Major capital works required (e.g. substantive tree / scrub removal, substantive excavation, connection to existing network, etc.)	Moderate capital works required (e.g. less extensive tree and / or scrub removal, rotational ditch clearance, excavation, etc.)	Minor capital works required (e.g. removal of a small number of tree limbs, limited ditch clearance, etc.)
Wider ecological considerations	Opportunity identified potentially has a moderate / low, short term impact on an important / protected species or habitat and limited mitigation measures will be required to ensure that there will be no long term impact	Delivery of works can be timed and / or designed to avoid / minimise likelihood of impact on important / protected species or habitats	No important / protected species or habitats identified that required consideration
Provision of Infrastructure	No improvement in the ability of Eastleigh Borough Council to manage the site for southern damselfly	Allows for more effective management of a small area of the site known to support southern damselfly	Allows for more effective management of a medium (or greater) area of the site known to support / an area where the habitat is currently unsuitable for southern damselfly due to under-management.

* Specifically relates to watercourses other than itself

† Opportunities where no evidence that a perennial water supply could be secured in the future have already been scoped out

A recent study exploring habitat enhancement opportunities for southern damselfly within and adjacent to the Eastleigh Borough boundary (Rushbrook, 2018b) assessed the 'potential' of the individual opportunities identified based on three categories of criteria. The opportunities identified at Itchen Valley Country Park were therefore assessed against these, to ensure that opportunities identified within this study could be directly compared with those identified at other sites in the lower Itchen Valley. This would allow for Itchen Valley Country Park to be fully incorporated within any future assessment and delivery of strategic measures for southern damselfly in this area.

The three categories of criteria identified by Rushbrook (2018b) are:

1. The *value* of the opportunities identified for southern damselfly;
2. The *feasibility* of their delivery and long-term 'success' of the opportunities identified;
3. The level of *support* and / or engagement it is considered that the opportunities would receive from landowners, angling clubs and other relevant stakeholders; this criteria also includes the discretion of the author to decide that, on more detailed consideration, the resources required to deliver works were considered to be disproportionate when assessing the potential value of delivered outputs.

These categories are further divided into a number of criteria as outlined below, and are described in more detail in Table 2. There are inherent synergies between the strategic criteria, and those used to prioritise these opportunities at the site level (see Section 2.2). Indeed, the strategic criteria are essentially an extension of the site-specific criteria to allow for comparative assessment of opportunities across a suite of sites. Furthermore, as set out above, it is emphasised that these criteria include a combination of objective and subjective measures, and their assessment were therefore based on the author's knowledge, understanding and experience (as set out in Section 2.2).

2.3.1 Value

The three criteria selected to assess the value of the identified opportunities for southern damselfly were:

- Physical extent of the enhanced habitat;
- Strategic value of works for southern damselfly;
- Level of threat of loss or degradation of population.

The assessment of physical extent to be enhanced was based on the length suitable for enhancement, rather than the total length of the watercourse where these differed.

Each opportunity was scored between 1 and 4 for each criteria based on the conditions set out in Table 2, and the mean of these scores was calculated to provide an overall *value* of the opportunities for southern damselfly. The *value* of the individual opportunities for southern damselfly was then assessed as:

- Low – mean value of scores ≤1.5
- Moderate – mean value of scores >1.5 but ≤3
- High – mean value of scores >3

2.3.2 Feasibility

The four criteria selected to assess the feasibility of the delivery and long-term 'success' of the identified opportunities for southern damselfly were:

- Level of certainty that opportunities can secure a sufficient supply of water and / or will track the existing site topography to provide a perennial slow to moderate flow of water;
- Scale of works / level of resources required for the delivery of the enhancement;
- Sustainability / long-term security of appropriate management of enhanced habitat;
- Wider ecological considerations of works.

Each opportunity was scored between 1 and 4 for each criteria based on the conditions set out in Table 2, and the mean of these scores was calculated to provide an overall *feasibility* of the opportunities for southern damselfly. The value of the individual opportunities for southern damselfly was then assessed as:

- Low – mean value of scores ≤1.5
- Moderate – mean value of scores >1.5 but ≤3
- High – mean value of scores >3

It is important to recognise that assessment criteria scores represent relative (rather than absolute) values, and are based on the current situation / knowledge of the author. Although this is relevant for all criteria across the three categories, it is particularly relevant for the first three criteria set out above.

Table 2: Assessment criteria conditions for the value, feasibility and level of support afforded to proposed habitat enhancement opportunities.

Category	Assessment Criteria	Assessment Criteria Score			
		1	**2**	**3**	**4**
Value	Extent (approximate)	Length of habitat to be enhanced less than 50m	Length of habitat to be 50m or greater but less than 200m	Length of habitat to be enhanced 200m or greater but less than 500m	Length of habitat to be 500m or greater
	Strategic value of works for southern damselfly	Uncertainty exists with regards to potential impacts of option on existing numbers / distribution of southern damselfly at site (i.e. potential implications on water level management)	Increase the resilience of an existing population at a site located >500m* from a known population	Increase the resilience of an existing 'strong' population at a site located ≤500m* of a known population / create a new site for southern damselfly located >500m* from a known population	Increase the resilience of an existing 'medium' or 'weak' population at a site located ≤500m* of a known population / create a new site for southern damselfly ≤500m* from a known population
	Threat of population loss / degradation	No existing population present at site / 'strong' population at site with no threats to population identified	'Medium' population with no threats to population identified	'Weak' population with no threats to population identified / medium-term threats to existing population identified (e.g. habitat degradation through current management)	Population considered to be in decline and / or short-term threats to existing population identified (e.g. habitat loss through development pressure / current management)
Feasibility	Perennial water flow†	Low certainty that sufficient water supply can be secured	Moderate certainty that sufficient supply of water can be secured	High certainty that sufficient supply of water can be secured	Certain that perennial flow can be achieved / manipulation of water level management not required
	Scale of capital works	Major capital works required (e.g. substantive tree / scrub removal, substantive excavation, connection to existing network, etc.)	Moderate capital works required (e.g. less extensive tree and / or scrub removal, rotational ditch clearance, limited excavation, etc.)	Minor capital works required (e.g. removal of a small number of tree limbs, limited ditch clearance, etc.)	No capital works required
	Sustainability / security of appropriate management	Notable changes in habitat management required for delivery of option (e.g. from crops to hay or pasture)	Moderate changes in habitat management required and / or future practices likely to be employed are considered labour intensive (e.g. regular scrub / vegetation clearance, regular ditch clearance etc.)	Minor changes in management required and / or future practices likely to be employed considered passive or less labour intensive (i.e. periodic management of scrub / vegetation, periodic ditch clearance, adjustment to grazing practices, etc.)	No changes in passive (e.g. grazing) management required
	Wider ecological considerations‡	Opportunity potentially has a moderate / low, short term impact on an important / protected species or habitats and extensive mitigation measures will be required to ensure that there will be no long term impact	Opportunity potentially has a moderate / low, short term impact on an important / protected species or habitats and limited mitigation measures will be required to ensure that there will be no long term impact	Delivery of works can be timed and / or designed to avoid / minimise likelihood of impact on important / protected species or habitats	No important / protected species or habitats identified that require consideration
Support	Level of support / engagement	Understood that one or more relevant interest groups would not support delivery	Considered unlikely that all relevant interest groups would support delivery	Considered moderately likely that all relevant interest groups would support delivery	Considered likely that all relevant interest groups would support delivery

* Based on findings of Rouquette (2005).

† Any opportunities where there is no evidence that a perennial water supply could be secured in the future have already been scoped out.

‡ Any opportunities that are considered likely to result in the long term negative impact on other important habitats and / or species (potentially) present at the site have already been scoped out.

For example, the terms used to reflect the scale of works – major, moderate and minor – indicate the level of resources and complexity of works required in comparison with each other (i.e. other habitat enhancement / creation works for southern damselfly). Indeed, when considered in the context of the level of resources and complexity of works required for other schemes of works (e.g. infrastructure works associated with the delivery of Eastleigh Borough Council's Local Plan), the perceived constraints associated with the scale of works may in fact be considered to be minimal for a number of the proposed habitat enhancement opportunities.

Furthermore, there exist inherent difficulties in accurately assessing opportunities that will manipulate water levels based solely on the information that can be collected on walk over surveys. As a consequence, a precautionary approach was adopted when assessing the level of certainty that sufficient water can be secured. It is therefore possible that the feasibility of a number of habitat enhancement opportunities may have been assessed too conservatively or underestimated.

2.3.3 Support

Each identified opportunity was scored between 1 and 4 based on the conditions set out in Table 2, with the level of likelihood of support / engagement for the individual opportunities for southern damselfly assessed as:

- Not supported – score = 1
- Unlikely – score = 2
- Moderately likely – score = 3
- Likely – score = 4

It is emphasised that, the assessments of the level support were based on the current situation / knowledge of the author, and a precautionary approach was adopted when making this assessment. It is therefore feasible that these assessments may have either been too conservative, or the level of support could markedly shift should there be a change in the position of relevant interest groups.

2.4 Habitat Enhancement Potential

The assessment of the potential likelihood that the proposed enhancement opportunities could be delivered was calculated in the following way:

[Value (mean) + Feasibility (mean)] x Support

The potential that the opportunities were currently deliverable was then assessed as:

- Very low potential / likelihood to succeed – score = <8
- Low potential / likelihood to succeed – score = ≥8 but <12
- Moderate potential – score = ≥12 but <18
- High potential – score ≥18

It is considered that this calculation provides a realistic indication of the potential likelihood of successfully delivering the opportunities. Additional weight has been afforded to the support / engagement category since, without the agreement and support of landowners, angling clubs and other relevant stakeholders, it is considered unrealistic to consider that these opportunities will be successful in the long term.

2.5 Limitations on Assessments

Access to channel margins and / or a continuous view of the watercourse during site visits was restricted across a number of watercourses visited, either as a consequence of tall, dense bankside and bank top monocotyledon vegetation, or as a result of being enclosed within scrub and / or trees. However, since regular access to the watercourse was gained along the length of all considered, this did not impact on the surveyor's ability to assess the suitability of the habitat present, nor their ability to provide recommendations that identify opportunities for enhancing the suitability of these carrier streams and ditches for southern damselfly. In fact, the presence of these habitat features inherently indicates that the relevant (sections of) watercourse is, at best, of sub-optimal quality for southern damselfly, and most likely unsuitable for the species.

It is important to clarify that the assessment of the opportunities are based on observations made during two walk over surveys, and therefore there exists an inherent degree of error when making subjective assessment in this manner. It is therefore possible, as outlined for specific criteria above, that some opportunities may have been too conservatively assessed or undervalued with regards to one or more criteria.

In addition, it is considered difficult to accurately assess opportunities that will manipulate water levels based on walk over surveys only. These difficulties relate both to the level of certainty that a perennial slow to moderate flow of water can be secured, and the potential impacts on existing numbers / distribution where modifications of the water level management that could / will effect watercourses currently supporting southern damselfly.

2.6 Data Analysis

All data analysis was performed using Microsoft® Excel 2010.

3. RESULTS AND ANALYSIS

3.1 Habitat Assessments

Habitat assessments were conducted on 26 watercourses at Itchen Valley Country Park (Map 3; Table 3), including four watercourses (i.e. watercourse no. 1-4) included within studies conducted in 2017 and / or 2018 by Rushbrook (2018a; 2018c), and five watercourses (i.e. watercourses MD1-MD5) included within the long-term monitoring study.

Five of the watercourses assessed were considered to support sections of optimal habitat for southern damselfly, though the relative extent of the optimal habitat varied between these five watercourses, as did the suitability of the remaining sections for this species (Table 3). A further nine watercourses were assessed to support sections of sub-optimal habitat for southern damselfly, although these were also variable in the relative extent of sub-optimal habitat provided.

Finally, it was considered that 12 of the 26 watercourses assessed were wholly or largely unsuitable for southern damselfly (Table 3). This was a consequence of either extensive shading by bankside and bank top trees, scrub and vegetation, and / or the absence of a discernible flow of water through the watercourse at the time of survey(s).

3.2 Assessment of Potential for Habitat Enhancement

It is considered that there is no potential for habitat enhancement at ten of the 26 watercourses assessed. This is either a consequence of their existing ecological value for other fauna and flora (i.e. watercourses 1a, 9a and 12), the absence of evidence that a perennial water supply could be secured in the future (i.e. watercourses 5, 6, 16, 17 and MD2), and / or the requirement for substantial tree and scrub clearance (i.e. watercourses 4a, 6, 12 and 13), which would both have potential implications for other ecological interest features at the site and require considerable resources.

However, habitat enhancement opportunities exist for the remaining 16 watercourses assessed (Map 4). Furthermore, the necessity for infrastructure improvements have been identified for the main control structure towards the centre of the site (Map 4, Photograph 1), and a ford at the junction of watercourses 10 and 13 (Maps 3 and 4, Photograph 2), currently used for vehicular and cattle crossing. This is considered important both to facilitate the ease of delivery of other habitat enhancement opportunities identified, and to tackle a potentially damaging source / vector for the mobilisation of sediment (Photograph 3) and nutrients to the watercourses present in the lower half of Itchen Valley Country Park, and the wider River Itchen SSSI / SAC.

3.3 Habitat Enhancement and Infrastructure Improvement Opportunities

An outline of the identified habitant enhancement and infrastructure improvement opportunities are provided below. It is emphasised that it is considered highly unlikely that it will be feasible (or necessarily desirable) to deliver all these enhancements in their entirety (see Section 2.2.). Furthermore, the outlines provided below do not represent detailed design plans, and hydrological and topographical studies will be required to assess a number of measures to confirm their feasibility and potential impacts on the current distribution of southern damselfly at the site.

3.3.1 Habitat enhancement opportunities

Habitat enhancement opportunities were identified for 16 of the 26 watercourses assessed (Map 4), with a further ten watercourses considered unfeasible or unsuitable as set out in Section 3.2 above.

It was observed that the existing grazing regime at the site has facilitated the development of suitable habitat features such as marginal berms supporting herbaceous vegetation and roosting habitat for adults on and associated with sections of a number of the watercourses. However, as outlined in Table 3, tall monocotyledon and / or dicotyledon vegetation dominates other sections of bankside and tops to a greater or lesser degree. Therefore, it is recommended that a programme of rotational ditch clearance is designed and implemented for a number of watercourses (Table 3) to facilitate the growth of emergent herbaceous vegetation along the margins of these channels. It is emphasised that this should focus on reducing the extent of encroaching monocotyledon and / or dicotyledon vegetation, without increasing the original depth or bank top width of the channel.

Table 3: Summary of southern damselfly status and suitability of watercourses included within habitat assessments at Itchen Valley Country Park.

Number	Watercourse Type	Southern Damselfly Status[†]	Habitat Suitability	Potential for Habitat Enhancement	Assessment Justification
1	Carrier Stream	Medium	Sub-optimal to unsuitable	**Yes**	This section of the carrier stream did support sections with a slow to moderate flow over shallow, silt dominated margins, supporting emergent herbaceous plant species for ovipositing / larval habitat beneath. However, large extents of the bank tops were perched above the channel and dominated by tall monocotyledon vegetation such as reed sweet-grass *Glyceria maxima*, herbs and ruderals, with localised patches of willow *Salix* spp. and bramble *Rubus fruticosus* agg. scrub.
1a*	Carrier Stream	Unknown (likely low)	Sub-optimal to unsuitable	No	This section of the carrier stream was enclosed with fencing providing a refuge area for a number of other species; it was characterised by bank tops perched above the channel, dominated by tall monocotyledon vegetation such as reed sweet-grass, herbs and ruderals, with localised patches of willow and bramble scrub.
1b	Carrier Stream	Unknown (likely medium)	Optimal to sub-optimal	**Yes**	The upper section of this channel supports a slow to moderate flow throughout, is fenced on one bank in the upper third, and supported tall vegetation on both banks with localised bank top scrub. However, the lower two-thirds was open on both banks and characterised by sections supporting emergent herbaceous plant species for ovipositing / larval habitat beneath, with occasional bank top scrub.
2*	Carrier Stream	Medium	Largely unsuitable	**Yes**	This section of the carrier stream was wider and slower flowing. It supported only short sections of marginal berms to provide suitable habitat conditions for southern damselfly, with extended sections enclosed within scrub, shaded by tall bankside trees, and / or dominated by tall monocotyledons and ruderals.
3*	Carrier Stream	Low	Largely unsuitable	**Yes**	This section of the carrier was wide, slow flowing and moderately deep, characterised by extensive lengths dominated by 'ribbon weed' *Sparganium emersum* near the upstream end, and pondweed *Potamogeton* sp. further downstream. The banksides were initially dominated by dense sedge and other monocotyledons, with willow scrub becoming increasingly prevalent and then dominant on the true right bank.
4	Main River	Medium	Sub-optimal	**Yes**	This section of the main river channel was relatively wide and deep, with a moderate flow; however, the true right bank supported a mixture of tall mono- and dicotyledon vegetation, with localised areas of emergent herbaceous vegetation in front.
4a	Main River	Unknown (likely low)	Unsuitable	No	This section of the main river channel was relatively wide and deep, with a moderate flow, and shaded by mature trees and scrub on both banks.
5*	Ditch	Unknown (likely absent)	Unsuitable	No	This ditch was dominated by sedge with occasional branched bur-reed *Sparganium erectum*, with sections shaded / enclosed within bank top trees and scrub. There was no discernible flow evident during the walk over survey conducted in May 2018, and no evidence that perennial water supply could be secured in the future.

Number	Watercourse Type	Southern Damselfly Status†	Habitat Suitability	Potential for Habitat Enhancement	Assessment Justification
6*	Ditch	Unknown (likely absent)	Unsuitable	No	Medium-sized ditch supporting some areas of standing water, but no evidence of a discernible flow; extensive sections were enclosed within tall, dense bramble scrub. No evidence that perennial water supply could be secured in the future.
7*	Ditch	Unknown (likely very low)	Largely unsuitable	**Yes**	Medium-sized ditch supporting a moderate to slow flow over fine substrate throughout its length; however, the bank tops were characterised by tall mature ash *Fraxinus excelsior* trees and willow scrub upstream of its junction with watercourse 8, with areas of accumulated leaf litter and ochre-enriched sediment also evident. Downstream, scrub and mature tree cover became less dense.
8*	Ditch	Unknown (likely low)	Sub-optimal to unsuitable	**Yes**	Medium -sized ditch with a shallow bowl profile, supporting a slow to moderate flow over silt; localised patches of dense bramble, hawthorn *Crataegus monogyna* and blackthorn *Prunus spinosa* scrub were present throughout, with mature ash and willow also present in the lower half of the ditch.
9*	Ditch	Unknown (likely low)	Sub-optimal to unsuitable	**Yes**	A large ditch, supporting moderate to slow flow over silt upstream of its junction with watercourse 8, but with no flow evident downstream as water preferentially feeds into the later channel. The upstream section was characterised by tall, dense mono- and dicotyledon bankside / top vegetation with some areas of emergent herbaceous vegetation frontage.
9a*	Ditch	Unknown (likely low)	Largely unsuitable	No	A narrow to medium-sized ditch, supporting moderate to slow flow over silt upstream throughout; however, channel was largely enclosed within dense scrub and mature trees, supporting only localised sections of in-channel and / or marginal vegetation.
10*	Carrier Stream	Unknown (likely medium)	Optimal to unsuitable	**Yes**	This section of the carrier was wide, slow flowing and moderately deep, characterised by tall mono- and dicotyledon bankside / top vegetation with some areas of emergent herbaceous vegetation frontage. The upper third is fenced off and supports mature trees and scrub (providing a refuge area for multiple species), with the lower two thirds supporting some shorter sections of scrub and occasional mature ash.
11	Carrier Stream	Present (likely medium)	Optimal to unsuitable	**Yes**	A narrow to medium width section of carrier steam supporting a moderate to slow flow throughout and characterised by tall, dense mono- and dicotyledon bankside / top vegetation with some emergent herbaceous vegetation frontage.
12*	Ditch	Unknown	Unsuitable	No	This ditch was largely enclosed within mature trees and scrub on both banks.
13*	Ditch / Carrier Stream	Unknown (likely absent)	Unsuitable	No	This ditch / carrier stream supported a moderate to fast flow throughout the visible section, but was largely enclosed within mature trees and scrub on both banks.
14*	Carrier Stream	Unknown (likely low)	Sub-optimal to unsuitable	**Yes**	Medium-sized section of carrier stream with slow to moderate flow over silt throughout; located by a broken fence line with occasional scrub present on the true right bank in the lower reaches, becoming enclosed within scrub in the upper half / third.

Number	Watercourse Type	Southern Damselfly Status[†]	Habitat Suitability	Potential for Habitat Enhancement	Assessment Justification
15	Carrier Stream	Present (likely medium)	Optimal to sub-optimal	**Yes**	Medium-sized section of carrier stream supporting a predominately slow to moderate flow, though the channel narrows with an associated increase in flow for a section downstream of its junction with watercourses 16 and 17. Above this section, the channel is open with extensive emergent watercress *Nasturtium officinale*, water forget-me-not *Myosotis scorpioides* and water speedwell *Veronica* c.f. *anagallis-aquatica*, whereas downstream it is characterised by tall bankside / top vegetation.
16*	Ditch	Unknown (likely absent)	Unsuitable	No	Dry ditch, enclosed within tall, mature trees and scrub, with no evidence that perennial water supply could be secured in the future.
17*	Ditch	Unknown (likely absent)	Unsuitable	No	Dry ditch with extensive sections of tall, mature trees and scrub, and no evidence that perennial water supply could be secured in the future.
MD1*	Carrier Stream	Medium	Sub-optimal	**Yes**	Relatively wide section of carrier stream with a slow to moderate flow over silt throughout. The true right bank top was dominated by tall, dense tree and scrub cover (shading extended sections of the channel for the majority of the day), whereas the true left supported a mixture of tall mono- and dicotyledon vegetation, with emergent herbaceous frontage, occasionally extending across the width of the channel.
MD2*	Ditch	Unknown (likely absent)	Unsuitable	No	Dry ditch with no evidence that perennial water supply could be secured in the future.
MD3	Carrier Stream	High	Optimal (primarily)	**Yes**	Medium to narrow section of carrier stream supporting a slow to moderate flow over a silt substrate, and a mixture of tall mono- and dicotyledon, and emergent herbaceous vegetation, which extends completely across the channel in extended sections. Cattle access has resulted in the formation of sections with beneficial marginal berm features, which were increasingly prevalent in the upper reaches.
MD4	Ditch	Medium	Sub-optimal to unsuitable	**Yes**	Wide ditch becoming a section of carrier stream, with no visible water in the channel (ditch) upstream of its junction with watercourse 15 at the time of the May 2018 survey. Downstream of this junction (where watercourse 15 in effect becomes MD4) the carrier stream supported a slow to moderate flow (with the exception where it flows over a weir at the downstream limit of the watercourse).
MD5	Carrier Stream	Medium	Sub-optimal	**Yes**	Shallow, predominantly wide section of carrier stream located a short distance from the main river offtake; supported a moderate flow over a mix of gravels and silt, with tall monocotyledon vegetation on the true left bank, and a combination of tall mono- and dicotyledon and emergent herbaceous vegetation on the true right bank. Cattle access has resulted in the formation of sections with beneficial marginal berm features.

[†] Strength of southern damselfly status based on all visits (formal watercourse surveys and walk over surveys) conducted by Rushbrook in 2017 and 2018.

***** Unable to access the entire watercourse length due to dense and / or tall bankside vegetation / scrub.

Nonetheless, this programme must not be unduly rigid, but be subject to continual assessment and responsive to the current habitat characteristics of the relevant watercourses. Specifically, where cattle grazing is already creating suitable conditions, it is not recommended that rotational clearance is undertaken, and could instead be re-assigned to another (sections of) watercourse where it is required at that time.

Watercourse 1

It is recommended that the localised patches of willow and bramble scrub are cleared from within a minimum of 5m of both banktops. Furthermore, it is recommended that sections of dense, extensive marginal / bank top monocotyledon vegetation are cleared over a period of 3 - 5 years using hand or power tools, with the arisings taken away from the bank tops. This will ensure that an abundance of suitable emergent herbaceous vegetation for oviposition is provided along the length of this watercourse, and will be maintained in the long term through the existing grazing regime at the site.

Watercourse 1b

The upper third of this watercourse is fenced off, providing an area of refuge for a range of species, and it is not considered appropriate to undertake habitat enhancement works for southern damselfly on this section.

However, the lower two-thirds of the channel currently provide optimal to sub-optimal habitat for southern damselfly, and therefore no immediate management work is required. However, if required in the future, it is recommended that if sections of dense, extensive marginal / bank top monocotyledon vegetation develop in the future, these are cleared over a period of 3 - 5 years using hand or power tools, with the arisings taken away from the bank tops.

Watercourse 2

It is recommended that willow, hawthorn and all other scrub (Photograph 4) is removed from within a minimum of 5m of both bank tops. Mature bank top trees should be retained, though the selective removal of limbs that overhang the channel is also recommended.

Furthermore, it is recommended that this watercourse is included within a programme of rotational ditch clearance (implemented as required), focusing on reducing the extent on encroaching monocotyledon vegetation without increasing the original depth or bank top width of the channel.

Watercourse 3

It is recommended that all areas of localised scrub and young alder are cleared from within a minimum of 5m of the true right bank, but with the wooded ditch to the west of the watercourse retained in its entirety (Map 4).

Furthermore, it is recommended that this watercourse is included within a programme of rotational ditch clearance (implemented as required), focusing on reducing the extent on encroaching monocotyledon vegetation without increasing the original depth or bank top width of the channel.

Watercourse 4

It is recommended that localised bankside re-profiling is undertaken along the true right bank to create marginal berms and / or sections of two-staged bankside to facilitate the expansion of emergent herbaceous vegetation at the margins of this section of main river channel. If feasible, it is recommended this is achieved by submerging approximately 1m of bank edge beneath the water level typically experienced during mid-summer.

Watercourse 7

The majority of watercourse 7 is enclosed within dense scrub and tall trees and is considered both currently unsuitable for southern damselfly, and unsuitable for enhancement due to the substantial tree and scrub clearance and on-going management that would be required.

However, it is recommended that tree and scrub clearance is undertaken between the junctions of this watercourse and watercourses 8 and 1a (Map 4). Following clearance works, it is likely that bankside re-profiling of this section of the watercourse would further increase the suitability of this reach for southern damselfly and, in this instance, would also be recommended.

Watercourse 8

It is recommended that all scrub cover (Photographs 5 and 6) should be cleared from within a minimum of 5m of both bank tops, including (but not limited to) bramble, hawthorn, blackthorn and willow. However, semi-mature and mature ash trees should be retained.

Watercourse 9

It is recommended that all patches of localised scrub (e.g. willow, bramble, etc.) are removed from the true left bank of this watercourse between the main control structure and the junction of watercourse 8 with this watercourse (Map 4).

Furthermore, it is recommended that this section of watercourse 9 is included within a programme of rotational ditch clearance (implemented as required) and, where required, bankside re-profiling, focusing on reducing the extent of encroaching mono- and dicotyledon vegetation without increasing the original depth or bank top width of the channel.

It is consider that further enhancement of watercourse 9 may be feasible based on the results of the recommended investigation of the main control structure at the centre of the site (see infrastructure improvement 2 in Section 3.3.2). However, no recommendations can be made without this information, due to concerns that any enhancement of this section may be delivered at the expense of watercourse 8.

Watercourse 10

The upper third of this watercourse is fenced off, providing an area of refuge for a range of species, and is not considered appropriate to undertake habitat enhancement works for southern damselfly on this section. However, the clearance of scrub (with all mature trees retained) from within a minimum of 5m of both bank tops along the lower third-thirds of this watercourse (Photograph 7) would be beneficial and potentially more acceptable.

Finally, it is recommended that targeted ditch bankside re-profiling is undertaken to create marginal berms and / or sections of two-staged channel, in order to facilitate the expansion of emergent herbaceous vegetation within reaches characterised by deeper, slower flowing water.

Watercourse 11

It is recommended that willow, bramble and all other scrub is removed from within a minimum of 5m of both bank tops. However, mature bank top trees, in particular a large ash (Photograph 8) with a number of features of ecological interest such as woodpecker holes, cracks and splits that has potential to support roosting bats, should be retained.

Furthermore, it is recommended that this watercourse is included within a programme of rotational ditch clearance (implemented as required), focusing on reducing the extent of encroaching mono- and dicotyledon vegetation without increasing the original depth or bank top width of the channel.

Watercourse 14

It is recommended that all scrub is cleared from within a minimum of 5m of the true right bank top of watercourse 14, with all branches overhanging from the true left bank also removed.

Furthermore, it is recommended that this watercourse is included within a programme of rotational ditch clearance (implemented as required), focusing on reducing the extent of encroaching mono- and dicotyledon vegetation without increasing the original depth or bank top width of the channel.

Finally, it is recommended that the control structures at both the down- upstream extent of this channel are investigated and, if considered necessary and feasible, altered to secure the desired supply of a slow to moderate perennial flow of water from the main river and through watercourses 13, 10 and the lower half of the site (Maps 3 and 4).

Watercourse 15

It is recommended that this watercourse is included within a programme of rotational ditch clearance (implemented as required), with a particular focus on the section between its junctions with watercourses 16 and MD4 (Maps 3 and 4), and concentrating on reducing the extent of encroaching

mono- and dicotyledon vegetation without increasing the original depth or bank top width of the channel.

Watercourse MD1

It is recommended that all scrub is cleared from the true left bank top of watercourse MD1, but with all mature trees retained. Furthermore, the removal of all scrub (including semi-mature willows), and selective removal of tree limbs, that overhang the channel from the true right bank top is also recommended (Photograph 9).

Watercourse MD3

It is recommended that the scrub associated with a bridge that crosses the lowers reaches of the channel is cleared.

Furthermore, it is recommended that this watercourse is included within a programme of rotational ditch clearance (implemented as required), focusing on reducing the extent of encroaching mono- and dicotyledon vegetation without increasing the original depth or bank top width of the channel.

Watercourse MD4

The majority of watercourse MD4 is dry and there is no evidence that perennial water supply could be secured in the immediate future. However, should an increase supply of water from MD5 be secured, it is recommended that habitat opportunities for this watercourse are re-assessed.

However, it is recommended that the lower third of the watercourse, where it effectively becomes a continuation of watercourse 15 (Map 4), is included within a programme of rotational ditch clearance (implemented as required), focusing on reducing the extent of encroaching mono- and dicotyledon vegetation without increasing the original depth or bank top width of the channel.

Watercourse MD5

It is recommended that the control structure immediately beyond the upstream limit of watercourse MD5 is investigated to determine whether any measures are required to ensure that an adequate year-on-year perennial supply of water is secured.

Furthermore, it is recommended that this watercourse is included within a programme of rotational ditch clearance (implemented as required), focusing on reducing the extent of encroaching mono- and dicotyledon vegetation without increasing the original depth or bank top width of the channel.

3.3.2 Infrastructure improvement opportunities

Two infrastructure improvement opportunities (Map 4) have been identified that are considered to provide benefits both for southern damselfly, and for the management / ecology of the wider Itchen Valley Country Park.

Infrastructure improvement 1

It is recommended that a new bridge is constructed to cross the top of watercourse 10 at the location of the existing ford (Map 4; Photograph 2). This should be of an appropriate design that allows the relevant vehicles and machinery (required for the delivery of habitat management / enhancement) access across the site, as well as being suitable for cattle crossing.

The area around this crossing, which is currently suffering the detrimental impacts of erosion through poaching and vehicle movements, should be temporarily fenced off to facilitate the regeneration of vegetation in this area, and associated reduction in sediment and nutrient mobilisation and transportation (Photograph 3).

Infrastructure improvement 2

It is recommended that the main control structure towards the centre of the site (Photograph 1) is investigated to determine whether current water level management across the lower half of Itchen Valley Country Park is achieving the maximum benefits for southern damselfly and wider biodiversity / ecological interest features at the site and, if not, adjusted to achieve so.

3.4 Site-Specific Prioritisation of Enhancement and Improvement Opportunities

The site-specific prioritisation assessments identified two habitat enhancement and both infrastructure improvement opportunities as being of high priority (Table 4). A further ten habitat enhancement opportunities were assessed to be of medium priority, and the remaining four opportunities as low priority (Table 4).

Table 4: Results of the site-specific prioritisation assessment of habitat enhancement and infrastructure improvement opportunities.

ID	Assessment Criteria Score*							Priority Level
	Extent	Value	Connectivity	Water flow	Scale	Ecology	Infra-structure	
1	2	2	1	3	2	2	1	**Medium**
1b	2	2	1	3	3	2	1	**Medium**
2	3	2	1	3	1	1	1	**Low**
3	2	2	1	3	2	1	1	**Low**
4	2	2	1	3	1	1	1	**Low**
7	1	3	2	3	2	1	1	**Medium**
8	3	3	3	3	1	2	1	**High**
9	2	2	2	3	2	2	1	**Medium**
10	3	2	3	3	1	1	1	**Medium**
11	3	2	3	3	2	1	1	**High**
14	3	3	2	3	1	1	1	**Medium**
15	3	2	2	3	2	1	1	**Medium**
MD1	3	2	2	3	1	2	1	**Medium**
MD3	2	3	2	3	1	1	1	**Medium**
MD4	1	2	1	3	3	1	1	**Low**
MD5	1	2	3	3	2	2	1	**Medium**
II1	3	2	2	3	2	2	2	**High**
II2	3	2	1	3	1	2	3	**High**

* As set out in Table 1

All habitat enhancement and infrastructure improvement opportunities were associated with watercourses that currently support a suitable slow to moderate perennial flow for southern damselfly, and therefore received the maximum score for *water flow* (Table 4). Furthermore, all habitat enhancement opportunities inherently received the lowest score for the infrastructure criteria.

The two habitat enhancement opportunities identified as high priority (i.e. watercourses 8 and 11) comprised an extensive length of watercourse (i.e. Extent = 3), were considered likely to result in a considerable improvement in the dispersal capability of southern damselfly across the site (i.e. Connectivity = 3), and only scored poorly in one of the remaining three criteria (i.e. Value, Scale and Ecology).

While, the two infrastructure improvement opportunities also scored highly on the extent of their positive influence on southern damselfly at the site, since their implementation should have a net benefit for this species across all channels downstream, their final assessment as being of high priority was also largely a consequence of their higher infrastructure scores, and due to the fact the impact of their delivery could be minimised through appropriate mitigation (Table 4).

Although no clear pattern could be identified for those habitats identified to be of medium priority (Table 4), it was noted that seven of the ten opportunities (i.e. watercourses 1b, 9, 10, 14, 15, MD1, MD5) returned the maximum score for this category (i.e. a mean score of 2). In contrast, it was noted that only the four habitat enhancement opportunities identified to be of a low priority scored poorly on both connectivity and ecological considerations (Table 4).

3.5 Strategic Assessment of Enhancement and Improvement Opportunities

It was considered that with the exception of two habitat enhancement opportunities, specifically those on watercourses 14 and MD5, all identified opportunities were considered to be of high potential (Table 5; Appendix 1) within the context of the delivery of strategic conservation plan for southern damselfly within and adjacent to the Eastleigh Borough boundary (see Rushbrook 2018b for more details).

Table 5: Summary of the results of the strategic assessment of habitat enhancement and infrastructure improvement opportunities.

Enhancement / Improvement ID	Value	Feasibility	Support	Current Potential
1	Medium	Medium	High	**High**
1b	Medium	High	High	**High**
2	High	Medium	High	**High**
3	Medium	Medium	High	**High**
4	Medium	Medium	High	**High**
7	Medium	Medium	High	**High**
8	High	Medium	High	**High**
9	Medium	High	High	**High**
10	High	Medium	High	**High**
11	High	Medium	High	**High**
14	High	Medium	Low	**Low**
15	High	Medium	High	**High**
MD1	High	Medium	High	**High**
MD3	High	Medium	High	**High**
MD4	High	Medium	High	**High**
MD5	High	High	Not Supported	**Very Low**
II1	High	Medium	High	**High**
II2	High	High	High	**High**

This is a consequence of the fact that those opportunities considered being of high potential lie within the boundary of Itchen Valley Country Park, and it has been assumed that these would be supported by Eastleigh Borough Council (Table 5; Appendix 1). In contrast, the upstream control structures included within recommendations for watercourses 14 and MD5 lie beyond the boundary of the site, and it is known or understood that permanent alterations to these structure would not be supported by other relevant interest groups.

If the former assumption is incorrect, for example if specific opportunities are considered by Eastleigh Borough Council to have the potential to negatively impact their management or other ecological interest features at the site, this would have substantial implications for the current potential of those specific opportunities.

Twelve and four of the opportunities were assessed to be of high value and feasibility respectively, though only two opportunities (i.e. watercourse MD5 and II2) scored highly for both these categories (Table 5; Appendix 1). This is a consequence of the limited works associated with the other two 'highly feasible' opportunities (i.e. watercourses 1b and 9), rendering them of only medium value (Table 5; Appendix 1).

4. DISCUSSION AND RECOMMENDATIONS

4.1 Summary of Results

4.1.1 Habitat enhancement and infrastructure improvement opportunities

Habitat assessments were conducted on 26 watercourses at Itchen Valley Country Park (Map 3; Table 3). This included four watercourses (i.e. watercourse no. 1-4) included within studies conducted in 2017 and / or 2018 by Rushbrook (2018a; 2018c), and five watercourses (i.e. watercourses MD1-MD5) included within a long-term monitoring study. Of these 26 watercourses, five were considered to support sections of optimal habitat for southern damselfly, and a further nine support sections of sub-optimal habitat for southern damselfly, though the exact and relative extent of optimal and / or sub-optimal habitat provided was variable. The remaining 12 watercourses were considered to be wholly or largely unsuitable for southern damselfly, due to either extensive shading by bankside and bank top trees, scrub and vegetation, and / or the absence of a discernible flow of water through the watercourse at the time of survey(s).

Habitat enhancement opportunities were identified for 16 of the 26 watercourses assessed (Map 4), with the remaining ten watercourses considered unfeasible or unsuitable for the reasons set out in Section 3.2. Furthermore, the necessity for infrastructure improvements have been identified for a ford at the junction of watercourses 10 and 13 and for a main control structure towards the centre of the site (Map 4).

An outline of the specific habitant enhancement and infrastructure improvement opportunities identified are provided in Section 3.3. It is emphasised that it is considered highly unlikely that it will be feasible (or necessarily desirable) to deliver all these enhancements in their entirety (see Section 2.2.), nor does the information provided in Section 3.3 represent detailed design plans. Indeed, hydrological and topographical studies will be required to assess a number of measures for their feasibility and potential impacts on current distribution of southern damselfly at the site.

It was considered that, based on the information currently available to the author, it is not appropriate to make recommendations for habitat creation at Itchen Valley Country Park since:

- the network of floodplain meadow carrier steams and ditch at this site is complex;
- a detailed hydrological study would therefore be necessary before any notable alterations are made to water level management at the site; and
- the author's understanding that securing sufficient water supply to support perennial flows through the existing network has been challenging in multiple years in the past decade.

4.1.2 Site-specific prioritisation of enhancement and improvement opportunities

The site-specific prioritisation assessments identified two habitat enhancement (i.e. on watercourses 8 and 11) and both infrastructure improvement opportunities as being of high priority (Table 4). A further ten habitat enhancement opportunities were assessed to be of medium priority, and the remaining four opportunities as low priority. The key criteria influencing the relative priority of the opportunities identified were the extent of the habitat that would be enhanced, the relative benefits for the dispersal capability of southern damselfly across the site, the scale of the works and the degree to which other ecological interests would need to be considered and / or mitigated for.

4.1.3 Strategic Assessment of Enhancement and Improvement Opportunities

In total, 16 of the 18 habitat enhancement and infrastructure improvement opportunities identified were considered to be of high potential (Table 5) within the context of the delivery of a strategic conservation plan for southern damselfly within and adjacent to the Eastleigh Borough boundary (see Rushbrook 2018b for more details). This is based on the assumption that all opportunities identified would be supported by Eastleigh Borough Council.

In contrast, modification in the design and / or operation of the upstream control structures included within recommendations for watercourses 14 and MD5 lie beyond the boundary of the site, and it is known or understood that permanent alterations to these structure would not be supported by other relevant interest groups. This is reflected in their respective assessments as having a low and very low current potential of being delivered.

If the former assumption is incorrect, for example if specific opportunities are considered by Eastleigh Borough Council to have the potential to negatively impact their management or other ecological interest features at the site, this would have substantial implications for the current potential of those specific opportunities.

4.2 Recommendations

It is considered highly unlikely that it will be feasible, and necessarily desirable, to deliver all habitat enhancement and infrastructure improvements in their entirety. Therefore, four options have been developed in order to allow Eastleigh Borough Council to implement a scheme of works that will provide the maximum benefits for southern damselfly, for the most effective and efficient utilisation of the resources available, and with appropriate consideration of the wider ecological value of the site.

The strategic assessment of the habitat enhancement and infrastructure improvement opportunities was included within this study to ensure that the opportunities identified could be directly compared with those identified at other sites in the lower Itchen Valley. This would therefore allow for Itchen Valley Country Park to be fully incorporated within any future assessment and delivery of strategic measures for southern damselfly in this area. However, there is no evidence of an imminent delivery of the recently published *strategic conservation plan for southern damselfly with in and adjacent to Eastleigh Borough boundary* (Rushbrook, 2018b). Furthermore, with the exception of recommendations for watercourses 14 and MD5 for the reasons outlined above, there was limited variability between options with all assessed to have a high current potential of being delivered.

It is therefore considered more appropriate and valuable to base the recommendations of potential implementation options on the results of the site-specific prioritisation assessment.

4.2.1 Implementation of habitat enhancement and infrastructure improvement opportunities

Four different options for the suite of opportunities that should be included in the future management of Itchen Valley Country Park are provided below, representing the preferred option, preferred (within site) option, an alternative sub-optimal option, and a strongly recommended 'minimum' option.

These options are based on the potential benefits these will provide to the distribution, robustness and resilience of the southern damselfly population at the site, and it is emphasised that the actual combination of opportunities will depend on availability of resources, assessment against potential negative impacts for other interest features at the site, and a more detailed investigation of potential ecological constraints (see Section 4.3) through the detailed delivery / design process.

Furthermore, it is emphasised that these options have been developed to provide options that represent a functional suite of works, and should not be considered to be the only viable combination of opportunities. However, any variation of these options that may be considered in the future must not only consider the result of the individual assessments through the prioritisation process (Table 4), but also how the selected opportunities will complement one another to provide synergistic benefits.

These recommendations are provided on the basis that they are delivered in parallel with the general management recommendations provided below (see Section 4.2.2). Therefore, as set out in Section 3.3.1, irrespective of what programme of works is selected, its delivery must not be unduly rigid, but be subject to continual assessment and responsive to the current habitat characteristics of the relevant watercourse(s). Specifically, where cattle grazing is already creating suitable conditions, it is not recommended that rotational clearance is undertaken, and could instead be re-assigned to another (sections of) watercourse where it is required at that time.

<u>Preferred option</u>

The suite of measures included in this option is illustrated in Map 5 and include (see Sections 3.3.1 and 3.3.2 for details):

- Complete delivery of habitat enhancement opportunities identified on watercourses 1, 1b, 2,3, 4, 7, 8, 11, 14, 15, MD1, MD3, MD4 and MD5.
- Delivery of both infrastructure improvement opportunities.
- Partial delivery of habitat enhancement opportunities identified on watercourses 9 and 10.

It is recommended that Eastleigh Borough Council deliver this suite of opportunities as it is considered to provide substantial benefits to the distribution, robustness and resilience of the southern damselfly population at Itchen Valley Country Park, whilst minimising the potential risk of negatively impacting on other ecological interest features.

Delivery of the recommendations set out for watercourses MD1–MD5, 14 and 15 should maintain and strengthen the area in the north of the site that, through the long-term monitoring study, is known to be an important hub (Rushbrook, 2018c). Likewise, it is considered that delivery of the recommendations for watercourses 1–4 will have a similar influence on the area in the south of site known to support a moderate number of southern damselfly (Rushbrook, 2018a; 2018c).

It is considered that the delivery of recommendations for watercourses 1b, 7, 8, 9, 10 and 11 will be of two-fold benefit for the wider population; firstly by maintaining and strengthening the numbers of individuals supported in the centre of the site, and secondly by providing near-complete continuous habitat throughout the length of the site (Map 5). The greater connectivity of habitat will facilitate dispersal and strengthen the robustness and resilience of the population. Furthermore, it is considered that the delivery of the infrastructure improvements II1 and II2 will supplement these recommendations, providing further site wide benefits to the population.

It is considered that the enhancement measures recommended for watercourses 9 and 10 should only be delivered in part. Specifically, until additional water supply to the network can be secured, it is considered that watercourses 8 and 7 should be prioritised above the delivery of works on watercourse 9 downstream of its junction with watercourse 8. Furthermore, it is considered that if watercourse 11 is enhanced in its entirety, the more extensive bands of scrub present on the lower two-thirds of watercourse 10 should be retained given their inherent value to a range of fauna as a shelter and / or foraging resource, and as a commuting feature for bats and birds. Indeed, it is considered that this, in combination with the exclusion of watercourses 12, 9a, 6 and 5 for any works, ensures that this option retains a near continuous scrub and / or treeline feature that will provide a foraging and commuting corridor for a range of fauna. Therefore, it is recommended that only targeted ditch bankside re-profiling is undertaken on watercourse 10, between these bands of trees and / or scrub.

<u>Preferred (within site) option</u>

The complete delivery of measures outlined for watercourses 14 and MD5 will likely to require the modification of control structures not owned and / or managed by Eastleigh Borough Council (see Sections 3.3.1 and 3.3.2 for details), and it is understood that it is unlikely that these measures will be supported by other relevant interest groups (see Section 3.5).

It is acknowledged that it is unlikely that Eastleigh Borough Council will be able to deliver these measures. Therefore should discussions with other relevant interest groups be unconstructive, the delivery of the following represents the preferred 'within site' option:

- Complete delivery of habitat enhancement opportunities identified on watercourses 1, 1b, 2, 3, 4, 7, 8, 11, 14, 15, MD1, MD3 and MD4 (as shown in Map 5).
- Delivery of both infrastructure improvement opportunities.
- Partial delivery of habitat enhancement opportunities identified on watercourses 9 (as shown on Map 5) and 14 (as shown in Map 6).

<u>Alternative option</u>

The suite of measures included in this option is illustrated in Map 6 and include:

- Complete delivery of habitat enhancement opportunities identified on watercourses 1, 1b, 7, 8, 11, 15, MD1, MD3 and MD4.
- Delivery of both infrastructure improvement opportunities.
- Partial delivery of habitat enhancement opportunities identified on watercourses 9 and 14.

Should there be insufficient resources to deliver either preferred option, it is recommended that this suite of works be prioritised. This option secures benefits for southern damselfly in the important hub in the north of site, provides the two-fold benefits (to a lesser degree) for the wider population through the works identified for the centre of the site, and will rely on the existing management regime (see Section 4.2.2) to maintain the moderate numbers supported in the south of the site.

'Minimum' option

The suite of measures included in this option is illustrated in Map 7 and include:

- Complete delivery of habitat enhancement opportunities identified on watercourses 1, 1b, 8, 11 15, MD1, MD3 and MD4.
- Delivery of both infrastructure improvement opportunities.
- Partial delivery of habitat enhancement opportunities identified on watercourse 9.

Should there be insufficient resources to deliver the alternative option, it is recommended that this suite of works be considered the minimum scope of works that should be delivered for southern damselfly at the site and, as outlined for the alternative option, will rely on the delivery of the existing management regime across the wider site.

This suite of works represents all those that were identified to be of high or medium priority (Table 4), with the exclusion of watercourses 14 and MD5 for the reasons outlined above. It also includes recommendations for watercourse MD4; the short length of the recommended works is a key reason for its assessment as being of low priority, and is considered worthy of inclusion when considered in the context of the habitat connectivity it secures in the north of site (Map 7).

4.2.2 General management recommendation

It was observed that the existing grazing regime at the site has facilitated the development of suitable habitat features such as marginal berms supporting herbaceous vegetation and roosting habitat for adults on, and associated with, a number of the watercourses. It is therefore considered essential that the extensive grazing operated at the site is retained, and that it is subject to regular / dynamic assessment (if it is not already).

Furthermore, it is important that all infrastructure involved with water level management across the site is monitored and maintained to ensure that the available supply of water is distributed most effectively across the site to support southern damselfly and the wider biodiversity / ecological interest features at the site.

4.3 Other Ecological Considerations

It is strongly emphasised that the development of the habitat enhancement and infrastructure improvement opportunities provided in this report have been based on the potential benefits their delivery could provide to southern damselfly population at Itchen Valley Country Park. Indeed, although ecological considerations were included within the assessment process (see Section 2.2 / Table 1 and Section 2.3 / Table 2), these were based on the existing habitat features and their potential to support rare, notable and protected species, and not on specific or targeted survey data.

Therefore, a more comprehensive assessment of the presence, distribution and potential negative impacts of the proposed works on such species and / or habitats must be included within the detailed design phase of any future delivery of the recommendations set out above. The results of this work must be used to inform the suite of opportunities selected, and the design and delivery (e.g. timing) to avoid / minimise likelihood of impact on important / protected species or habitat.

5. CONCLUSION

The historic water meadow network at Itchen Valley Country Park supports a population of southern damselfly considered to be of national importance (Thompson et al., 2003), and with Allington Manor Farm and (to a lesser degree) West Horton Farm, is considered to be a highly important population 'complex' in the lower Itchen Valley (Rouquette, 2005; Rushbrook, 2018b). However, recent studies have indicated a potential decline in the strength of the population at Itchen Valley Country Park, and it is considered that urgent conservation action for this species is required at this site (Rouquette, 2005; Rushbrook, 2018b).

It is therefore strongly recommended that a programme of habitat enhancement and infrastructure improvement works is delivered that will increase the numbers and distribution of southern damselfly at the site. Their delivery will strengthen the robustness and resilience of the resident population, and consequently its inherent value as a source population for the wider lower Itchen Valley metapopulation.

It is considered that there would be three distinct, but not disconnected, elements of any programme of habitat enhancement and infrastructure improvement works in order to maximise the resulting increase in the distribution, robustness and resilience of the southern damselfly population at Itchen Valley Country Park. Specifically this will include measures that:

1. maintain and strengthen southern damselfly numbers in the important hub in the north of site;
2. provide two-fold benefits for the wider population through works in the centre of the site; and
3. maintain and strengthen southern damselfly numbers supported in the south of the site.

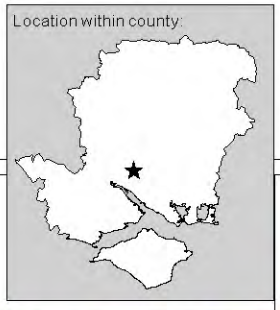
In conclusion, it is strongly recommended that any future programme of works is designed to encompass all three elements outlined above (i.e. as included within the two preferred options outlined in Section 4.2.1). However, where there are insufficient resources and / or it is not feasible to deliver a programme of works that meets all three of these criteria, the programme should be designed to include works that deliver in line with the three elements as prioritised above.

6. REFERENCES

- **Boudot, J.-P. (2006).** *Coenagrion mercuriale*. The IUCN Red List of Threatened Species 2006: e.T5081A11113215. http://dx.doi.org/10.2305/IUCN.UK.2006.RLTS.T5081A11113215.en. Downloaded on 29 August 2017.
- **Rouquette, J.R. (2005).** *Conservation requirements of the southern damselfly in chalkstream and fen habitats*. Science Report SC000017/SR, Environment Agency, Bristol.
- **Rushbrook, B. (2018a).** *Southern damselfly survey and habitat assessment study: Eastleigh Borough*. Arcadian Ecology & Consulting Ltd, Curdridge.
- **Rushbrook, B. (2018b).** *Strategic conservation plan for southern damselfly Coenagrion mercuriale: habitat enhancement and creation opportunities in and adjacent to Eastleigh Borough*. Arcadian Ecology & Consulting Ltd, Curdridge.
- **Rushbrook, B. (2018c).** *Southern damselfly repeat survey programme report: Eastleigh Borough*. Arcadian Ecology & Consulting Ltd, Curdridge.
- **Thompson, D.J., Rouquette, J.R. & Purse, B.V. (2003).** *Ecology of the southern damselfly*. Conserving Natura 2000 Rivers Ecology Series No.8, English Nature, Peterborough.

MAPS

Location within county:

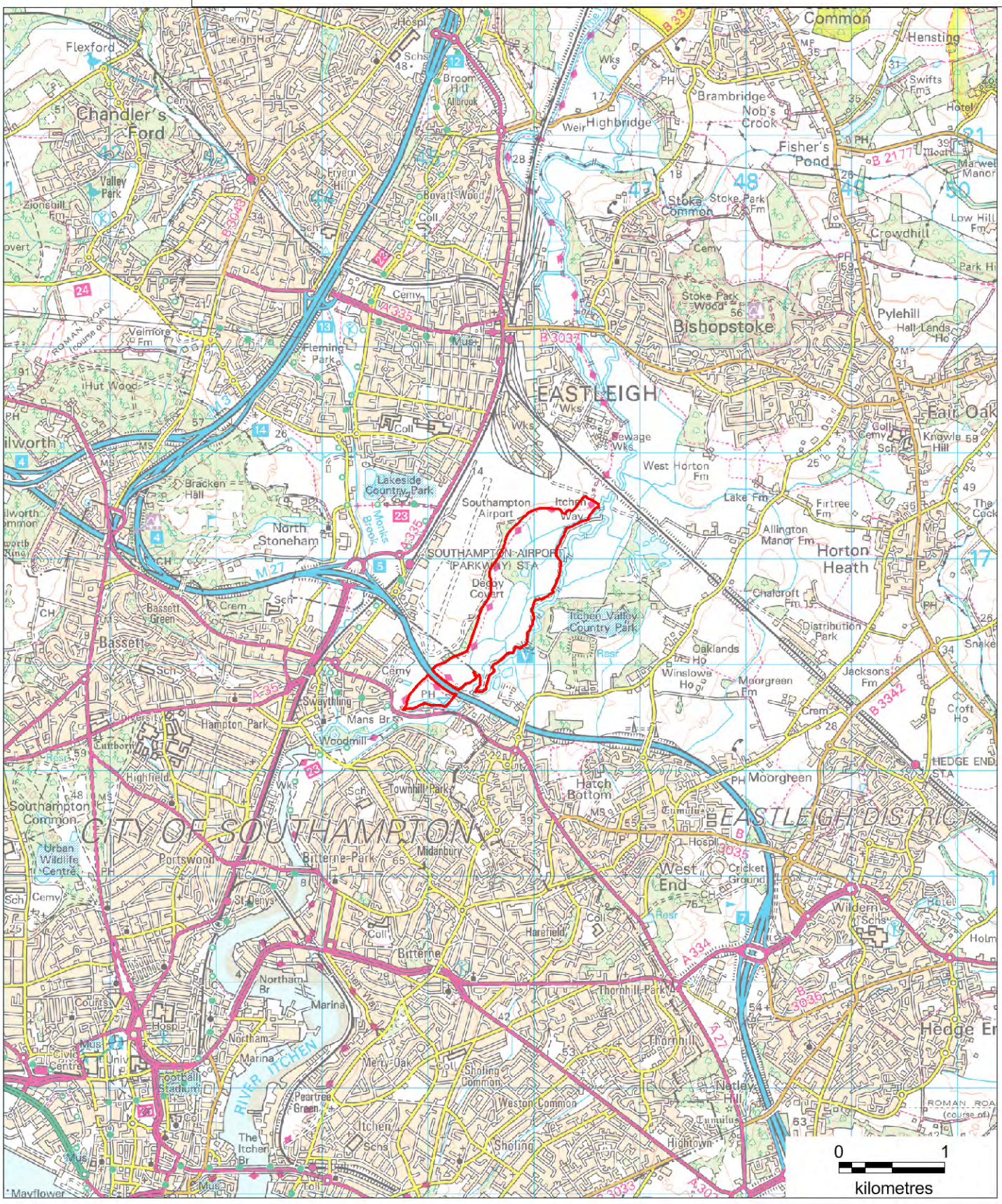


Map 1. Site location

IVCP southern damselfly habitat enhancement study

Ordnance Survey basemap (1:50,000)

Site boundary



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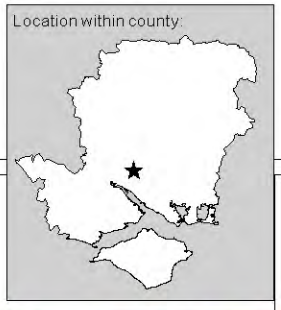
BAP Priority habitat, notable species and SINC data supplied by the Hampshire Biodiversity Information Centre on behalf of the HBIC Partnership.
Aerial photography courtesy of GetMapping plc. Produced on 20 November 2018 by Deborah Whitfield
For enquiries relating to GIS data contact Catherine McGuire, email Catherine.McGuire@hiwwt.org.uk, tel: 01489 774455.



Map 2. Statutory designations

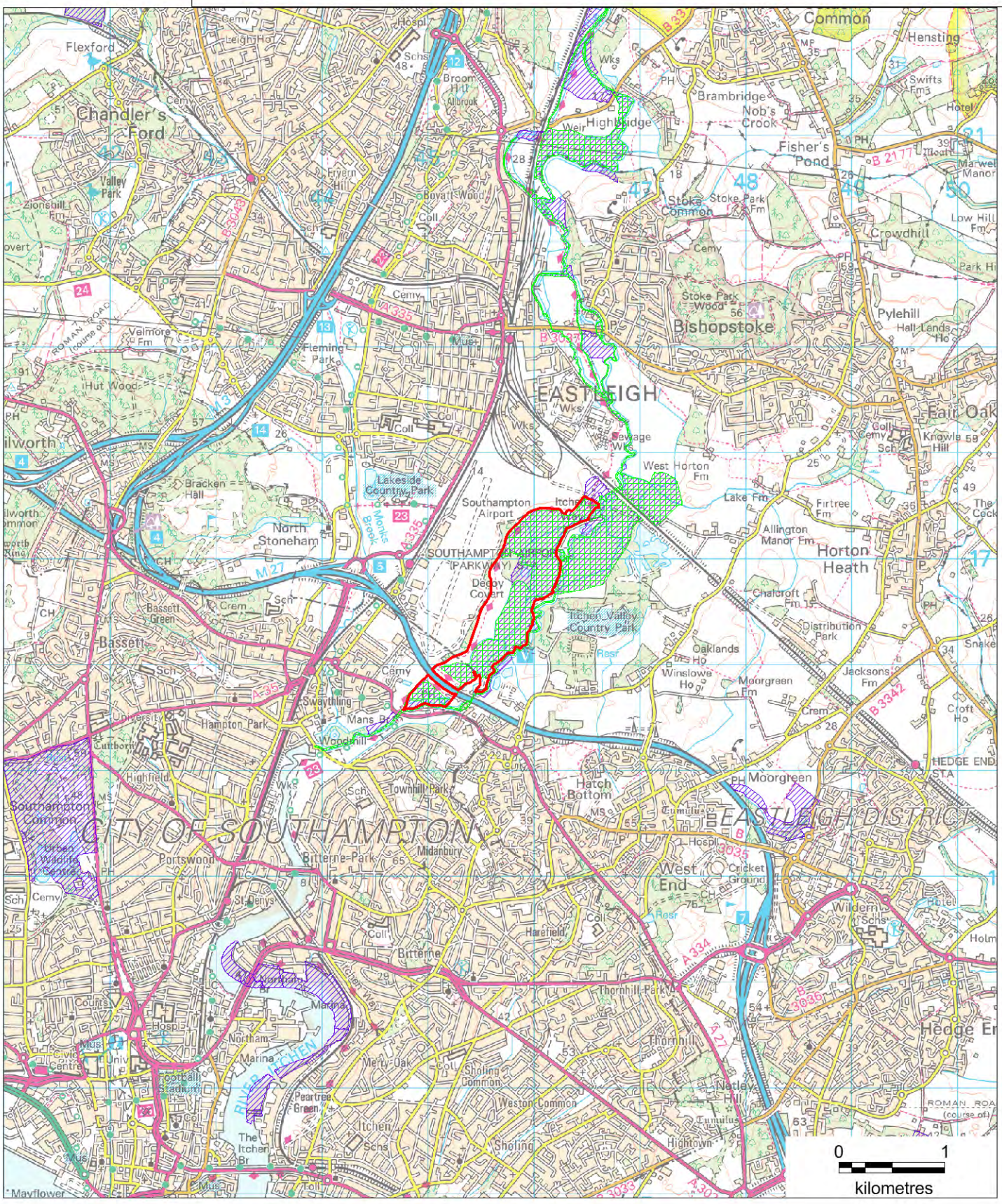
IVCP southern damselfly habitat enhancement study

Ordnance Survey basemap (1:50,000)

Site boundary

Special Area of Conservation

Site of Special Scientific Interest



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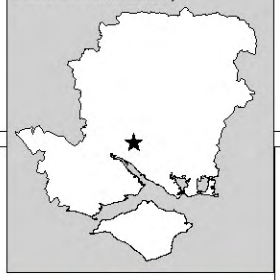


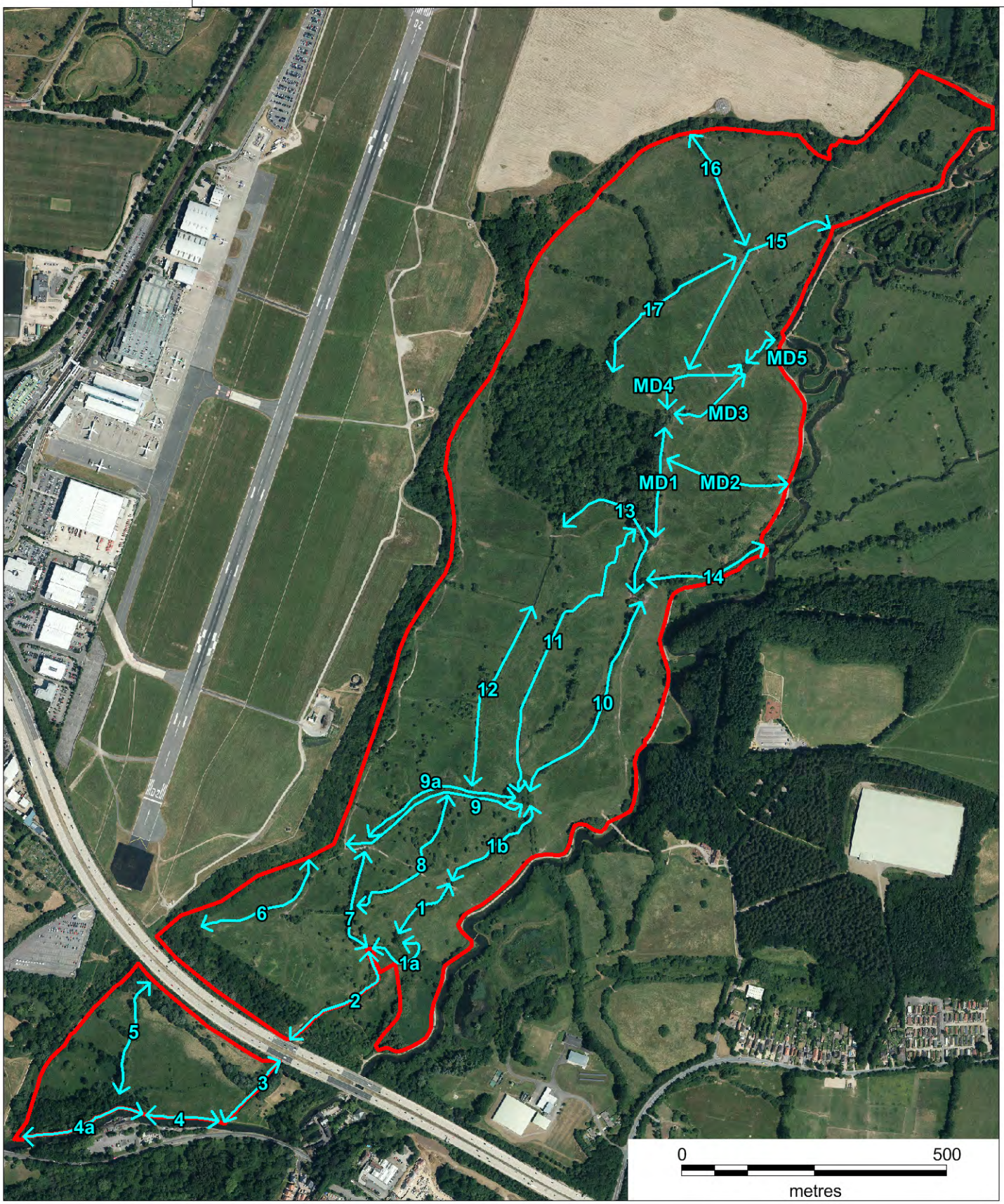
Map 3. Watercourses subject to habitat assessment

IVCP southern damselfly habitat enhancement study

Scale 1:10,000

Site boundary

Watercourse



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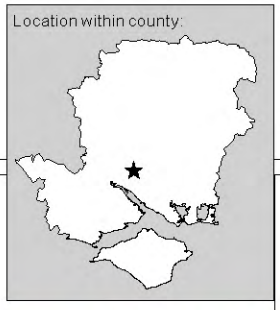


Map 4. Enhancement and improvement opportunities

IVCP southern damselfly habitat enhancement study

Scale 1:10,000

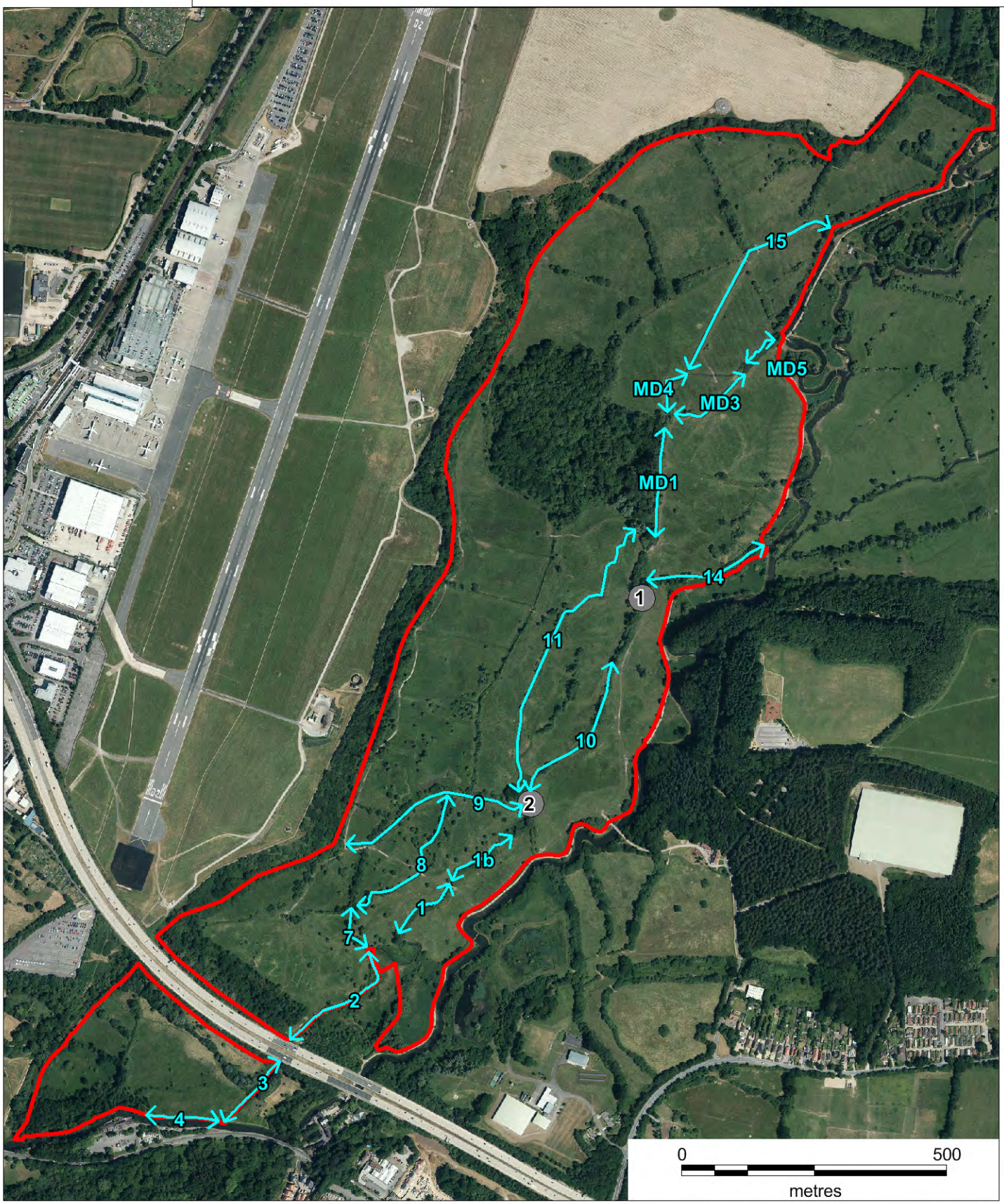
Arcadian

The Wildlife Trusts – Hampshire & Isle of Wight Wildlife Trust

Site boundary

Habitat enhancement

Infrastructure improvement



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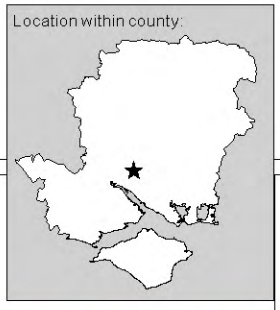


Map 5. Preferred combination of opportunities

IVCP southern damselfly habitat enhancement study

Scale 1:10,000

Site boundary

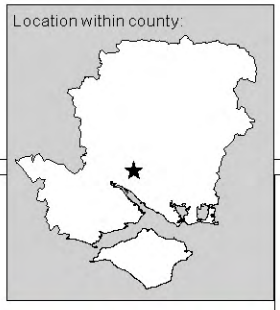
Habitat enhancement

Infrastructure improvement

15
MD5
MD4
MD3
MD1
14
1
11
10
9
2
8
1b
1
7
2
3
4

0 500
metres

N



Map 6. Alternative combination of opportunities

IVCP southern damselfly habitat enhancement study

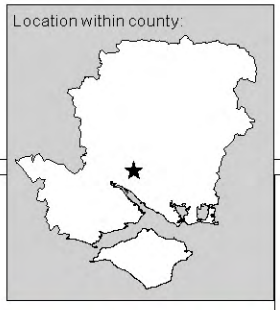
Scale 1:10,000

Site boundary

Habitat enhancement

Infrastructure improvement

15
MD4
MD3
MD1
14
1
11
9
2
8
1b
1
7
0
500
metres



Map 7. 'Minimum' combination of opportunities

IVCP southern damselfly habitat enhancement study

Scale 1:10,000

Site boundary

Habitat enhancement

Infrastructure improvement

15

MD4

MD3

MD1

1

11

2

9

8

1b

1

0

500

metres

N

PHOTOGRAPHS

Photograph 1: Main control structure near the centre of the site

Photograph 2: Ford at the junction of watercourses 10 and 13 used for cattle and vehicular crossing

Photograph 3: Evidence of silt mobilisation following cattle crossing ford

Photograph 4: Localised patch of scrub to be removed from watercourse 2

Photograph 5: Watercourse 8 downstream of footbridge

Photograph 6: Watercourse 8 downstream of footbridge

Photograph 7: Bank top scrub on watercourse 10

Photograph 8: Mature ash on watercourse 11 supporting ecologically important features

Photograph 9: Scrub and tree limbs overhanging watercourse MD1

APPENDICES

Appendix 1:

Criteria scores and results of habitat enhancement and infrastructure improvement assessments (based on Table 2)

Appendix 1: Criteria scores and results of habitat enhancement and infrastructure improvement assessments (based on Table 2).

Enhancement / Improvement ID	Value				Feasibility					Support		Current Enhancement Potential
	Extent	Strategic Value	Threats	**Assessment of Value**	Perennial water flow	Scale of works	Sustainability	Ecological considerations	**Assessment of Feasibility**	Level of support	**Assessment of Support**	
1	2	2	4	**Medium**	4	2	2	3	**Medium**	4	**High**	**High**
1b	2	2	4	**Medium**	4	3	3	3	**High**	4	**High**	**High**
2	3	2	4	**High**	4	1	2	2	**Medium**	4	**High**	**High**
3	2	2	4	**Medium**	4	2	2	2	**Medium**	4	**High**	**High**
4	2	2	4	**Medium**	4	1	4	2	**Medium**	4	**High**	**High**
7	2	2	4	**Medium**	4	2	2	2	**Medium**	4	**High**	**High**
8	3	2	4	**High**	4	1	2	3	**Medium**	4	**High**	**High**
9	2	2	4	**Medium**	4	2	3	3	**High**	4	**High**	**High**
10	3	3	4	**High**	4	1	2	2	**Medium**	4	**High**	**High**
11	4	3	4	**High**	4	2	3	2	**Medium**	4	**High**	**High**
14	3	3	4	**High**	4	1	2	2	**Medium**	2	**Low**	**Low**
15	3	3	4	**High**	4	2	3	2	**Medium**	4	**High**	**High**
MD1	3	3	4	**High**	4	1	2	3	**Medium**	4	**High**	**High**
MD3	2	3	4	**High**	4	1	3	2	**Medium**	4	**High**	**High**
MD4	2	3	4	**High**	4	3	2	2	**Medium**	4	**High**	**High**
MD5	2	3	4	**High**	4	2	3	3	**High**	1	**Not Supported**	**Very Low**
II1	4	3	4	**High**	4	1	3	3	**Medium**	4	**High**	**High**
II2	4	3	4	**High**	4	2	3	3	**High**	4	**High**	**High**