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# Haweswater Aqueduct Resilience Programme

## Proposed Bowland Environmental Statement

### Technical Appendix 9B.2:

### Otter Baseline

LCC\_RVBC-BO-TA-009-02-002

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United Utilities

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# 1 Introduction

This report is a technical appendix to Chapter 9B Aquatic Ecology of the HARP Proposed Bowland Section Environmental Statement. The purpose of the report is to identify the status of the Eurasian otter (*Lutra lutra*) in watercourses within the Proposed Bowland Section study area to inform the Ecological Impact Assessment (EclA) and the associated mitigation strategy presented in Chapter 9B Aquatic Ecology.

This report presents baseline data for otter collated from a desk study of existing ecological data and otter surveys of watercourses within the Proposed Bowland Section study area.

## 2 Methodology

### 2.1 Desk study

Historic records of otter from within 2km of the scheme were requested from the local environmental records centre: Lancashire Environmental Records Network (LERN) in 2019.

### 2.2 Otter surveys

The methodology for surveying otters broadly follows the guidance set out in English Nature<sup>1</sup> and includes an assessment of the (relative) suitability of the habitat for otters and a search for field signs indicating the presence, or possible presence.

#### 2.2.1 Habitat suitability

An initial habitat assessment was undertaken as part of the Extended Phase 1 survey undertaken by Bowland Ecology in 2019 to determine the requirement for detailed otter (*Lutra lutra*) surveys. The Extended Phase 1 survey of the Bowland scheme is presented in Phase 1 Technical Appendix 9A.2 (LCC\_RVBC-BO-TA-009-01-002) to Chapter 9A of the Bowland Environmental Statement. Detailed otter surveys focused on searching for field signs of otter presence such as spraints, feeding remains, slides, footprints/tracks, potential and actual couch or holt locations.

Habitat assessments were undertaken for additional watercourses required following scheme design changes during aquatic walkover surveys undertaken by Ricardo in April 2020 and were combined with detailed surveys for otter field signs described below in Section Field signs 2.2.2. During the surveys in April 2020 the location of any evidence was marked using a hand-held tablet device allowing the data to be mapped using GIS software. Photographs were taken to document otter evidence as well as the habitats present on site.

Incidental findings of otter field signs observed during the extended Phase 1 survey in 2019 have been included in this report and are detailed in survey results presented in **Annex 1** Bowland Ecology (2019) TR3 Ecology Survey Data Report: Otter.

#### 2.2.2 Field signs

Searches were undertaken for field signs as described by Chanin (2003)<sup>2</sup>. Surveys were carried out where possible during periods of low rainfall. The presence of Otter may be indicated by the following signs:

- Holts
- Spraints (droppings)
- Footprints
- Evidence of feeding (fish carcasses)

The initial surveys for field signs undertaken by Bowland Ecology were completed in October 2019 for the following water courses:

- Unnamed Watercourse 384

<sup>1</sup> Chanin P. (2003) *Monitoring the Otter, Lutra lutra*. Conserving Natura 2000 Rivers Monitoring Series 10.

<sup>2</sup> Chanin P. (2003) *Monitoring the Otter, Lutra lutra*. Conserving Natura 2000 Rivers Monitoring Series 10.



- Unnamed Watercourse 169
- Cod Gill
- Unnamed Watercourse 178

Additional watercourses subject to detailed surveys for otter field signs by Ricardo Energy & Environment in April 2020 were:

- River Hodder

### 2.2.3 Weather conditions and survey dates

The weather conditions and survey dates for the otter field signs surveys are shown below in **Table 2.1** for 2019 and **Table 2.2** for 2020 surveys.

**Table 2.1: Surveys dates and weather conditions for the 2019 otter field sign surveys**

Survey Date	Cloud cover	Wind speed (Beaufort scale) and direction	Temperature (°C)	Precipitation
24/10/2019	6/8	F2	9°C	No precipitation
19/10/2019	6/8	F2	9°C	No precipitation

**Table 2.2: Surveys dates and weather conditions for the 2020 otter field sign surveys**

Survey Date	Weather conditions
23/04/2020	19°C, sunshine, clear skies, still. No precipitation during the survey and no rainfall was recorded in the week preceding the surveys

### 2.2.4 Assumptions and Limitations

The absence of desk study records cannot be relied upon to infer absence of a species/habitat. Often, the absence of records is a result of under-recording within the given search area.

The surveys undertaken in October 2019 were carried out during an exceptionally wet autumn. Whilst the surveys were not carried out during or immediately after periods of heavy rain fall and the subsequent high water levels, the intervals between high water levels were not considered sufficiently long enough to allow otter to remark territories and re-establish signs typical of their presence. As a result, whilst the weather conditions were suitable for undertaking the surveys, the river conditions were sub-optimal.

## 3 Baseline Conditions

### 3.1.1 Desk study

The data received from LERN (the local environmental records centre) for within 2 km of the proposed scheme contained no records of water vole from the River Hodder or river Hindburn catchments.

### 3.1.2 Survey Results

The watercourses scoped out for requiring surveys for otter field signs following the Extended Phase 1 survey or habitat suitability assessment are shown in **Table 3.1**. The results of the surveys of watercourses for otter field signs and habitat suitability undertaken in 2019 and 2020 are summarised in **Table 3.2**.

Three watercourses were surveyed at the northern end of the Bowland tunnel adjacent to the receptor site for the tunnelling works: Unnamed Watercourse 169, Cod Gill, and Unnamed Watercourse 178. This included an additional watercourse, Unnamed Watercourse 178, that is outside of the zone of impact for the current scheme design but has been included in the baseline assessment to provide additional context for the otter population in the catchment. The water courses were typically small streams low suitability for otters. No Otter holts or lie-up areas were identified in the surveyed reaches which did not contain suitable vegetation or features for otter holts or lie-ups.

Two watercourses were surveyed at the southern end of the Bowland tunnel adjacent to the launch site for the tunnelling works, both water courses are part of the River Hodder (confluence to Easington Brook) catchment. No Otter holts or lie-up areas were identified in the surveyed reach of Unnamed Watercourse 384. Unnamed Watercourse 384 was considered to have low suitability for otter. Extensive evidence of recent otter activity was found on the River Hodder including 22 spraints, three potential couches, and one possible holt. The potential holt identified during the survey was located on the left bank of the River Hodder at NGR SD 68947 49671.

**Table 3.1 Watercourses scoped out of surveys for otter field signs**

Watercourse name	WFD catchment	Results of scoping exercise
Unnamed Watercourse 163	Hindburn	Not suitable for otter

**Table 3.2: Otter survey results summary**

Watercourse name	WFD catchment	Upstream NGR	Downstream NGR	Habitat suitability	Otter Field signs present	Otter resting place present
Unnamed watercourse 384	Hodder - conf Easington Bk to conf Ribble	SD6864 5043	SD6901 5005	Low	No evidence of otter.	No suitable holt or couch locations.
River Hodder	Hodder - conf Easington Bk to conf Ribble	SD69231 49703	SD68876 49580	High	Extensive evidence of recent otter activity was found including 22 spraints	Three potential couches and one possible holt were identified within the surveyed reach. The potential holt was located on the left bank at NGR SD 68947 49671
Unnamed watercourse 169	Hindburn	SD6348 6511	SD6344 6553	Low	No evidence of otter.	No suitable holt or couch locations.
Cod Gill	Hindburn	SD6323 6554	SD6374 6579	Low	No evidence of otter.	No suitable holt or couch locations.
Unnamed watercourse 178	Hindburn	SD6401 6389	SD6416 6390	Low	No evidence of otter.	No suitable holt or couch locations.

## 4 Summary

### 4.1.1 Otters

The otter is recognised as nationally important in the UK due to its inclusion as a priority species under Section 41 of the NERC Act (2006).

Three watercourses were surveyed in the River Hindburn WFD waterbody adjacent to the Newton-in-Bowland Compound (tunnelling receptor site): Unnamed Watercourse 169, Cod Gill, and Unnamed Watercourse 178. All surveyed watercourses in the Hindburn Catchment were assessed as having low suitability for otters, no evidence of otters was identified during surveys in 2019.


Two watercourses were surveyed in the River Hodder (confluence to Easington Brook) catchment at the southern end of the Bowland tunnel adjacent to the Lower Houses Compound (launch site for the tunnelling works), both watercourses are part of the River Hodder (confluence to Easington Brook) catchment. No otter holts or lie-up areas were identified in the surveyed reach of Unnamed Watercourse 384. Extensive evidence of recent otter activity was found on the River Hodder including 22 spraints, three potential couches, and one possible holt. Unnamed Watercourse 384 was considered to have low suitability for otter but is likely to be used by otters intermittently due to the presence of otters on the River Hodder in the wider catchment.




Studies suggest that the otter has a relatively large home range with population densities around one adult otter per 15km to 27km of river or one otter per 17 km<sup>2</sup> of river catchment. Due to the difficulties of defining which watercourses should be included in a calculation on population density via river length, this calculation has not been attempted. Instead, an estimate of population distribution has been calculated based on the figure of one otter per 17 km<sup>2</sup> for catchment areas. The catchment areas of the two main watercourses adjacent to the proposed works have been calculated as approximately: 69. km<sup>2</sup> for the River Hodder, and 49.1 km<sup>2</sup> for Stainton Beck. Based on the numbers above, this would suggest that there might be around four otters in the River Hodder waterbody, and up to three in the Hindburn waterbody.



## Annexes

## Annex 1: Bowland Ecology (2019) – TR3 Otter Survey Data Report

1 Project Details			
Project Name:	Haweswater Aqueduct Resilience Programme	Project Number:	80061155
Written:	Ellen Milner, <i>Principal Ecologist</i>	Approved:	Alice Helyar, <i>Principal Ecologist</i>
Report reference:	TR3 Otter Report 2019 V1 TR3 Otter Report 2019 V2	Date:	05/11/2019 24/06/2020
2 Project Drawings			
TR3 Otter Survey Plans – October 2019 (Ref: BOW167_HARP_9.5_OTTER_TR3)		Sheets TBC	
3 Ecology Surveys			
Surveyors:	Sabina Ostalowska MSc BSc ACIEEM Mark Breaks BSc (Hons) Abi Hamer BSc (Hons)		
Survey date(s):	24/10/2019, 29/10/2019.		
Survey Method:	An initial habitat assessment was undertaken as part of the Extended Phase 1 survey to determine the requirement for detailed otter ( <i>Lutra lutra</i> ) surveys.  Detailed otter surveys focused on searching for field signs of otter presence such as spraints, feeding remains, slides, footprints/tracks, potential and actual couch or holt locations.  This report also details any findings of otter field signs observed during the extended Phase 1 survey.		
Weather Conditions:	24/10/2019: Cloud cover 6/8, Wind Beaufort F2, 9°C, no precipitation. 29/10.2019: Cloud cover 6/8, Wind Beaufort F2, 9°C, no precipitation.		
Limitations to the survey:	The surveys were undertaken during an exceptionally wet autumn. Whilst the surveys were not carried out during or immediately after periods of heavy rainfall and subsequent high water levels, the intervals between high water levels were not considered long enough to allow otter to re-mark territories and re-establish field signs typical of their presence. As a result, whilst the weather conditions were suitable for undertaking the surveys, the watercourse conditions were sub-optimal.  This report is based on a single visit only.		
4 Survey Results			
TR3.WC6			
		Upstream: SD63236554 Downstream: SD63746579  No evidence of otter. Considered to be low suitability. No suitable holt or couch locations.  A ditch with running water, with steep earth and rock-cliff banks less than 0.5 m in height.  The bordering vegetation is grazed upland grassland. The ditch is approximately 1 m wide and has areas of slow flowing water and faster flowing sections.  The bankside vegetation comprises dominant rushes, with occasional bankside trees, bushes and short grass. Small amounts of submerged vegetation were noted. There is no evidence of human disturbance.	

<p><b>TR3.WC7</b></p> 	<p>Upstream: SD63486511</p> <p>Downstream: SD63446553 (joins TR3.WC6)</p> <p>No evidence of otter. Considered to be low suitability. No suitable holt or couch locations.</p> <p>A ditch with running water and shallow earth banks less than 0.5 m in height.</p> <p>The bordering vegetation is grazed upland grassland. The ditch is approximately 0.3 m, wide with a slow flow of water.</p> <p>The bankside vegetation comprises abundant rushes, with occasional short grasses, bushes, and more rarely bankside trees. There is no evidence of human disturbance.</p>
<p><b>TR3.WC31</b></p> 	<p>Upstream: SD64016389</p> <p>Downstream: SD64166390</p> <p>No evidence of otter. Considered to be low suitability. No suitable holt or couch locations. Stoat (<i>Mustela erminea</i>) droppings at upstream limit of survey area.</p> <p>A ditch with running water and shallow banks comprising stones and earth that are less than 0.5 m in height.</p> <p>The bordering vegetation is grazed upland grassland. The ditch is approximately 1 m wide, with a fast flow of water.</p> <p>The bankside vegetation comprises frequent rushes, with occasional short grasses and more rarely bushes. There is no evidence of human disturbance.</p>
<p><b>TR3.WC66/67</b></p> 	<p>Upstream: SD68685036</p> <p>Downstream: SD68935011 (several directions of flow)</p> <p>No evidence of otter. No suitable holt or couch locations. Considered to be low suitability.</p> <p>A ditch with running water and flat (&lt;10°) banks comprising earth. The water depth is less than 0.5 m.</p> <p>The bordering vegetation is grazed grassland. The ditch is less than 1 m wide, with a slow flow of water.</p> <p>The bankside vegetation comprises abundant grasses with occasional herbs. There are frequent bankside bushes. There is no evidence of human disturbance.</p>

## References

National Rivers Authority (1993). Otters and River Habitat Management. Conservation Technical Handbook Number 3.

Ward, D., Holmes, N., and Jose, P., (1994) The New Rivers & Wildlife Handbook. Royal Society for the Protection of Birds (RSPB).

Chanin P (2003) Monitoring the Otter *Lutra lutra*. Conserving Natura 2000 Rivers Monitoring Series No.10, English Nature, Peterborough.

## Annex 2: RSK Biocensus (2020) – Haweswater Aqueduct Resilience Programme: Otter and Water Vole report – TR3 Bowland





# Haweswater Aqueduct Resilience Programme

Protected species survey report – TR3 Bowland

Project No. 2480524

**MARCH 2021**

## RSK GENERAL NOTES

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**Project No.:** 2480524



**Title:** Haweswater Aqueduct Resilience Programme: Protected Species Survey Report  
– TR3 Bowland


**Client:** Ricardo Energy and Environment

**Date:** March 2021

**Office:** Helsby

**Status:** REV2

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Date:	<u>03/03/2021</u>

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# 1 INTRODUCTION

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## 1.1 Purpose of this report

RSK Biocensus (RSK) was commissioned by Ricardo Environment and Energy (Ricardo) to provide specialist ecological support in relation to the Haweswater Aqueduct Resilience Programme (HARP). Otter (*Lutra lutra*), water vole (*Arvicola amphibius*) and white-clawed crayfish (*Austropotamobius pallipes*) surveys are required to inform a Water Framework Directive (WFD) assessment, Environmental Impact Assessment (EIA) and mitigation strategy for the scheme.

As part of the scheme, United Utilities proposes to replace several sections of the existing single line aqueduct. The replacement sections are proposed to be delivered over five distinct sections. From north to south these sections are named as follows:

- Docker (TR1);
- Swarther (TR2);
- Bowland (TR3);
- Marl Hill (TR4); and
- Haslingden to Walmersley (TR5/6).

Nine planning applications are required to cover all five sections. These will be accompanied by an Environmental Statement (ES) for each section and a Habitat Regulations Assessment (HRA) as required for each section.

This report details surveys undertaken on watercourses within the Bowland (TR3) section, which will likely be impacted by the proposed works.

## 1.2 Site information

*Figure 1* shows the location of the survey reaches and the survey extents for each watercourse identified that will be impacted by the works for section TR3 of the scheme. *Table 1* summarises the survey requirements at each watercourse which were specified by Ricardo.

**Table 1. Site information and survey requirements, TR3 Bowland.**

Name	Watercourse ID	Section	Eastings and Northings		Date of survey	Surveys Required		
			Upstream	Downstream		Water Vole	Otter	White Clawed Crayfish (WCC)
Cod Gill	W206	T03	X: 363623 Y: 465709	X: 363233 Y: 465546	23/04/2020	Yes	-	-
Unnamed Watercourse 169	W215	T03	X: 363446 Y: 465534	X: 363400 Y: 465396	23/04/2020	Yes	-	-
Unnamed Watercourse 384	W461	T03	X: 368665 Y: 450376	X: 369080 Y: 449924	23/04/2020	Yes	-	-
River Hodder	W477	T03	X: 369231 Y: 449703	X: 368876 Y: 449580	23/04/2020	Yes (x2)	Yes	-
Unnamed Watercourse 1298	W1369	T03	X: 368198 Y: 451175	X: 368425 Y: 451320	01/06/2020	Yes	Yes	-
Mears Beck	N/A	T03	X: 358958 Y: 468060	X: 358361 Y: 468011	24/11/2020	Yes (survey timing sub optimal - habitat suitability assessment only)	Yes	Yes (survey timing sub optimal - habitat suitability assessment only)
River Wenning	RW5	T03	X: 361157 Y: 469702	X: 360708 Y: 469180	01/12/2020	Yes (survey timing sub optimal - habitat suitability assessment only)	Yes	Yes (survey timing sub optimal - habitat suitability assessment only)
Unnamed watercourse	RW6	T03	X: 362278 Y: 470326	X: 362019 Y: 470097	09/02/2021	Yes (survey timing sub optimal - habitat suitability assessment only)	Yes	Yes (survey timing sub optimal - habitat suitability assessment only)
Unnamed watercourse	RW7	T03	X: 364071 Y: 469666	X: 363876 Y: 469561	01/12/2020	Yes (survey timing sub optimal - habitat suitability assessment only)	Yes	Yes (survey timing sub optimal - habitat suitability assessment only)
Unnamed watercourse	RW8	T03	X: 364742 Y: 468982	X: 364498 Y: 469155	01/12/2020	Yes (survey timing sub optimal - habitat suitability assessment only)	Yes	Yes (survey timing sub optimal - habitat suitability assessment only)
Unnamed watercourse 157	RW16	T03	X: 363056 Y: 465891	X: 363219 Y: 466334	01/12/2020	Yes (survey timing sub optimal - habitat suitability assessment only)	Yes	Yes (survey timing sub optimal - habitat suitability assessment only)
Hunts Gill	RW20	T03	X: 362245 Y: 466542	X: 361996 Y: 466349	02/12/2020	Yes (survey timing sub optimal - habitat suitability assessment only)	Yes	Yes (survey timing sub optimal - habitat suitability assessment only)
River Hindburn	W478	T03	X: 360818 Y: 467586	X: 360705 Y: 467757	02/12/2020	Yes (survey timing sub optimal - habitat suitability assessment only)	Yes	Yes (survey timing sub optimal - habitat suitability assessment only)

## 2 METHOD

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### 2.1 Survey timings

Surveys were undertaken in April, June and December 2020 as well as early February 2021 by a team of highly experienced aquatic ecologists. For most of the surveys the weather was fine and clear with some light rain on occasion.

In the week preceding each of the surveys no significant rainfall was recorded.

### 2.2 Otter surveys

Otter surveys followed an amended methodology derived from that detailed within Chanin 2003<sup>1</sup>. Where access permitted, both banks of each watercourse were surveyed to look for and record signs of otter. Emphasis was given to investigating prominent features such as bridge arches, fallen trees and root systems as well as rocks and ledges along the banks where spraints, footprints, evidence of resting or breeding sites and feeding remains were most likely to be present. Presence of access points, such as slides or runs, were also recorded. The location of any evidence was marked using a hand-held tablet device allowing the data to be mapped using GIS software. Photographs were taken to evidence sign of otter as well as the habitat present on the site.

### 2.3 Water vole surveys

The water vole surveys followed the standard methods outlined within Strachan (2011)<sup>2</sup> and Dean *et al.* (2016)<sup>3</sup> respectively. Where accessible, surveyors searched both banks of each watercourse for evidence of water voles including burrows, feeding platforms, grazing (including food remains), latrines and footprints.

The location of any water vole evidence was recorded using a hand-held tablet device allowing the data to be mapped using GIS software. Photographs were also taken to evidence water vole activity as well as the habitat present on site.

Where surveys were undertaken outside the survey season for water vole (April – September) the suitability of the habitat for water voles was assessed using the following criteria (Dean *et al.*, 2016<sup>4</sup>):

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<sup>1</sup> Chanin, P. 2003. Ecology of the European Otter. Conserving Natura 2000 Rivers Ecology Series No. 10. English Nature, Peterborough.

<sup>2</sup> Strachan, R. (2011). Water Vole Conservation Handbook – The Third Edition. Wildlife Conservation Research Unit, Oxford

<sup>3</sup> Dean, M., Strachan, R., Gow, D. and Andrews, R. (2016). The Water Vole Mitigation Handbook (The Mammal Society Mitigation Guidance Series). Eds Fiona Mathews and Paul Chanin. The Mammal Society, London

<sup>4</sup> Dean, M., Strachan, R., Gow, D. and Andrews, R. (2016). *The Water Vole Mitigation Handbook (The Mammal Society Mitigation Guidance Series)*. Eds Fiona Mathews and Paul Chanin. The Mammal Society, London.



- Bank profile;
- Bank substrate, specifically its suitability for burrowing;
- Water depth;
- Likely frequency and height of water level changes, relative to bank height;
- Amount of shading from trees / shrubs;
- Bankside herbaceous vegetation type (tall tussocky grass, mown grass etc.);
- Bankside herbaceous vegetation density;
- In-channel herbaceous vegetation type;
- In-channel herbaceous vegetation width (from toe of bank to the point at which the bank meets water level);
- In-channel herbaceous vegetation density;
- Percentage of the channel with in-channel herbaceous vegetation;
- Evidence of current or recent management, and the likely effects of management, and;
- Any other relevant factors.

Classification of habitat suitability was made as follows:

- **Excellent** – optimal habitat with good cover, food sources and other features that would allow water vole populations to thrive throughout the year.
- **Suitable** – habitat that has all the elements required by water vole, certainly in the summer, and probably through most winters.
- **Moderate** – habitat that has some of the features that are suitable for water vole, but with some constraints so that suitability throughout the year is not certain.
- **Unsuitable** – habitat lacking one or more crucial element for use by water voles. This category does not necessarily preclude the habitat being used by water voles, but it would not be able to support a resident population.

## 2.4 White-clawed crayfish habitat suitability assessment.

Where required, instream habitat was assessed for its suitability to support white-clawed crayfish. The suitability of the habitat for white-clawed crayfish was assessed using the following criteria:

- Abundance and distribution of submerged refuges;
- Evidence of poor water quality i.e. sewage fungus;
- River flow velocity;
- Quantities of fine sediment;
- Abundance of potential food sources i.e. macroinvertebrates; and
- Evidence of invasive non-native crayfish species.

## 2.5 Survey constraints

For most of the watercourses there were no obvious constraints to undertaking the surveys. Where presence absence surveys were undertaken, timings were considered suitable for water vole and otter and the surveys were not compromised by poor weather. Surveyors were also able to access the full extent of each watercourse.


## **2.6 Biosecurity**

All RSK ecologists have undertaken internal training on biosecurity practices, which are in accordance with those described by the Great Britain Non-Native Species Secretariat's (GB NNSS) check-clean-dry policy. Furthermore, they have all completed, as a minimum, modules 1 and 3 of the GB NNSS e-learning modules on biosecurity. In addition to adhering to this procedure, surveyors worked in a downstream direction in flowing watercourses to further minimise risk. All equipment was thoroughly checked, cleaned (and disinfected) and dried before it was used in a different watercourse.

### 3 RESULTS

Table 2 summarises the results of the surveys at each respective site.

**Table 2. Otter and water vole survey results, TR3 Bowland**

T03: W206 Cod Gill	
	<p><b>Eastings and Northings</b>          Upstream: X: 363623 Y: 465709          Downstream: X: 363233 Y: 465546</p> <ul style="list-style-type: none"> <li>• <b>Potential water vole evidence recorded</b></li> <li>• <b>Habitat of low suitability at W206.</b></li> </ul> <p>Surveyors identified a total of 11 burrows (see example picture - middle left) and one feeding station (Figure 2 – W206). Despite several small burrows being found, in the absence of definitive evidence i.e. latrines, it is considered unlikely that water vole are present at the site. The burrows and feeding station identified at the time of the survey could be attributable to bank voles (<i>Myodes glareolus</i>), especially when considered in the context that the site was predominantly dry with limited food resources for water vole, thus making it unsuitable for water vole.</p> <p>W206 was predominantly dry with occasional areas of shallow ponded water or water with no perceptible flow. The width of the channel was c. 0.7 m and with variable depth to c. 2 cm. The banks are steep sided earth and bedrock varying in height. The substrate was bedrock, boulder, gravel, and silt. The channel was bordered by sheep grazed pasture comprised of grass, <i>Juncus</i> sp. (a Rush) and occasional herbs and trees.</p>



**T03: W215 Unnamed Watercourse 169**



**Eastings and Northings**

Upstream: X: 363446 Y: 465534

Downstream: X: 363400 Y: 465396

- **Potential water vole evidence recorded**
- **Habitat of low suitability at W215.**

One burrow was recorded but in the absence of definitive evidence i.e. latrines, it is considered unlikely for water vole to be present (*Figure 2 – W215*).

W215 was dry with sections of shallow, ponded water or water with no perceptible flow. The channel substrate was boulder, clay, and bedrock. Woody debris was present throughout the reach. The steep, grazed bankside had vegetation comprised predominantly of grass and *Juncus* sp.

The width of the channel was c. 0.3 m with a depth c. 2 cm, where water was present.

**T03: W461 Unnamed Watercourse 384**



**Eastings and Northings**

Upstream: X: 368665 Y: 450376


Downstream: X: 369080 Y: 449924

- **Potential water vole evidence recorded**
- **Habitat of low to moderate suitability at W461.**

In total, six burrows were recorded with no definitive evidence of water vole being present (*Figure 2 – W461*). The stream is considered to have moderate to low suitability for water vole due to the presence of tree cover and steep concrete banks.

Generally, this was a moderately flowing, shallow stream with a mixed substrate of boulder, cobble, and gravel. A section has been canalised forming an artificial concrete channel (pictured) with concrete steps. Although variable, the width of the channel was typically c. 0.4 m with a depth of c. 5 cm.

In the upper reaches of the survey extent, the channel was predominantly silted, choked with terrestrial vegetation and dry or with no perceptible flow. Upstream of the road intersection the stream had

	<p>frequent emergent vegetation, downstream of the road no in-channel vegetation was present. The channel was bordered by sheep grazed pasture. Bankside vegetation included grass, <i>Juncus</i> sp. and intermittent tree cover was present throughout.</p>
<b>T03: W477 River Hodder</b>	
	<p><b>Eastings and Northings</b>        Upstream: X: 369231 Y: 449703        Downstream: X: 368876 Y: 449580</p> <ul style="list-style-type: none"> <li>• <b>Otter evidence recorded and suitable habitat at W477.</b></li> <li>• <b>Potential water vole evidence recorded but habitat of low suitability at W477.</b></li> </ul> <p>Extensive evidence of recent otter activity was found at W477 (<i>Figure 2 – W477</i>) including: 22 spraints, three potential couches and one possible holt (pictured). As such, the river is considered suitable for otter.</p> <p>Two burrows were also identified (pictured); however, in the absence of other evidence i.e. latrines, it is considered unlikely that they are used by water vole.</p> <p>W477 presented a mosaic of depths and flow including a section of torrent. The width and depth of the River Hodder was variable, ranging from c. 8 – 15m wide and c. 0.5 m deep. The channel was bordered by a mixture of steep sided woodland, mature trees and low-lying sheep grazed pasture.</p> <p>No in-channel vegetation was present but filamentous algae was abundant throughout, principally in shallow pools and slower flows. Juvenile salmonid and lamprey habitats were also recorded within the reach.</p> <p>The channel substrate was comprised of boulder, cobble, gravel, and silt. Substantial side bars were found on both banks, some being vegetated (pictured).</p>



**T03: W1369 Unnamed Watercourse 1298**



**Eastings and Northings**

Upstream: X: 368198 Y: 451175

Downstream: X: 368425 Y: 451320

- **No otter or water vole evidence**
- **Low habitat suitability at W1369.**

No evidence of otter or water vole was recorded at W1369 during the surveys (*Figure 2 – W1369*).

W1369 was a dry ditch dominated by improved / semi-improved sheep grazed pasture. The width of the channel was c. 2.5 m. The channel had gently sloping banks reaching a height of c. 0.5 m. A short section of the ditch located next to a gate is bare, presumably from continued use. The ditch ends at a dry-stone wall.

**T03: Mears Beck**



**Eastings and Northings**

Upstream: X: 358958 Y: 468060

Downstream: X: 358361 Y: 468011




- **No evidence of otter at Mears Beck, habitat of moderate suitability.**
- **No evidence of water vole, habitat largely unsuitable.**
- **No evidence of white-clawed crayfish, suitable habitat present at the downstream extent of survey reach.**

No evidence of otter was recorded during the survey, however a section of bank reinforcement (piled boulders - pictured) towards the upstream extent of the site (left bank) could potentially act as an otter refuge.

Habitat was largely unsuitable for water vole as the bank faces of the watercourse were reinforced almost continuously along the reach. The section of channel was also heavily shaded by tree cover limiting the growth of bankside and marginal vegetation.

At the downstream extent of the reach suitable crayfish refuges were present in the form of large cobbles and boulders. Conversely the upper and middle reaches of the survey extent were largely



	unsuitable for crayfish owing to the large quantities of fine silt within the channel.
<b>T03: RW5</b>	
  	<p><b>Eastings and Northings</b>        Upstream: X: 361157 Y: 469702        Downstream: X: 360708 Y: 469180</p> <ul style="list-style-type: none"> <li>• <b>Evidence of otter, suitable habitat present at RW5.</b></li> <li>• <b>No evidence of white-clawed crayfish but suitable habitat present.</b></li> <li>• <b>No evidence of water vole, habitat of moderate suitability.</b></li> </ul> <p>Evidence of otter was observed at RW5 in the form of spraint (pictured) and footprints (<i>Figure 2 – RW5</i>). Several trees along the reach provide potential otter holts amongst their roots.</p> <p>The reach provides optimal habitat for white-clawed crayfish owing to the abundance of suitable refuges. These include coarse substrate (boulders &amp; cobbles), submerged tree roots and coarse woody debris. No evidence of crayfish was recorded during the survey and no remains were observed within the otter spraint.</p> <p>Habitat within the reach was assessed to be of moderate suitability for water voles. The upstream extent of the reach is heavily shaded by tree cover, which restricts the growth of low-lying bankside vegetation. Towards the downstream extent of the watercourse (right bank) tree cover is reduced, and the banks provide some habitat for burrowing. Bankside and emergent vegetation growth in this area appeared sparse even when considering the timings of the survey.</p>

**T03: RW6**



**Eastings and Northings**

Upstream: X: 362278 Y: 470326

Downstream: X: 362019 Y: 470097

- **Evidence of otter, habitat of high suitability at RW6.**
- **No evidence of white-clawed crayfish, but suitable habitat present.**
- **No evidence of water voles, habitat of low suitability.**



Evidence of otter was recorded in the form of spraint (x 3), footprints (3 sets), possible holts (x 2) and a possible couch (*Figure 2 – RW6*). There were numerous trees along this reach that may provide potential resting areas for otters amongst their roots. No evidence of otter was recorded along the tributary.



The River Wenning and the tributary both were assessed to have habitat that was optimal for white-clawed crayfish owing to the abundance of suitable substrate e.g. boulders and large cobbles. No evidence of white-clawed crayfish was recorded during the survey and no remains were identified in the otter spraint.

The habitat was largely unsuitable for water voles due to the banks being heavily shaded and therefore limiting the growth of low-lying herbaceous vegetation.

The River Wenning at RW6 contained two large sections of optimal juvenile lamprey habitat.

**T03: RW7**



**Eastings and Northings**

Upstream: X: 364071 Y: 469666

Downstream: X: 363876 Y: 469561

- **Evidence of otter, suitable habitat present at RW7.**
- **No evidence of white-clawed crayfish but suitable habitat present.**
- **No evidence of water vole, habitat largely unsuitable.**

Evidence of otter was observed at RW7 in the form of spraint (*Figure 2 – RW7*). Several trees along the reach provide potential resting areas for otter





amongst their roots. Two sites on the left hand bank of the watercourse (*Figure 2 – RW7*) appeared to have been recently used by otter as indicated by fresh spraint and flattened ground (pictured). No otter evidence was observed on the tributary.

The River Wenning provides optimal habitat for white-clawed crayfish owing to the abundance of suitable refuges. These included coarse substrate (boulders & cobbles), coarse woody debris and submerged tree roots. No evidence of crayfish was recorded during the survey and no remains were observed within the otter spraint.

The tributary provides sub-optimal crayfish habitat as although suitable refuges are present (boulder & cobbles) they are in low abundance.

Bankside habitat on the River Wenning is largely unsuitable for water vole due to heavy shading from tree cover, which will restrict the growth of low-lying herbaceous vegetation.

Although shading is largely absent on the tributary, the banks of the watercourse are shallow and unsuitable for burrowing. Bankside vegetation was also noticeably sparse.

### T03: RW8




#### Eastings and Northings

Upstream: X: 364742 Y: 468982


Downstream: X: 364498 Y: 469155

- **Evidence of otter, suitable habitat present at RW8.**
- **No evidence of white-clawed crayfish but suitable habitat present.**
- **No evidence of water vole, habitat largely unsuitable.**

Evidence of otter was observed on the River Wenning in the form of spraint and footprints (*Figure 2 – RW8*). No otter holts or resting areas (couches) were recorded during the survey. A small hollow was present beneath a fallen tree at the upstream extent of the reach (right bank) but there was no evidence to suggest it was being used by otters as refuge. No evidence of otter was observed on the tributary during the survey.

	<p>The River Wenning provides sub-optimal habitat for white-clawed crayfish owing to the abundance of bedrock within the reach. Suitable refuges are present however and include coarse substrate (boulders &amp; cobbles) and coarse woody debris. No evidence of crayfish was recorded during the survey and no remains were observed within the otter spraint.</p> <p>Habitat within the tributary is largely unsuitable for crayfish habitat due to a lack of available refuges.</p> <p>Bankside habitat on the River Wenning is largely unsuitable for water vole due to heavy shading from tree cover and lack of burrowing opportunities (bedrock and bank reinforcements). Although shading is largely absent on the tributary, the banks of the watercourse are shallow and unsuitable for burrowing. Bankside vegetation was also noticeably sparse even when considering the timings of the surveys.</p>
<b>T03: RW16 Unnamed watercourse 157</b>	
	<p><b>Eastings and Northings</b></p> <p>Upstream: X: 363056 Y: 465891 Downstream: X: 363219 Y: 466334</p> <ul style="list-style-type: none"> <li>• <b>No evidence of otter, habitat of low suitability at RW16.</b></li> <li>• <b>No evidence of water vole, habitat largely unsuitable.</b></li> <li>• <b>No evidence of white-clawed crayfish, suitable habitat present towards downstream extent of survey reach.</b></li> </ul> <p>The site provides sub-optimal crayfish habitat as although suitable refuges were present (coarse substrate and woody debris) they are restricted to the downstream extent of the survey reach.</p> <p>The habitat was unsuitable for otter due to the limited foraging and resting opportunities. No evidence of otter was recorded during the survey</p> <p>Habitat was largely unsuitable for water vole as large sections of the channel were shaded by tree cover, inhibiting the growth of low-lying herbaceous plants. Disturbance was also present in the form of poaching from livestock (sheep).</p> <p>At the upstream extent of the reach, the watercourse flows adjacent to a road (pictured). This area was</p>



	<p>considered to provide suitable bank profiles to permit burrowing with some foraging habitat (emergent board leaved vegetation) as being present.</p> <p>At this location, the watercourse averages just 0.4 m in width and 0.1 m in depth. No areas of deep open water (which water vole could use to evade predation) were recorded at the upstream extent of the reach or throughout the survey extent.</p>
<b>T03: RW20 Hunts Gill Beck</b>	
	<p><b>Eastings and Northings</b>        Upstream: X: 362245 Y: 466542        Downstream: X: 361996 Y: 466349</p> <ul style="list-style-type: none"> <li>• <b>No evidence of otter, habitat suitable at RW20.</b></li> <li>• <b>No evidence of water vole, habitat largely unsuitable.</b></li> <li>• <b>No evidence of white-clawed crayfish, suitable habitat available on tributary and Hunts Gill.</b></li> </ul> <p>Despite the absence of physical evidence i.e. spraint it is likely that otters utilise Hunts Gill for commuting and foraging. Possible refuge is also available within the reach in the form of a cavity which was recorded beneath a bankside tree.</p> <p>The tributary could also provide foraging habitat should fish and crayfish be present. No potential otter holts or resting areas were recorded on the tributary.</p> <p>Hunts Gill provides sub-optimal habitat for white-clawed crayfish owing to the abundance of bedrock within the reach. Suitable refuges were present however and include coarse substrate (boulders &amp; cobbles) and coarse woody debris. No evidence of crayfish was recorded during the survey.</p> <p>The tributary also provides potential refuge areas for crayfish in the form of cobbles, boulders and coarse woody debris,</p> <p>Habitat was largely unsuitable for water vole as large sections of the channel were shaded by tree cover, inhibiting the growth of low-lying herbaceous plants. The banks of the watercourse were also frequently comprised of bedrock limiting opportunities for burrowing</p>

	<p>At the upstream extent of the tributary the watercourse flows through an exposed open area of boggy grassland. Although the banks are shallow and unsuitable for burrowing, large quantities of tussock sedge (pictured) could provide foraging and refuge habitat for water vole. Areas of open water are limited as the watercourse only averages 0.4 m in width at this location.</p>
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### T03: River Hindburn



#### Eastings and Northings

Upstream: X: 360818 Y: 467586

Downstream: X: 360705 Y: 467757

- **Evidence of otter, habitat suitable.**
- **No evidence of water vole, habitat largely unsuitable.**
- **No evidence of white-clawed crayfish, suitable habitat present.**

Evidence of otter was recorded in the form of spraint, anal jellies, footprints, feeding remains (Atlantic salmon carcass), several couches and one suspected holt (*Figure 2 – River Hindburn*). The reach provides optimal habitat for otter.

The reach also provides optimal habitat for white-clawed crayfish owing to the abundance of suitable refuges. These included coarse substrate (boulders & cobbles) and coarse woody debris. No evidence of crayfish was recorded during the survey and no remains were observed within the otter spraint.

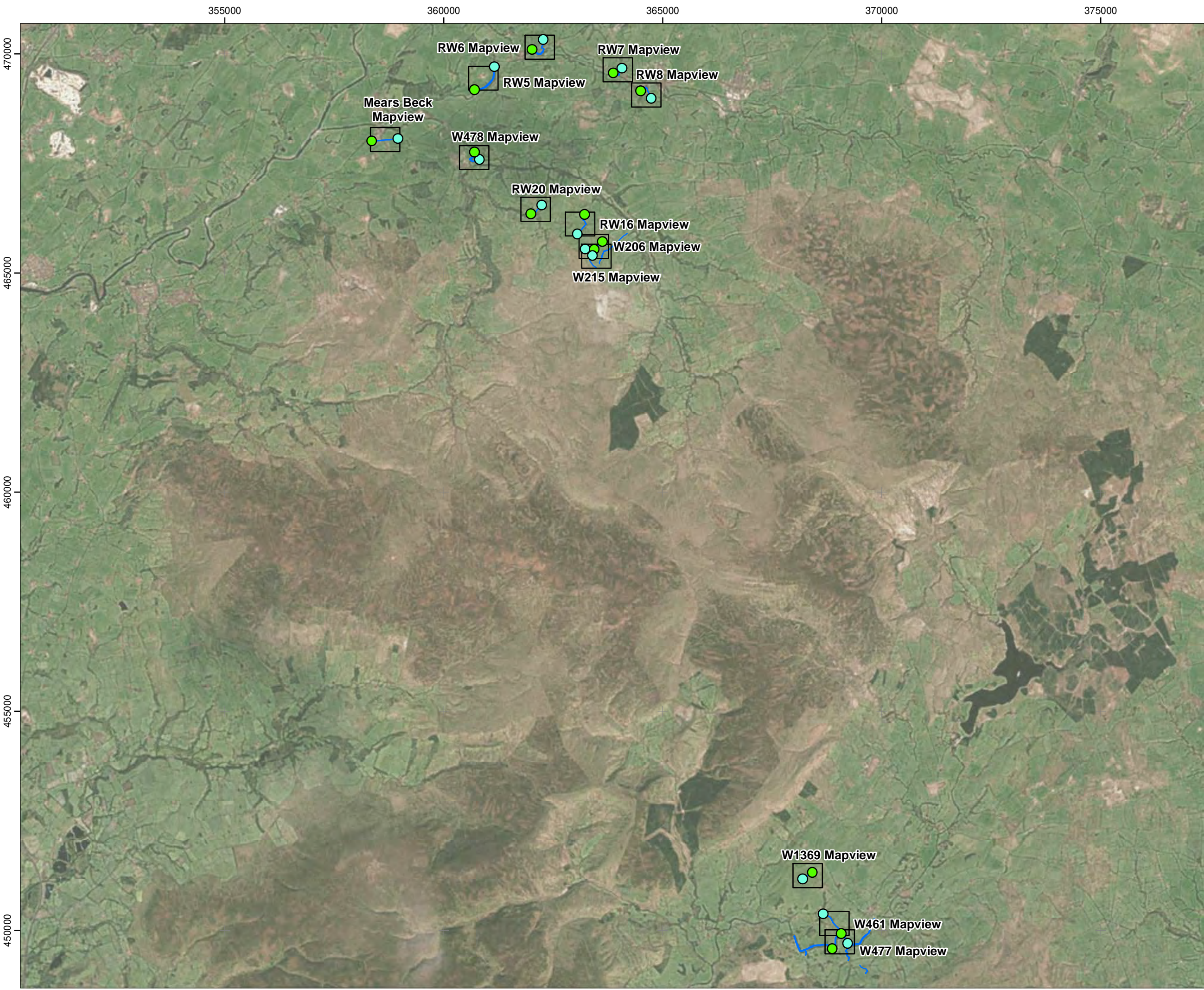
Habitat was largely unsuitable for water vole as the banks were heavily shaded by tree cover, inhibiting the growth of low-lying herbaceous plants. The banks of the watercourse were also frequently comprised of bedrock limiting opportunities for burrowing. Similarly, sections of the bankside were reinforced further inhibiting burrowing opportunities.



## 4 APPENDICES – SURVEY MAPS

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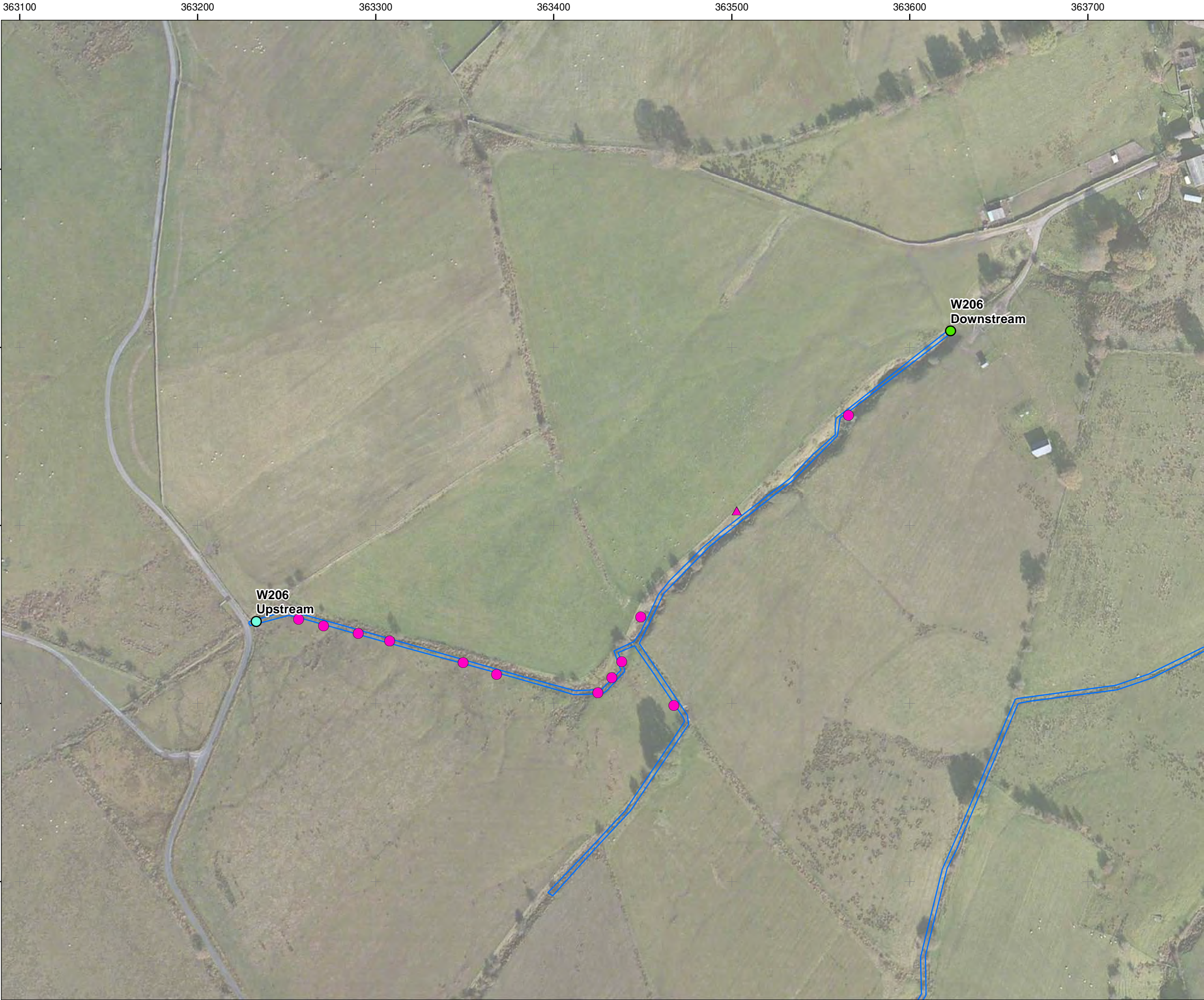
**Legend:**

- Waterbody
- Upstream Survey Extent
- Downstream Survey Extent
- Map View

Coordinate System: British National Grid  
Projection: Transverse Mercator  
Datum: OSGB 1936  
Units: Meter

00	17/02/2021	2480524	RG	SP	BF
Rev	Date	Description	Drn	Chk	App
HARP Aquatics					
TITLE: Figure 1: Otter and Water Vole Survey Overview Map - Bowland (TR3)					
0 1,500 3,000 Meters SCALE: 1:80,000 @ A3			 REV 00		





- Legend:
- Waterbody
  - Upstream Survey Extent
  - Downstream Survey Extent
- Potential Water Vole Evidence
- Burrow
  - Feeding Signs

Coordinate System: British National Grid  
Projection: Transverse Mercator  
Datum: OSGB 1936  
Units: Meter

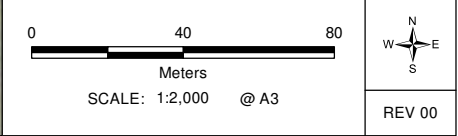


00	17/02/2021	W206	RG	SP	BF
Rev	Date	Description	Drm	Chk	App

HARP Aquatics



TITLE: Figure 2:  
Water Vole Survey Results  
Bowland (TR3) - Watercourse W206







- Legend:
- Waterbody
  - Upstream Survey Extent
  - Downstream Survey Extent

Coordinate System: British National Grid  
Projection: Transverse Mercator  
Datum: OSGB 1936  
Units: Meter

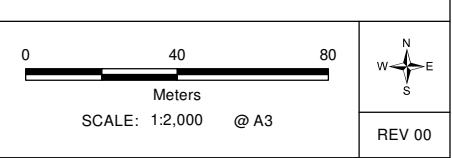


00	17/02/2021	RW16	RG	SP	BF
Rev	Date	Description	Drn	Chk	App

HARP Aquatics



TITLE: Figure 2:  
No Otter or Water Vole Survey Results  
Bowland (TR3) - Watercourse RW16







- Legend:**
- Waterbody
  - Upstream Survey Extent
  - Downstream Survey Extent
- Otter Evidence**
- Otter Couch

Coordinate System: British National Grid  
Projection: Transverse Mercator  
Datum: OSGB 1936  
Units: Meter



00	17/02/2021	RW20	RG	SP	BF
Rev	Date	Description	Drn	Chk	App

HARP Aquatics



TITLE: Figure 2:  
Otter Survey Results  
Bowland (TR3) - Watercourse RW20

04080

Meters

SCALE: 1:2,000 @ A3

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REV 00






- Legend:**
- Waterbody
  - Upstream Survey Extent
  - Downstream Survey Extent
- Otter Evidence**
- Otter Holt
  - Otter Couch
  - Otter feeding evidence
  - Otter Spraint
  - Otter Footprint

Coordinate System: British National Grid  
Projection: Transverse Mercator  
Datum: OSGB 1936  
Units: Meter



00	17/02/2021	W478	RG	SP	BF
Rev	Date	Description	Drn	Chk	App

HARP Aquatics



RSK  
biocensus  
EXPERTS IN ECOLOGY

TITLE: Figure 2:  
Otter Survey Results  
Bowland (TR3) - Watercourse W478

04080

Meters

SCALE: 1:2,000 @ A3

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REV 00





- Legend:
- Waterbody
  - Upstream Survey Extent
  - Downstream Survey Extent

Coordinate System: British National Grid  
Projection: Transverse Mercator  
Datum: OSGB 1936  
Units: Meter

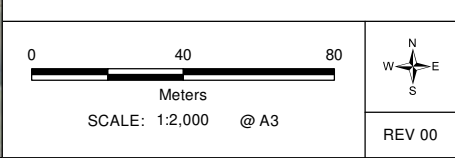


Rev	Date	Description	Drn	Chk	App
00	17/02/2021	Mears Beck	RG	SP	BF

HARP Aquatics



TITLE: Figure 2:  
No Otter or Water Vole Survey Results  
Bowland (TR3) - Watercourse Mears Beck







**Legend:**

- Waterbody
- Upstream Survey Extent
- Downstream Survey Extent

**Potential Water Vole Evidence**

- Burrow
- Feeding Signs

Coordinate System: British National Grid  
Projection: Transverse Mercator  
Datum: OSGB 1936  
Units: Meter



00	17/02/2021	W215	RG	SP	BF
Rev	Date	Description	Drn	Chk	App

HARP Aquatics



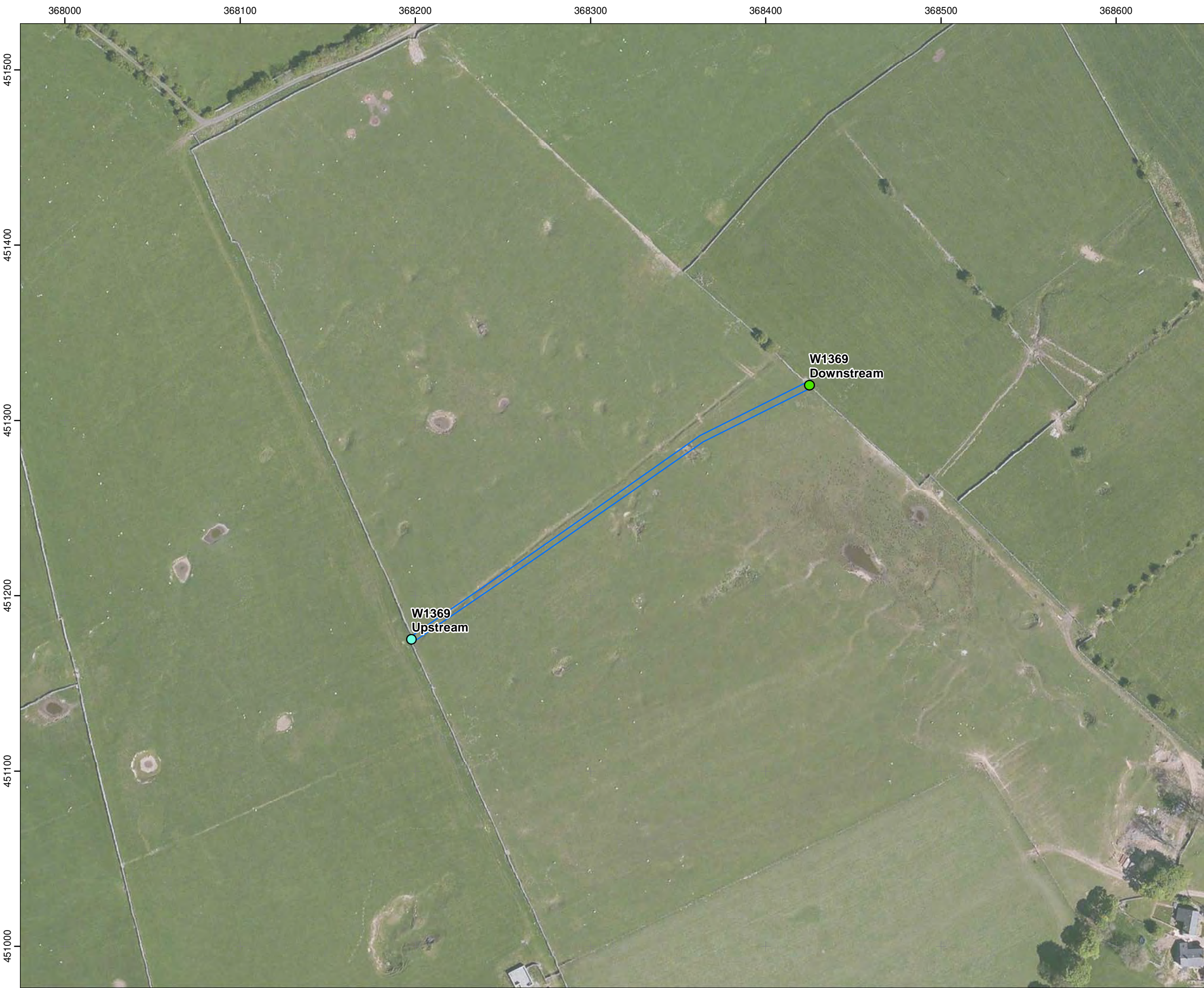
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Water Vole Survey Results  
Bowland (TR3) - Watercourse W215




04080  
Meters  
SCALE: 1:2,000 @ A3

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REV 00





- Legend:
-  Waterbody
  -  Upstream Survey Extent
  -  Downstream Survey Extent

Coordinate System: British National Grid  
Projection: Transverse Mercator  
Datum: OSGB 1936  
Units: Meter

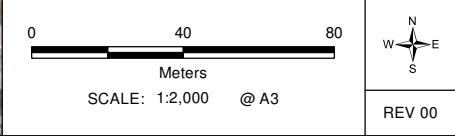


00	17/02/2021	W1369	RG	SP	BF
Rev	Date	Description	Drn	Chk	App

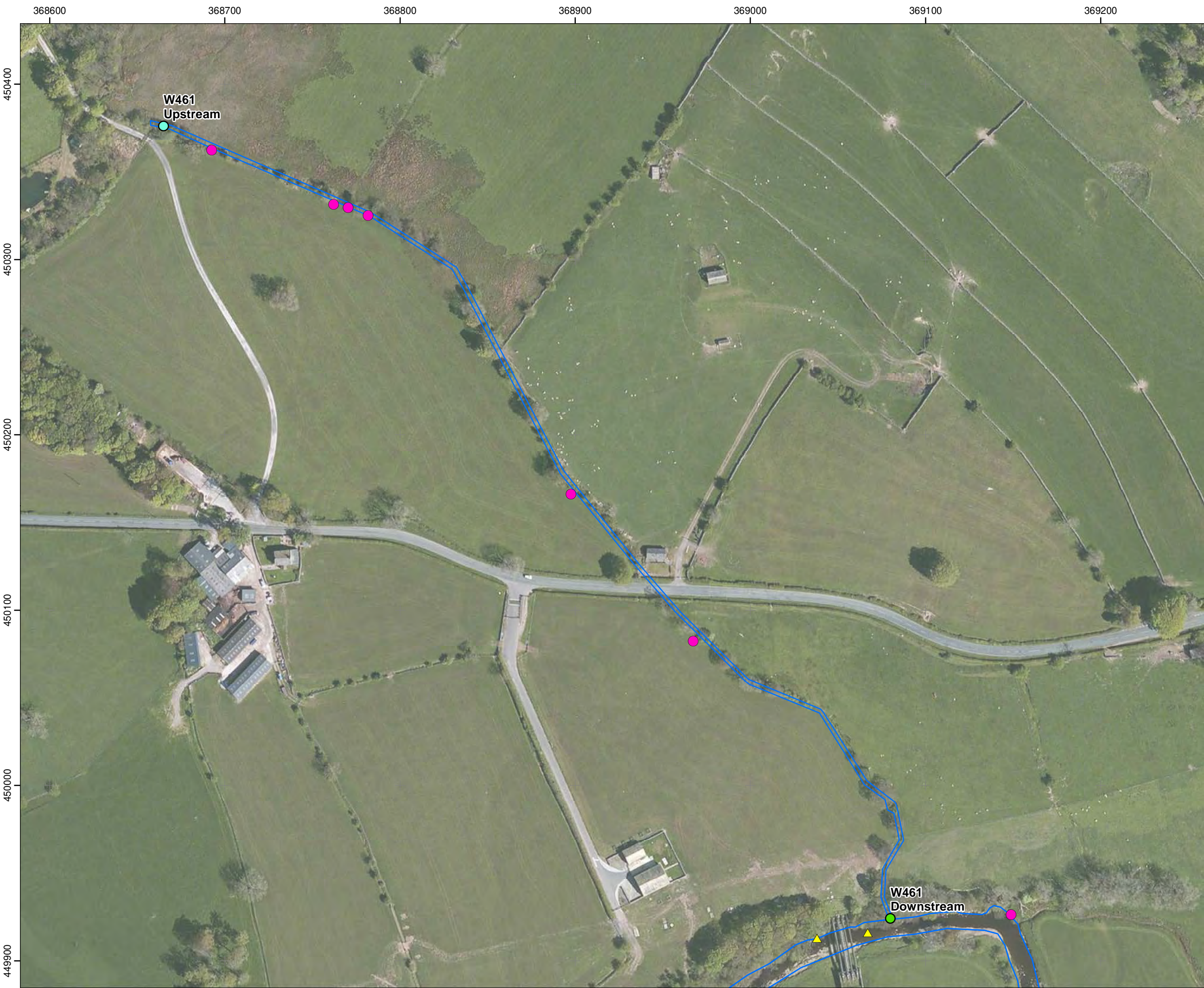
HARP Aquatics



TITLE: Figure 2:  
Water Vole Survey Results  
Bowland (TR3) - Watercourse W1369







**Legend:**

- Waterbody
- Upstream Survey Extent
- Downstream Survey Extent

**Otter Evidence**

- Otter Spraint

**Potential Water Vole Evidence**

- Burrow

Coordinate System: British National Grid  
Projection: Transverse Mercator  
Datum: OSGB 1936  
Units: Meter

00	17/02/2021	W461	RG	SP	BF
Rev	Date	Description	Drn	Chk	App

**HARP Aquatics**

**TITLE:** Figure 2:  
Water Vole Survey Results  
Bowland (TR3) - Watercourse W461

0

40

80

Meters

SCALE: 1:2,000 @ A3

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REV 00





- Legend:**
- Waterbody
  - Upstream Survey Extent
  - Downstream Survey Extent
  - Otter Evidence**
    - Potential Otter Holt
    - Otter Couch
    - Otter Spraint
  - Potential Water Vole Evidence**
    - Burrow

Coordinate System: British National Grid  
Projection: Transverse Mercator  
Datum: OSGB 1936  
Units: Meter



00	17/02/2021	W477	RG	SP	BF
Rev	Date	Description	Drn	Chk	App

HARP Aquatics



TITLE: Figure 2:  
Otter and Water Vole Survey Results  
Bowland (TR3) - Watercourse W477

04080

Meters

SCALE: 1:2,000 @ A3

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W  
S  
E

REV 00





- Legend:**
- Waterbody
  - Upstream Survey Extent
  - Downstream Survey Extent
- Otter Evidence**
- Otter Couch
  - Otter Spraint
  - Otter Footprint

Coordinate System: British National Grid  
Projection: Transverse Mercator  
Datum: OSGB 1936  
Units: Meter



00	17/02/2021	RW5	RG	SP	BF
Rev	Date	Description	Drn	Chk	App

HARP Aquatics



TITLE: Figure 2:  
Otter Survey Results  
Bowland (TR3) - Watercourse RW5

04080

Meters

SCALE: 1:2,000 @ A3

WSE

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REV 00





**Legend:**

- Waterbody
- Upstream Survey Extent
- Downstream Survey Extent

**Otter Evidence**

- Otter Holt
- Otter Couch
- Otter Spraint
- Otter Footprint

Coordinate System: British National Grid  
Projection: Transverse Mercator  
Datum: OSGB 1936  
Units: Meter

00	17/02/2021	RW6	RG	SP	BF
Rev	Date	Description	Drn	Chk	App

**HARP Aquatics**

TITLE: Figure 2:  
Otter Survey Results  
Bowland (TR3) - Watercourse RW6

04080

Meters

SCALE: 1:2,000 @ A3

W

N

E

S

REV 00





- Legend:**
- Waterbody
  - Upstream Survey Extent
  - Downstream Survey Extent
- Otter Evidence**
- Otter Couch
  - Otter Spraint

Coordinate System: British National Grid  
Projection: Transverse Mercator  
Datum: OSGB 1936  
Units: Meter

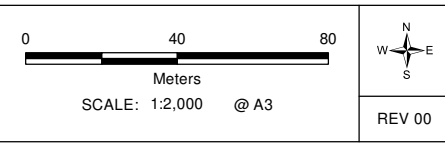


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Rev	Date	Description	Drn	Chk	App

HARP Aquatics



TITLE: Figure 2:  
Otter Survey Results  
Bowland (TR3) - Watercourse RW7







**Legend:**

- Waterbody
- Upstream Survey Extent
- Downstream Survey Extent

**Otter Evidence**

- ▲ Otter Spraint

Coordinate System: British National Grid  
Projection: Transverse Mercator  
Datum: OSGB 1936  
Units: Meter



00	17/02/2021	RW8	RG	SP	BF
Rev	Date	Description	Drn	Chk	App

HARP Aquatics



TITLE: Figure 2:  
Otter Survey Results  
Bowland (TR3) - Watercourse RW8

04080

Meters

SCALE: 1:2,000 @ A3

N  
W  
E  
S

REV 00





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