A47/A11 Thickthorn Junction

Scheme Number: TR010037

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APFP Regulation 5(2)(a)

Planning Act 2008

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

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Infrastructure Planning

Planning Act 2008

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

The A47/A11 Thickthorn Junction Development Consent Order 202[x]

ENVIRONMENTAL STATEMENT APPENDICES
Appendix 8.9 – Otter and Water Vole Report

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1. Introduction

1.1. Background

1.1.1. Sweco UK Ltd was commissioned to undertake otter and water vole surveys as part of the Proposed Scheme at A47/A11 Thickthorn Junction to inform the Environmental Statement (ES) Chapter 8, Biodiversity **(TR010037/APP/6.1)**.

1.1.2. This baseline report provides a summary of the results of the surveys carried out, the impacts of the Proposed Scheme and proposals for mitigation which are addressed in the ES Chapter 8, Biodiversity **(TR010037/APP/6.1)**.

1.2. Proposed Scheme description

1.2.1. The A47/A11 Thickthorn Junction is located on the south-western edge of Norwich, at national grid reference TG 18424 05483, and provides access to the A47 via the A11 for Eaton, Cringleford, Hethersett and Wymondham.

- Improve accessibility to and around the region, reducing congestion and delays so encouraging more reliable journey times
- Improve safety performance for all road users – drivers, public transport users, cyclists, horse riders and pedestrians
- Provide alternative access to local roads
- Protect the environment by minimising adverse impacts and, where possible, deliver benefits
- Support economic growth in the Peterborough, Norwich, Cambridge and Great Yarmouth areas, improving overall road capacity

1.2.2. The aims and objectives of the Proposed Scheme are to:

- create a new connector road from the A11 to the A47
- improve the existing Thickthorn Junction roundabout
- create a new link road between Cantley Lane South and the B1172 Norwich Road
- create a new Cantley Lane Footbridge (Cringleford) across the A47 for walkers, cyclists and horse riders

2. Ecological background

2.1. Previous studies

Desk study

2.1.1. A desk study was undertaken in 2016 which included the purchase of data from Norfolk Biodiversity Information Service (NBIS). The data purchase returned no records of otter and water vole onsite, however records were returned where presence of otter was confirmed approximately 1km to the west of the study area.

Extended Phase 1 habitat survey

2.1.2. In 2016, an extended phase 1 habitat survey was undertaken of habitats within 100m of the Proposed Scheme, which identified potential habitat on site for otter and water vole. The Preliminary Ecological Appraisal (PEA) that was produced in 2016 incorporated the desk study results and the extended phase 1 habitat survey results and recommended that otter and water vole were assessed as potential constraints to the Proposed Scheme.

Otter and water vole survey

2017

2.1.3. An otter and water vole survey was undertaken in spring and autumn of 2017 as recommended in the PEA.

2.1.4. An otter spraint was found on the northern bank of the fishing lake during the survey in spring of 2017, at OS grid reference TG1891004856. Otters were incidentally recorded on camera traps located either side of the A47 underpass during the polecat survey in September 2017 and incidental sightings of otter spraint was also found at the A11 underpass during other ecology surveys for the Proposed Scheme. No otter holts were found within the study area.

2.1.5. Water vole signs were recorded along the stream close to the A11, up to 20m upstream of the underpass and up to 200m downstream during both surveys. Three burrows and a maximum of 10 latrines were recorded as well as regular prints and feeding remains. No other survey locations had signs of water vole.

2018

2.1.6. In addition, further surveys were undertaken in 2018 to update the data recorded in 2017. These surveys were conducted in dry weather and after a period of dry weather.

2.1.7. The Habitat Suitability Assessment Surveys were undertaken in July 2018, and then updated in September 2018.

2.1.8. Otter signs observed during the survey include otter footprints on the A11 underpass, Otter spraint was also recorded on a makeshift footbridge to the west of the A11 underpass and on the ledges of the A47 culvert. No otter holts, potential otter holts or resting places were found within the DCO boundary during the 2018 surveys.

2.1.9. Spot checks for otters were carried out under bridges at 16 locations within 3km of the DCO boundary on two separate occasions, on 01 August 2018 and on 09 September 2018 in reference to the previous DMRB guidelines (Volume 10, Section 4, Part 4 HA 81/99) which have since been withdrawn and replaced with LA118 (Biodiversity Design).

2.1.10. During the otter spot checks along the watercourse three otter spraints were observed in the culvert underneath Intwood Road, approximately 500m east of the site. Seven otter spraints were observed on the concrete ledges of the A47 culvert. No otter signs were observed at any of the other spot check locations.

2.1.11. Water vole feeding remains, footprints and latrines were recorded in abundance in the western area of the survey area from approximately 150m west of the A11 underpass to approximately 600m east of the A11 underpass.

2.1.12. Latrines and footprints were also recorded from the A47 culvert stretching approximately 250m east of the A47 culvert.

2.1.13. Water vole burrows were recorded along the watercourse from just west of the A11 underpass to approximately 450m east of the A47 culvert where the survey area terminated. The highest densities of burrows recorded were located in the vicinity of the A11 underpass and the last 250m stretch of the survey area in the east, west of Intwood Road.

2.1.14. During the otter spot checks three sets of water vole footprints were recorded along the banks of the watercourse beneath Keswick Road, approximately 1129m east of the Proposed Scheme boundary.

2.1.15. From these surveys, it was concluded that water vole is a constraint to the Proposed Scheme due to their presence on Cantley Stream either side of the A11 underpass. Otter are also considered a constraint to the Proposed Scheme as the spraints and camera trap images observed evidence the use of Cantley Stream to the south of the junction as a commuting route and foraging habitat.

2.2. Legislation and policy

Habitats Directive

2.2.1. The Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora, or the 'Habitats Directive', is a European Union directive adopted in 1992 in response to the Bern Convention. Its aims are to protect approximately 220 habitats and 1,000 species listed in its several Annexes.

2.2.2. In England, the Habitats Directive is transposed into national law via the Conservation of Habitats and Species Regulations 2017. These regulations came into force on 30 November 2017. The Regulations make it an offence to deliberately capture, kill, disturb, damage or destroy a breeding/resting place of or trade in the animals listed in Schedule 2, or pick, uproot, destroy, or trade in the plants listed in Schedule 5.

Otters

2.2.3. Otters are given special protection within England by their inclusion on Schedule 2 of the Conservation of Habitats and Species Regulations 2017 and Schedule 5 of the Wildlife and Countryside Act 1981 (as amended).

2.2.4. As a result, it is an offence to:

- deliberately capture, injure or kill an otter
- possess or advertise, sell or exchange an otter (dead or alive) or any part of an otter

2.2.5. Deliberately disturb an otter in such a way as to be likely significant to affect:

- the ability of any significant group of otters to survive, breed or nurture their young
- the local distribution or abundance of otters
- damage or destroy a breeding site or resting place of any otter (this does not necessarily need to be intentional or deliberate)
- intentionally damage, destroy or obstruct access to any place that an otter uses for shelter or protection
- intentionally or recklessly disturb an otter while it is occupying a structure or place that it uses for shelter or protection

2.2.6. With specific reference to the offence of disturbance, Regulation 43(1) of the Conservation of Habitats and Species Regulations 2017 states that a person commits an offence if the disturbance of animals includes in particular any disturbance which is likely to impair their ability:

- to survive, to breed or reproduce, or to rear or nurture their young; or

- in the case of animals of a hibernating or migratory species, to hibernate or migrate; or
- to affect significantly the local distribution or abundance of the species to which they belong

2.2.7. Otters are also afforded more general protection within the Natural Environment and Rural Communities Act (NERC) 2006. This imposes a duty on all public bodies, including local authorities and statutory bodies, in exercising their functions, “to have due regard, so far as is consistent with the proper exercise of those functions, to the purpose of conserving biodiversity” [Section 41]. It notes that “conserving biodiversity includes restoring or enhancing a population or habitat” [Section 41]. Consequently, attention should be given to dealing with the modification or development of an area if aspects of it are deemed important to otters.

2.2.8. Section 41 (S41) of this Act requires the Secretary of State to publish a list (in consultation with Natural England) of habitats and species which are of principal importance for the conservation of biodiversity in England. The S41 list is used to guide decision-makers such as public bodies including local and regional authorities, when carrying out their normal (e.g. planning) functions. The S41 list includes 65 habitats of principal importance and 1,150 species of principal importance. The otter is listed under Section 41 of the NERC Act 2006.

2.2.9. Local Biodiversity Action Plans (LBAP) identify habitat and species conservation priorities at a local level (typically at the County level) and are usually drawn up by a consortium of local Government organisations and conservation charities. The otter is included in Norfolk’s LBAP (Norfolk Biodiversity Partnership, 1999).

Water voles

2.2.10. Water voles are protected under schedule 5 of the Wildlife and Countryside Act 1981 (as amended). While previously only their burrows were protected from disturbance or damage, since 6th April 2008 they have been given further protection which makes it illegal to:

- Intentionally or recklessly kill, injure or take water voles
- Possess or control live or dead water voles or derivatives thereof
- Intentionally or recklessly damage, destroy or obstruct access to any structure or place used for shelter or protection
- Intentionally or recklessly disturb water voles whilst occupying a structure or place used for that purpose

2.2.11. The water vole is also listed as a species of Principal Importance in England under schedule 41 of the NERC Act 2006. Water vole is a priority species on the LBAP for Norfolk.

National Planning Policy Framework (NPPF)

2.2.12. The NPPF (2019) outlines government planning policies and how they should be applied within local authorities. The framework places an emphasis on sustainable development, encouraging the re-use of land that has previously been developed over land that has a higher environmental value and by minimising impacts on biodiversity.

2.2.13. The NPPF states that developments should aim to conserve or enhance biodiversity and encourages opportunities to incorporate biodiversity in and around developments using the principles of the mitigation hierarchy. Paragraphs 170, 174 and 175 of the NPPF give policy support to the provision of measurable net gains in biodiversity. Paragraph 174 specifies that plans should identify, map and safeguard components of local wildlife-rich habitats and wider ecological networks, including locally designated sites; and promote the conservation, restoration and enhancement of priority habitats and ecological networks and the protection and recovery of priority species.

National Policy Statement for National Networks (2014)

2.2.14. The National Policy Statement for National Networks (2014) states "*development should avoid significant harm to biodiversity and geological conservation interests, including through mitigation and consideration of reasonable alternatives. The applicant may also wish to make use of biodiversity offsetting in devising compensation proposals to counteract any impacts on biodiversity which cannot be avoided or mitigated. Where significant harm cannot be avoided or mitigated, as a last resort, appropriate compensation measures should be sought*."

2.3. Aims and objectives

2.3.1. The purpose of the otter and water vole surveys is to support the DCO application by informing the assessment of impacts to ecological receptors and requires the following:

- To determine the presence or likely absence of otters and water voles on site
- To provide preliminary advice on mitigation strategies against any adverse effects on the local otter and water vole population which may arise as a result of the Proposed Scheme
- To inform any Natural England mitigation licences that may be required

2.3.2. To enable this, the following scope of works was programmed:

- Desktop study - a review of historical records of otters and water voles in the surrounding area, including the results of previous ecological surveys in the area
- Field surveys - a survey of suitable watercourses within 250m of the A47/A11 Thickthorn Junction that could potentially be affected
- Ecological report - detailing the survey results, implications for the Proposed Scheme and instructions for further ecological work.

3. Methodology

3.1. Field survey

3.1.1. The study area comprises the Proposed Scheme, with an additional buffer zone, the size of which depends upon the ecological receptor that is being surveyed. In the case of surveying for otter and water vole, the buffer zone is 250m from the DCO boundary of the Proposed Scheme (Dean *et al.,* 2016). The buffer is primarily the existing A47 and agricultural fields with associated hedgerows, stands of trees, small woodlands, and residential properties.

3.1.2. Otter and water vole surveys are undertaken simultaneously. All field surveys referred to the Design Manual for Roads and Bridges (DMRB) methodology LA 118 (Biodiversity Design), (formerly HA 59/92, HA 67/93, HA 80/99, HA 81/99, HA 84/01, HA 97/01, HA 98/01, HA 116/05,IAN 116/08, IAN 116/08(W)). In addition, recognised industry best practice was referred to for undertaken the surveys and methodologies outlined in Chanin (2003) for the surveying of otters and Strachan *et al.* (2011) for the surveying of water vole were used. Both sides of each watercourse (Cantley Stream and the fishing lakes located to the north of Cantley Stream at the west of where the A47 crosses the rail line) were surveyed where accessible. Evidence of otters, water voles and other riparian mammal activity, such as invasive American mink *Neovison vison*, was searched for during the course of the surveys. The surveys were completed on 05 and 06 May 2020 and from 27 to 30 October 2020.

3.1.3. The study area was divided into 100m sections for the purposes of calculating water vole density (see Paragraph 3.1.9), as shown in Table 3-1 and Annex A (Figure 1: Otter and Water Vole Survey Results Map May 2020 and Figure 2: Otter and Water Vole Survey Results Map October 2020). The A11 underpass has been included in section 2a, and the A47 culvert has been included in section 3g. Therefore, sections 1a and 3g are longer than 100m.

Otters

3.1.4. Otter field signs surveyed for included spraints, tracks, feeding remains, otter slides, holts (underground dens and breeding sites) and couches (above ground sites where otters rest during the day). A survey extent of 250m upstream and downstream of the DCO boundary to check for otter holts and resting places that may be impacted by the works was carried out. This was the methodology used in previous surveys, so was repeated for comparison. The spot checks under bridges extended to 3km upstream and downstream of the DCO boundary.

3.1.5. There are a number of different holts or resting places that can be used by otters. Below in Sections 3.1.6, 3.1.7 and 3.1.8 are brief descriptions of the terminology used in this report.

Holts

3.1.6. Otter holts are places or structures used by otters for shelter on a 'permanent' basis. Holts are covered structures, usually a hole or burrow along the riverbank amongst riparian vegetation and the root system of river side trees, or behind boulders set into the bank. Usually, a holt will also have other associated otter field signs such as footprints or an accumulation of spraint. Holts may also be connected to lying-up areas and have more than one entrance as with badger setts.

Lying-up areas or couches

3.1.7. Lying-up areas or couches are 'temporary' areas used by otters for resting, grooming or feeding whilst on the move. Lying-up areas usually do not form a full covered structure, rather they are partially hidden bankside shelves amongst riparian vegetation, or 'nest-like' structures amongst reeds and grasses. As with holts, lying-up areas usually have other field signs to demonstrate use by otters.

Natal dens

3.1.8. Natal dens are holts which are used by otters to give birth and rear their young. Natal dens usually have inconspicuous entrances and have little or no evidence of otter activity around the entrance. Natal dens can be located some distance from the watercourse, sometimes being set back in woodland amongst log piles, tree roots, rubble or even amongst reed beds.

Camera-trap survey

3.1.9. The surveys undertaken in October 2020 identified two potential otter holts (one considered used and one considered disused) in addition to those further two potential holts identified in May 2020 (see Table 4-1). In order to further assess the use of these features by otters and either confirm use or likely disuse as an otter holt camera-trap surveys were undertaken in December 2020.

3.1.10. Camera-trap survey visits were undertaken on 7 and 11 December 2020. A Bushnell Trophy Cam HD camera trap was deployed on 7 December 2020 at one location in survey section 2c (see Table 4-1) which was identified as being a potential used otter holt during the field surveys undertaken in October 2020 (see Table 4-1). Surveyors visited the potential hover/holt location in survey section 4b however no camera-trap was deployed at this location. Surveyors attempted to visit the potential disused holt in survey section 4a on 11 December

2020, but it was not visited due to horses in the field preventing access. However, as Cantley Stream was largely in spate in the field directly adjacent to the feature, and the feature was previously found flooded in October 2020, it is considered most likely that the feature would have also been flooded at the time of survey on 11 December 2020. A flooded feature would be unsuitable as an otter holt at the time of flooding and due to the flooding and lack of access no camera trap was deployed at this location (in survey Section 4a (see Table 4-1)). The remaining potential holt identified in survey section 3c (see Table 4-1) could not be accessed (see Section 3.3.5).

3.1.11. The camera-trap was deployed with care to ensure the best possible chance of capturing any otter activity at the entrance to the potential otter holt. This was achieved by installing the camera at an appropriate height and angle and ensuring the camera had a visual of the entrance to the potential holt feature.

3.1.12. Whilst installing the camera, the potential holt in survey section 2c on which the camera was deployed and the potential holt in survey section 4b were re-surveyed for signs of otter use in and around the entrances of these features, and on the banks of Cantley Stream directly either side of the features.

3.1.13. The re-survey of the two locations and camera-installation was undertaken by Ishbel Campbell ACIEEM (Senior Consultant Ecologist, Sweco), Beth Mell (Consultant Ecologist, Sweco). The camera-trap was collected in on 12 January 2021 by Harry Beardsall (Graduate Geo-environmental Consultant, Sweco).

Water voles

3.1.14. Water vole evidence searched for during the surveys included latrines, feeding evidence, feeding stations, burrows, grazed lawns, footprints and runways through vegetation. The survey area included suitable watercourses within 250m of the DCO boundary, where accessible.

3.1.15. During May 2020 surveys, water depth for each 100m of surveyed watercourse was not recorded, due to extreme variability along the total length of the watercourse. The lowest water depth point was <10cm, whilst the highest >1m. Therefore, water depth data in Table 3-1 is based on measures taken during October 2020 surveys.

3.1.16. Relative water vole population size for each 100m of surveyed watercourse was estimated using current guidance from Dean *et al.* (2016) based on the number of latrines recorded. Results were then recorded as “high”, “medium” or “low” relative population size. In watercourses, or stretches of watercourses, where no water vole latrines were identified (where other water vole field signs were recorded to confirm presence), water voles were recorded as present with no relative population size estimated.

3.1.17. The results are provided in Annex A (Figure 1: Otter and Water Vole Survey Results Map. May 2020; Figure 2: Otter and Water Vole Survey Map. October 2020).

Table 3-1: Survey areas and justification for undertaking the survey

Survey sections	Point of potential impact	Watercourse type	Justification for survey	Bank substrate	Water depth (cm)
1a, 1b	Land west of A11 underpass and east side of A11 underpass	Stream	Within boundary of Proposed Scheme and 250m from the boundary extent. Modification of over bridge over Cantley Stream.	Earth	<0.5m
2a-2d	Land between east side of A11 underpass and Cantley Lane South	Stream	Within boundary of Proposed Scheme. A 390m section of Cantley Stream is being realigned.	Earth	<0.5m
3a-3g	Fishponds at Meadow Farm	Ponds	Within boundary of Proposed Scheme.	Earth	<0.5m
	Land between Cantley Lane South and east side A47 culvert	Stream	Within boundary of proposed scheme.		0.5m-1m (3d, 3e)
4a-4c	Land east of A47 culvert	Stream	Within boundary of Proposed Scheme and 250m from the boundary extent. Modification of A47.	Earth	<0.5m

3.1.18. Spot checks for otter signs under bridges were carried out over 16 locations in total on two separate occasions, on 01 August 2018 and on 09 September 2018 in reference to the previous DMRB guidelines (Volume 10, Section 4, Part 4 HA 81/99) which have since been withdrawn and replaced with LD 118 (Biodiversity Design).

3.2. Survey timings and weather conditions

3.2.1. Otter surveys are not restricted to specific months and seasons as other protected species surveys are. It is recommended that surveys are not undertaken during periods when there is, or after heavy rain as field signs will be washed away or obscured by higher water levels. The surveys in May 2020 were undertaken in sunny and clear conditions, whilst the October 2020 surveys were undertaken in moderate rain.

3.2.2. The survey was undertaken by Ishbel Campbell ACIEEM (Consultant Ecologist, Sweco), Beth Mell GradCIEEM (Graduate Ecologist, Sweco) in July 2018, Richard Webber-Salmon ACIEEM (Ecologist, MLM Group) and Sam Wilson

ACIEEM (Ecologist, MLM Group) in May 2020 and by Evelyn Gruchala (Assistant Ecologist, Sweco) and Sarah Taylor MCIEEM (Tailored Ecology) in October 2020.

3.2.3. The Habitat Suitability Assessment Surveys were initially undertaken in July 2018, and then updated in September 2018. The Cantley Stream surveyed during May and October 2020 surveys flows from west to east through parcels of woodland, improved/semi-improved grassland and arable fields, used for cattle grazing. The dominant vegetation type was noted during October 2020 surveys (Annex C, Table C-1). The vegetation recorded during the survey (October 2020) included: sycamore *Acer pseudoplatanus*, hazel *Corylus avellana*, holly *Ilex aquifolium*, water mint *Mentha aquatica*, water parsnip *Sium* sp., water forget-me-not *Myosotis scorpioides* and rosebay willowherb *Chamaenerion angustifolium*.

3.3. Limitations

3.3.1. The results of the surveys will remain valid until April 2022. Beyond this period, if works have not commenced, it is recommended that a review of the ecological conditions is undertaken.

3.3.2. All surveys were incomplete in some places due to inaccessible areas of dense vegetation. However, these sections were bypassed, and the survey continued in areas that were accessible further along the water courses. This is a significant constraint, as an accurate density of water voles on each water course could not be calculated. In addition, the presence of otter signs could have been missed. The surveys in October 2020 were undertaken in moderate rain. In addition, there had been rain two days earlier meaning that some signs of otter and water vole that were made over two days prior to the survey which was undertaken between 27 and 30 October 2020 could have been washed away and missed. In addition, some areas of vegetation had died back and densely covered the areas of Cantley Stream, such that it could not be surveyed.

3.3.3. The October 2020 surveys were undertaken outside of the optimal survey season for water voles according to best practice guidance stated in Dean *et al*., (2016). This is not considered to be a significant limitation as signs of water vole activity were recorded and most areas of the study area could be accessed.

3.3.4. Safe access to the potential disused holt in survey section 4a during the camera-trap surveys was prevented by the presence of horses in the paddock where the potential holt is located. As such this potential disused holt could not be visited on this occasion and no camera-trap was deployed (see Section 3.1.9). The camera-trap deployed at the potential used holt in survey section 2c only recorded for four days from deployment on 7 December 2020 to 10 December

2020 due to a technical failure. The lack of a significant survey period and data is considered a significant limitation to the camera-trap survey.

3.3.5. Due to COVID-19 and its associated restrictions it was not possible to arrange access to the potential holt at survey section 3c for re-survey and/or camera-trap survey.

3.3.6. Construction is programmed to begin in 2023. The ecology of a site is subject to change and as mammals are highly mobile it is recommended that an update survey is undertaken in 2022 (or before this time should works be re-programmed to start earlier) to update the information collected in these surveys. This would allow time for the consideration of further amendments to the design and development phase or other matters related to planning and licensing as required.

4. Results

4.1. Field survey results

4.1.1. The results of the otter and water vole surveys are outlined below. Site photographs are included in Annex B.

4.1.2. All watercourses are situated in rural areas with surrounding land used for either livestock, or arable farming, and are relatively undisturbed by human activities. The immediate habitat surrounding the watercourses generally comprises hedgerows, grassland and scrub, which is suitable for supporting both otters and water voles.

4.1.3. The watercourse banks generally have a substrate composed of earth and are covered with dense marginal vegetation suitable for supporting water voles and otters, as this vegetation creates bank-side cover and forage for water voles. The water depth was generally low throughout these eight points and emergent vegetation was present, thereby providing further cover to any water voles.

4.2. Otter activity

4.2.1. Three potential otter holts were found during the surveys in May 2020. The October 2020 surveys re-identified one of these holts in section 2c and identified one further potential holt. A total of four potential otter holts were found during 2020 surveys (May and October), are summarised below in Table 4-1 at the following locations:

Table 4-1: otter survey results recorded in May and October 2020

Survey section	Otter sign	Year	OS Grid reference
2c	Potential holt	May 2020	TG 18124 04855
	Potential used holt	October 2020	
3c	Otter hover (potentially a holt being excavated)	May 2020	TG 18644 04836
4a	Potential disused holt	October 2020	TG 19130 04859
4b	Potential hover/holt	May 2020	TG 19250 04869

4.2.2. Table 4-1 shows that otter presence is throughout the study area, and it is likely that the Cantley Stream is an important commuting and foraging corridor for this species. This conclusion is supported by the otter evidence of spraint recorded during the survey in October 2020 on survey sections 2c and 3f (three spraints in total) in addition to the findings of spraint in the survey undertaken in May 2020

in survey sections 1b, 2a (two spraints in total), 3c, 4a (seven spraints in total) and 4c.

4.2.3. Figure 1 sheets 1-3 and Figure 2 sheets 1-3 in Annex A (Otter and Water Vole Survey Results) illustrates these results. Photographs are in Annex B.

4.3. Camera-trap survey

4.3.1. No otters were recorded on the camera-trap deployed at the potential used holt location in survey section 2c. The following species were recorded; muntjac *Muntiacus reevesi* (an invasive non-native species (INNS) listed on Schedule 9 of the WCA 1981 (as amended)), wren *Troglodytes troglodytes*, blackbird *Turdus merula*, a brown rat *Rattus norvegicus* and a species of mouse.

4.4. Water vole activity

4.4.1. There is suitable habitat for supporting water voles throughout the study area. The habitat suitability assessment data recorded during October 2020 is given in Annex C.

4.4.2. Signs of water vole activity were recorded on site and are displayed in Table 4-2 below. Results are also illustrated in Annex A (Otter and water vole survey results) and in Photographs 1-5 of Annex B (Site photographs).

Table 4-2: Summary of water vole signs and water vole density

Year	Location	Water vole signs	Relative population density
May 2020	1a	None	N/A
May 2020	1b	None	N/A
May 2020	2a	3 water vole latrines	Medium
May 2020	2b	24 water vole latrines	High
May 2020	2c	18 water vole latrines	High
May 2020	2d	28 water vole latrines	High
May 2020	3a	4 water vole footprints 12 water vole latrines	High
May 2020	3b	1 water vole latrine	Low
May 2020	3c	15 water vole latrines 1 water vole footprint 1 water vole sighting	High
May 2020	3d	None	N/A
May 2020	3e	1 water vole latrine	Low

Year	Location	Water vole signs	Relative population density
May 2020	3f	None	N/A
May 2020	3g	None	N/A
May 2020	4a	None	N/A
May 2020	4b	4 water vole latrines	Medium
May 2020	4c	11 water vole latrines 1 water vole footprint 1 water vole sighting	High
October 2020	1a, 1b	None	N/A
October 2020	2a, 2b	None	N/A
October 2020	2c	2 water vole latrines 1 water vole burrow 2 water vole footprints	Low
October 2020	2d	1 water vole burrow 2 water vole footprints 2 water vole pathways	Low
October 2020	3a	2 water vole burrows 7 water vole footprints	Low
October 2020	3b	1 water vole latrine 1 water vole burrow 2 water vole footprints	Low
October 2020	3c	1 water vole latrine 1 water vole burrow 1 water vole pathway	Low
October 2020	3d, 3e, 3f, 3g	None	N/A
October 2020	4a, 4b	None	N/A
October 2020	4c	1 water vole burrow 1 water vole footprint	Low

4.5. Other notable species

4.5.1. Records of other notable species found during the surveys in 2020 are summarised in Table 4-3 (see Annex A: Otter and Water Vole Survey Results).

Table 4-3: Summary of signs of other notable species recorded during the surveys

Year	Location	Notable species signs	Notes (if any)
May 2020	2d	Grass snake *Natrix natrix*	Listed on Schedule 9 of Wildlife and Countryside Act 1981 (as amended)

Year	Location	Notable species signs	Notes (if any)
October 2020	2c	Common kingfisher *Alcedo atthis* sighting	Listed on Schedule 1 of Wildlife and Countryside Act 1981 (as amended)
October 2020	3a	Muntjac *Muntiacus reevesi* footprints	Listed on Schedule 9 of Wildlife and Countryside Act 1981 (as amended)
October 2020	3c	Muntjac footprints	Listed on Schedule 9 of Wildlife and Countryside Act 1981 (as amended)

5. Conclusions and requirements

5.1. Habitat

5.1.1. Mitigation measures will be implemented to prevent any reduction in water quality or increase in sediment loadings to the watercourses. During construction, best practice for pollution prevention and water management would be implemented by the Principal Contractor as part of the overall Environmental Management Plan (EMP) (**TR010037/APP/7.4**).

5.1.2. Guidance on best practice in relation to pollution prevention and water management is set out in Construction Industry research and Information Association (CIRIA) Guidelines (Soubry, M. (2001), Murnane, E. *et al.,* (2006), and Charles and Edwards (2015)), and the Environment Agency's approach to groundwater protection (2017a) and groundwater protection guides (2017e), as required under the Water Framework Directive. These guidelines should be adhered to where works are being undertaken near or within watercourses.

5.1.3. Particular attention should be made to the Cantley Stream and consultation with Natural England regarding potential impacts to this site is to be undertaken prior to construction and mitigation measures included within the Environmental Management Plan (EMP) (**TR010037/APP/7.4**).

5.2. Otters

5.2.1. Otter presence has been confirmed to occur within 2km of the study area and for commuting and foraging. Several signs of otter presence (including spraint, footprints and two potential holts) were recorded throughout the areas of the Cantley Stream, which confirms that otter use the study area.

5.2.2. The proposed works must not limit the ability of otters to move freely up and down the Cantley Stream during construction or operation. The construction work where the Cantley Lane link road is being constructed must be fenced off with temporary wire mesh (50mm) and post and rail fencing along the road and around the works area to prevent any otters from crossing the roads and entering the works area, during construction. These same measures must be adopted throughout the construction works for the Cantley Stream realignment.

5.2.3. Permanent fencing must be installed after the works have been completed, to prevent otters from crossing the roads where the stream flows underneath during operation and being killed. In addition, any excavations and trenches that are created as part of the works should be covered at night (or an exit ramp provided) to minimise the likelihood of otters being injured, and all lighting should

cease at night so that otters are not disturbed from undertaking their natural behaviour of commuting along Cantley Stream.

5.2.4. The camera-trap surveys undertaken in October 2020 (see Table 4-1) revealed no further information to confirm the use of the two potential otter holt locations by otters. Due to limitations to the camera-trap survey undertaken in December 2020 (see Section 3.3) the status of these two features as potential holts remains the same.

5.2.5. As these features are still considered potential holts and lie within the Proposed Scheme DCO boundary it is recommended that these two features are re-surveyed with camera-traps to ascertain whether they are in-use as otter holts pre-construction. These pre-construction surveys should be undertaken approximately nine months prior to construction (scheduled for 2023) to allow time to apply for a mitigation licence should a holt be confirmed.

5.2.6. As four potential holts were found (one in 2c area, one in 3c area, one in 4a area and one in 4b (4b is outside of the DCO boundary)) three of which lie within the Proposed Scheme DCO boundary, camera trapping should be undertaken to ascertain whether these are in fact used as otter holts. This will inform mitigation design and the requirement for a licence from Natural England.

5.3. Water voles

5.3.1. Water vole presence has been confirmed to occur within 2km of the site and on-site along the Cantley Stream. Several signs of water vole presence (including burrows, latrines, feeding remains and footprints) were recorded throughout the areas surveyed, which confirms that water vole use this site.

5.3.2. Permanent direct habitat loss is predicted where the Cantley Stream will be realigned, and habitat will be enhanced for this species.

5.3.3. In areas where the Proposed Scheme does not cross the Cantley Stream, works must be more than 5m from the top of the banks of the Cantley Stream. Dependent on the length of any areas of the Cantley Stream where water voles are present that will be temporarily disturbed by works, these will require that the water voles are displaced by habitat manipulation (if 50m long or less) or a full science, education and conservation licence (if over 50m long). Displacement can be undertaken by an ecologist that holds a Natural England licence to displace water voles for development projects between 15 February and 15 April.

5.3.4. Where the Proposed Scheme footprint will cross the Cantley Stream, works must be undertaken under a full science, education and conservation licence (translocation of water voles with a method statement and mitigation plan) after

consultation with Natural England for the relocation of water voles, due to these works being of a permanent nature and over 50m in length.

5.3.5. Translocation means the capture and relocation of water voles from the area to another suitable area of habitat for supporting water voles. This should only be done when there is no reasonable alternative (that is, displacement of water voles). In order for translocation to occur, compensatory water vole habitat must be created first into which the water voles can be relocated permanently, once the habitat is of optimum condition for supporting water voles. Trapping and translocation must be completed in the spring where the water voles can become accustomed to the new habitat, prior to the peak of the breeding season and when food sources are in abundance.

5.3.6. Trapping and translocation must be undertaken under a science, education and conservation licence from Natural England permitting this activity.

5.4. Other notable species

5.4.1. In May 2020 a grass snake was sighted in area 2d. This species has been noted and will be discussed in the ES Chapter 8 (Biodiversity) (**TR010037/APP/6.1**). There were no incidental records of grass snake or any other reptiles made during October 2020 otter and water vole surveys.

5.4.2. In October 2020 a kingfisher was sighted in area 2c. This species has been noted as a constraint with mitigation outlined in the breeding bird survey report in Appendix 8.6 of the ES Chapter 8 (Biodiversity) (**TR010037/APP/6.1**). On the whole, Cantley Stream does not offer nesting opportunities and therefore there will be minimal risk to disturbing nesting kingfishers.

6. References

6.1.1. AECOM (2017). A47 Thickthorn Junction Badger and Polecat Survey Report CONFIDENTIAL

6.1.2. Amey (2017). Road Investment Strategy. East Area 6. A47/A11 Thickthorn Junction. Interim Environmental Assessment Report. A47IMPS2-AMY-TE-ZZ-DO-J0024.

6.1.3. Chanin, P. (2003). Monitoring the otter. Conserving Natura 2000, Rivers Monitoring Series No. 10, English Nature, Peterborough, UK.

6.1.4. Charles, P. and Edwards, P. (2015) Environmental good practice on site guide (Fourth Edition). CIRIA C741

6.1.5. Dean *et al.,* (2016). The Water Vole Mitigation Handbook *(The Mammal Society Guidance Series).* Eds Fiona Mathews and Paul Chanin. The Mammal Society, London.

6.1.6. DMRB Volume 10, Section 4, Part 4 HA 81/99 Nature Conservation Advice in Relation to Otters.

6.1.7. Environment Agency. (2017d). Protect groundwater and prevent groundwater pollution. [online] Available at: https://www.gov.uk/government/publications/protect-groundwater-and-prevent-groundwater-pollution

6.1.8. Environment Agency. (2017e). Groundwater protection technical guidance. [online] Available at: https://www.gov.uk/government/publications/groundwater-protection-technical-guidance

6.1.9. A47 Schemes. A47/A11 Thickthorn Junction Otter and Water Vole Survey Results (HE551489 -AMY-EBD-TE_STG2-DR-EN-0006 (Amey, 2017)).

6.1.10. Morris *et al.* (1998). Estimating numbers of the water vole *Arvicola terrestris:* a correction to the published method. *Journal of Zoology,* **246**: 61.62.

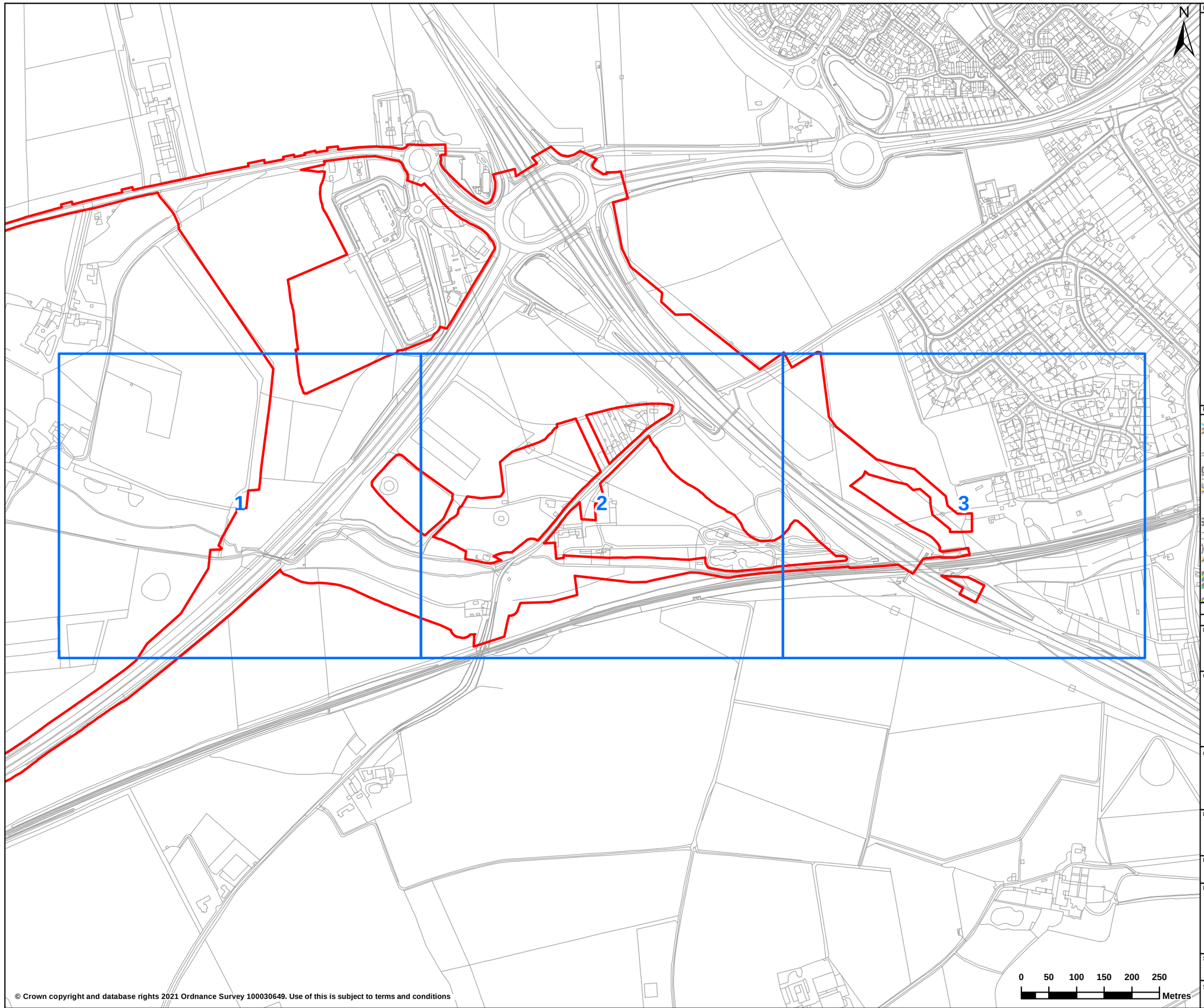
6.1.11. Murnane, E., Heap, A. and Swain, A. (2006) Control of water pollution from linear construction projects. Technical guidance. CIRIA C648

6.1.12. Norfolk Biodiversity Partnership. (1999). *Norfolk Local Biodiversity Action Plan*. Available online at: http://www.norfolkbiodiversity.org/assets/Uploads/ (Accessed November 2020).

6.1.13. Soubry, M. (2001) Bridge Detailing Guide. CIRIA C543

6.1.14. Strachan, R., Moorhouse, T. & Gelling, M. (2011). Water Vole Conservation Handbook (3rd Edn). Wildlife Conservation Research Unit, Oxford.

Annex A. Otter and water vole survey results



LEGEND

DCO Boundary

A47_THK_OtterWV_Grid

Otter field signs:
PH- Potential holt
PHD- Potential disused holt
SP- Otter spraint

Water Vole Survey:
B- Burrow
PB- Potential burrow
PW- Pathway
FP- Footprint
L- Latrine

REFERENCE MAP

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PROJECT TITLE

A47/A11 THICKTHORN JUNCTION

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PCF STAGE 3

DRAWING TITLE

OTTER AND WATER VOLE SURVEY - SHEET OVERVIEW

SUITABILITY

FOR INFORMATION

SHEET SIZE	SCALE	STATUS
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DRAWING NUMBER

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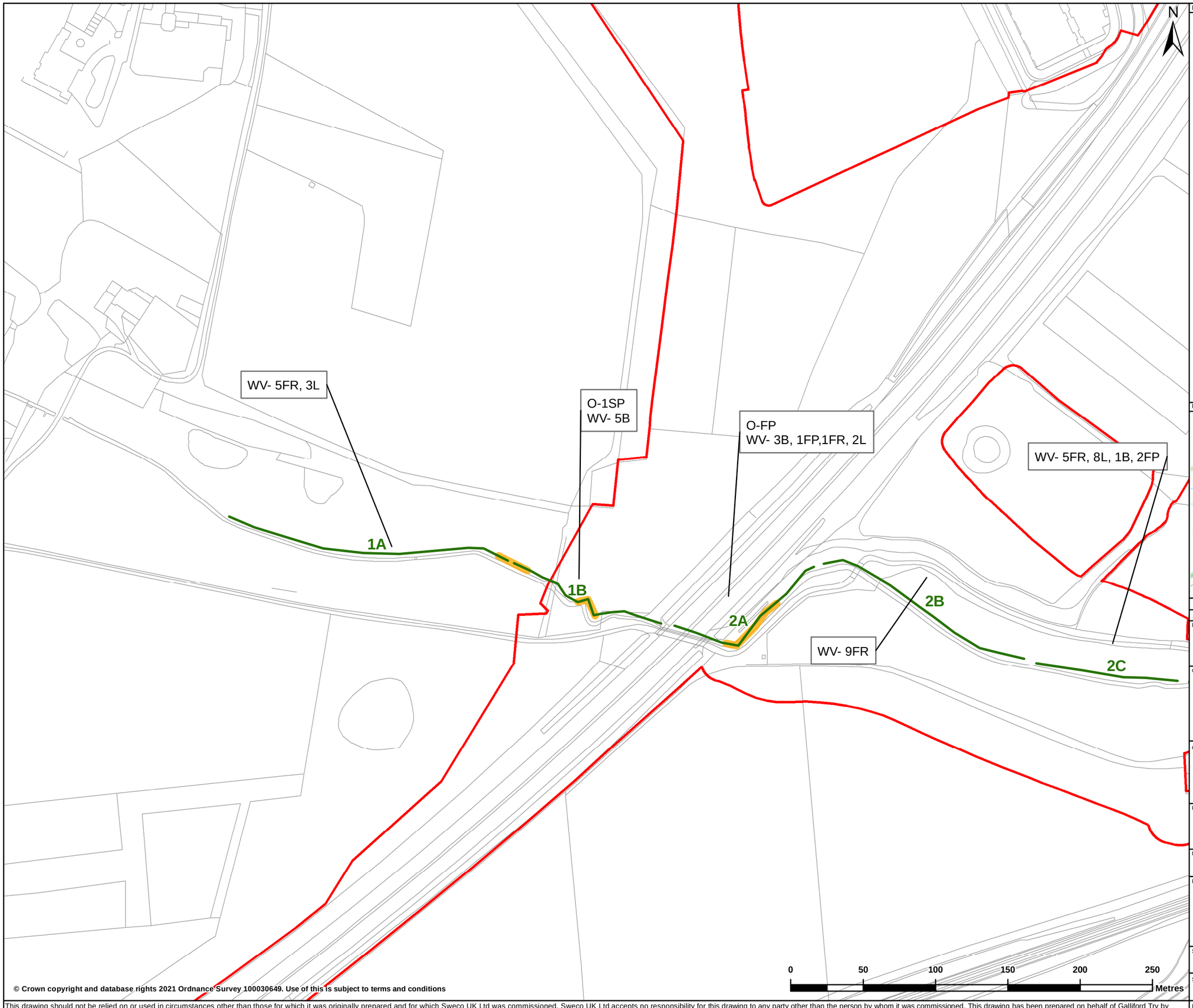


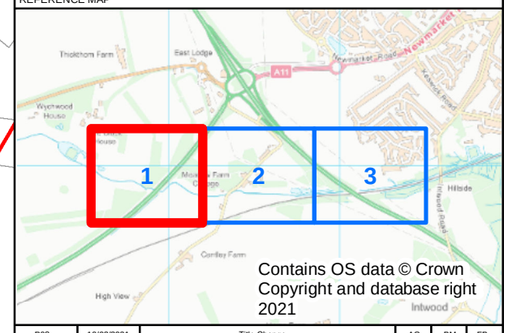
LEGEND

- Survey Areas
- Inaccessible land
- DCO Boundary

Otter field signs:
H - Holt
FP - Footprints
FR - Feeding remains
SL - Otter slide
SP - Otter Spraint

Water Vole Survey:
B - Burrow
FP - Footprint
FR - Feeding remains
L - Latrines

REFERENCE MAP



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PCF STAGE 3

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OTTER AND WATER VOLE SURVEY RESULTS 2018
SHEET 1 OF 3

SUITABILITY
FOR INFORMATION

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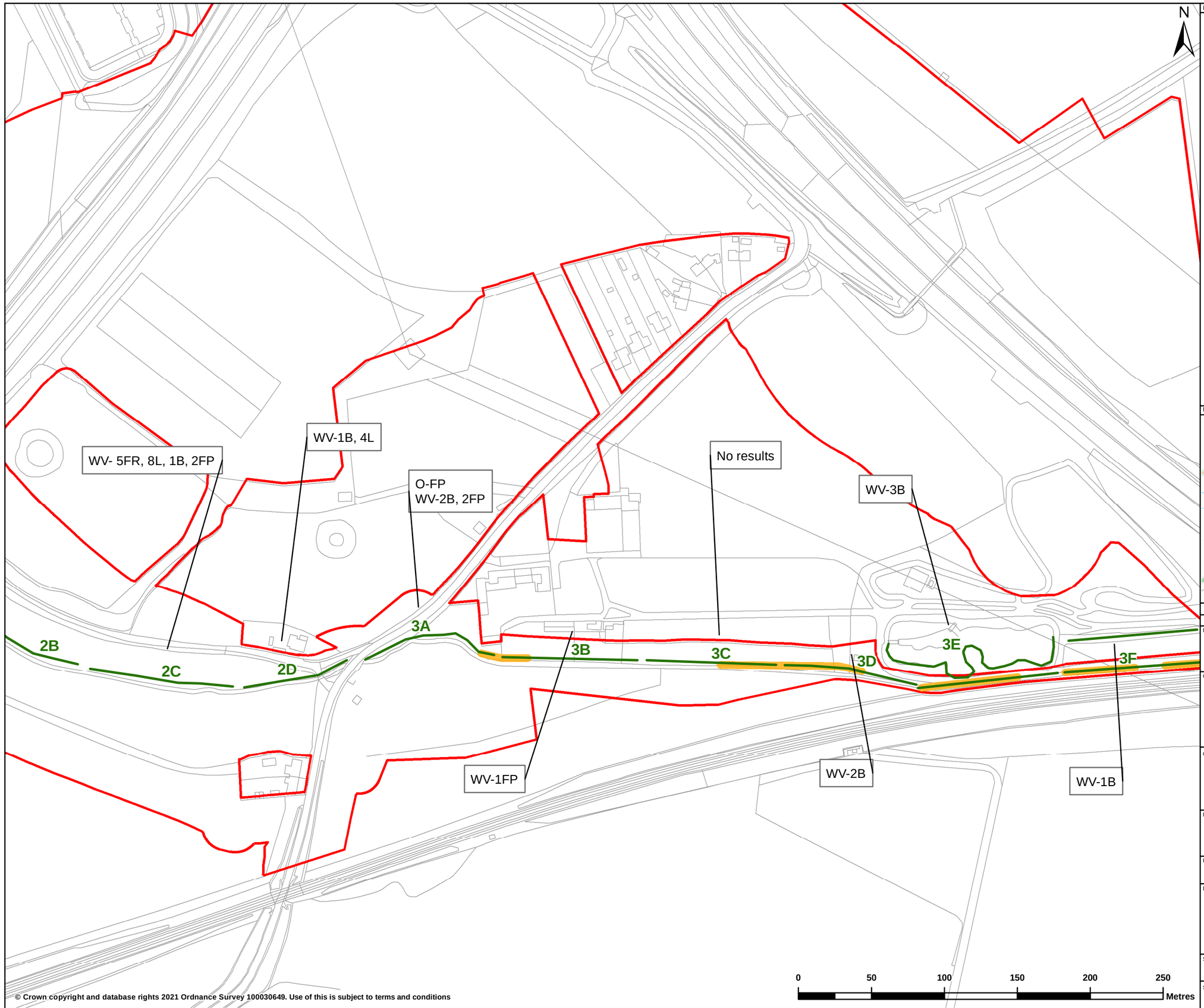


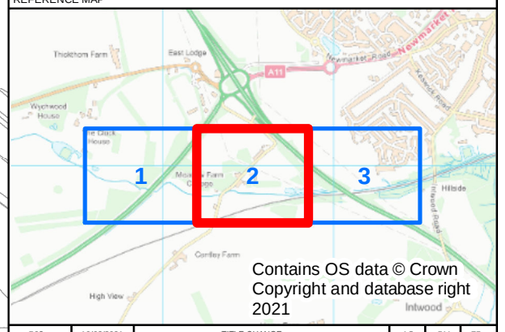
LEGEND

- Survey Areas
- Inaccessible land
- DCO Boundary

Otter field signs:
H - Holt
FP - Footprints
FR - Feeding remains
SL - Otter slide
SP - Otter Spraint

Water Vole Survey:
B - Burrow
FP - Footprint
FR - Feeding remains
L - Latrines

REFERENCE MAP



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PCF STAGE 3

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OTTER AND WATER VOLE SURVEY RESULTS 2018
SHEET 2 OF 3

SUITABILITY
FOR INFORMATION

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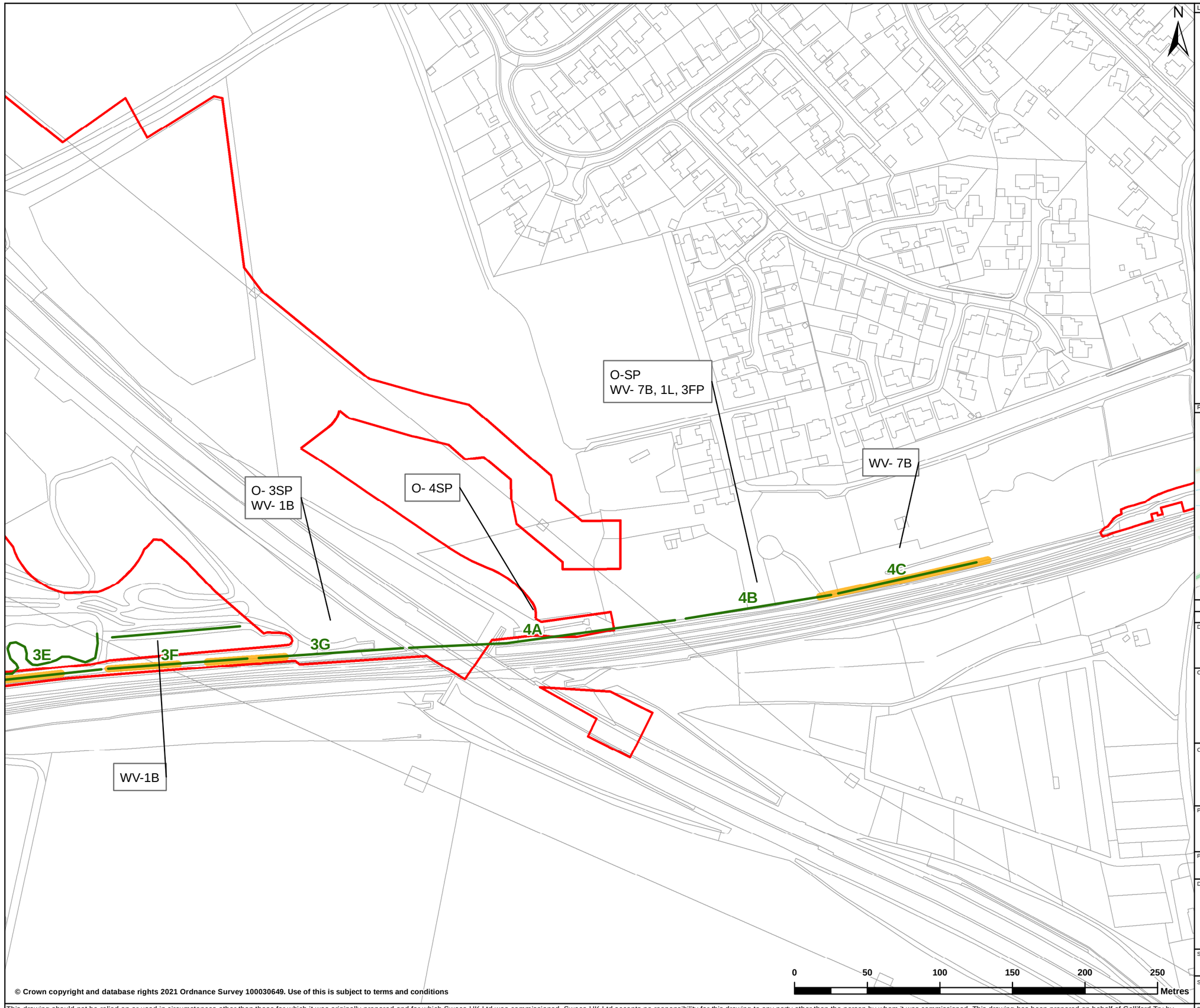


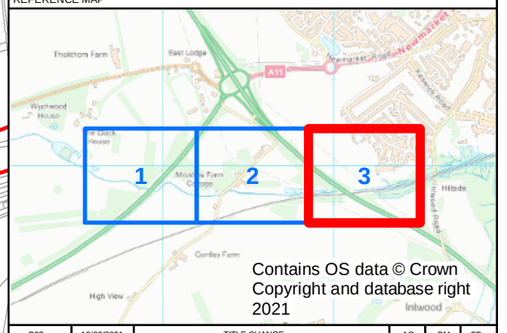
LEGEND

- Survey Areas
- Inaccessible land
- DCO Boundary

Otter field signs:
H - Holt
FP - Footprints
FR - Feeding remains
SL - Otter slide
SP - Otter Spraint

Water Vole Survey:
B - Burrow
FP - Footprint
FR - Feeding remains
L - Latrines

REFERENCE MAP



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SHEET 3 OF 3

SUITABILITY
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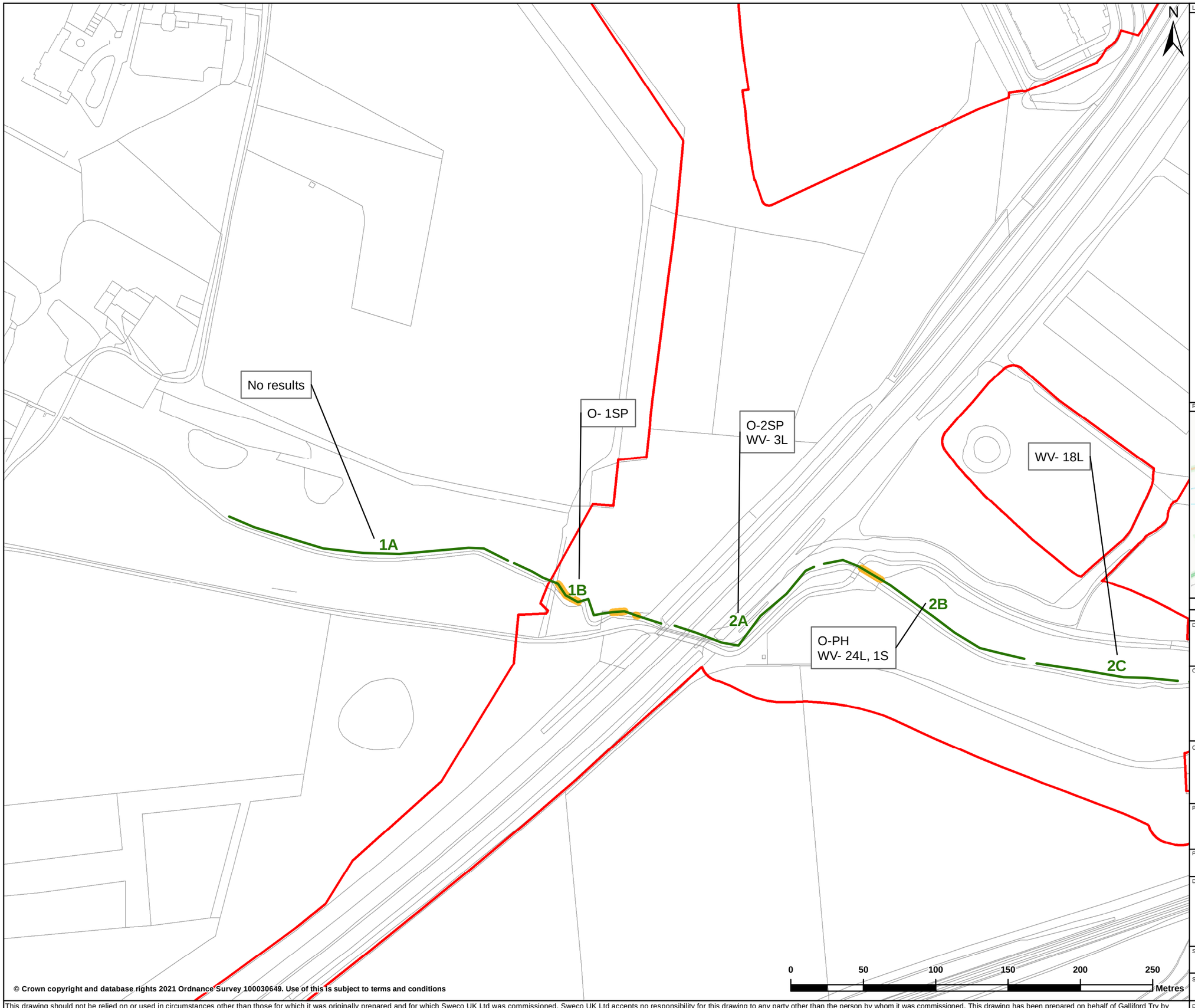


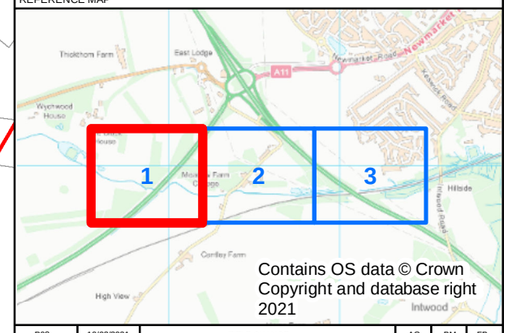
LEGEND

- Survey Areas
- Inaccessible land
- DCO Boundary

Otter field signs:
H - Holt
FP - Footprints
FR - Feeding remains
PH - Potential holt or hover
SL - Otter slide
SP - Otter Spraint

Water Vole Survey:
B - Burrow
FP - Footprint
FR - Feeding remains
L - Latrines

REFERENCE MAP



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OTTER AND WATER VOLE SURVEY - MAY 2020 RESULTS
SHEET 1 OF 3

SUITABILITY
FOR INFORMATION

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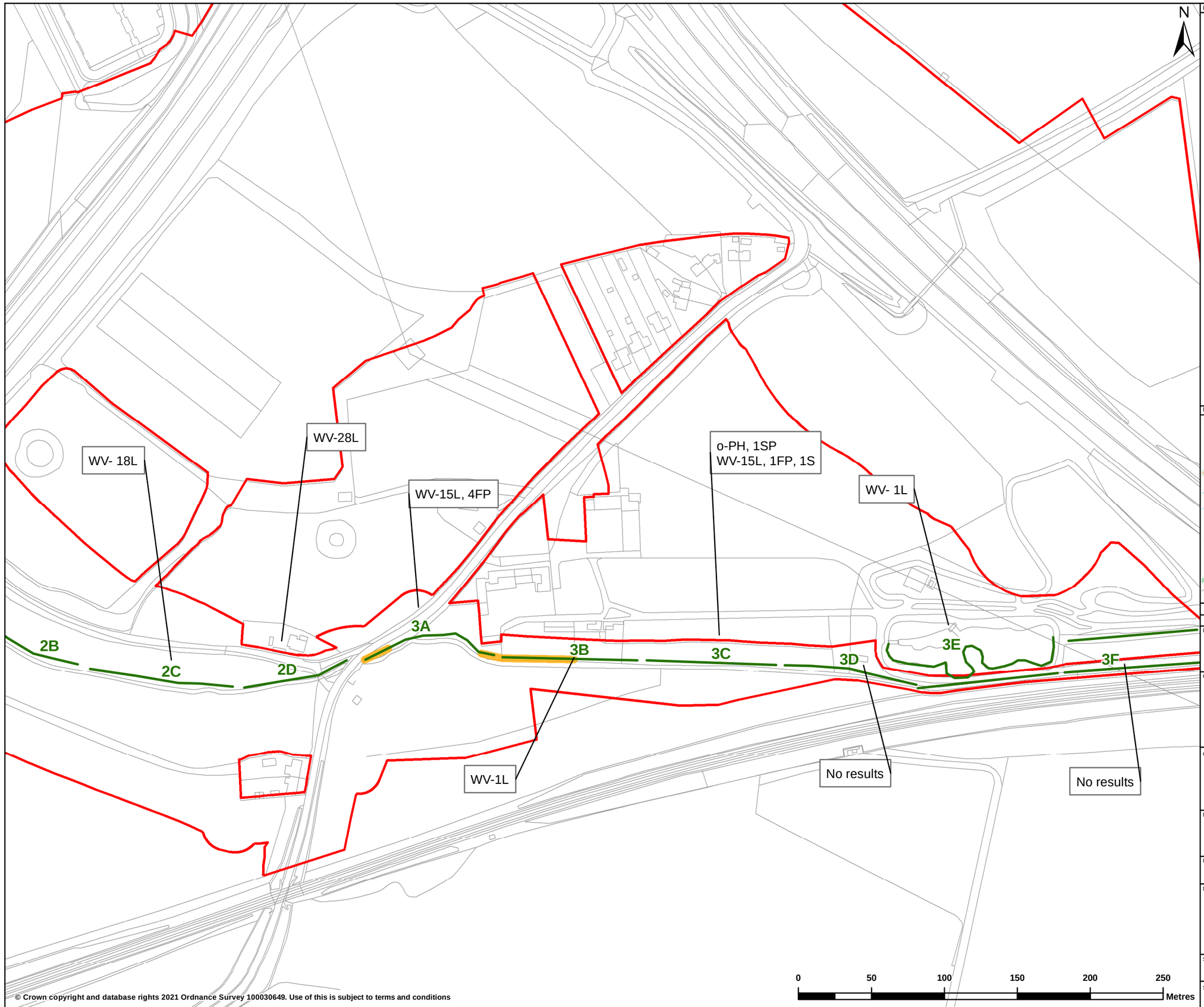


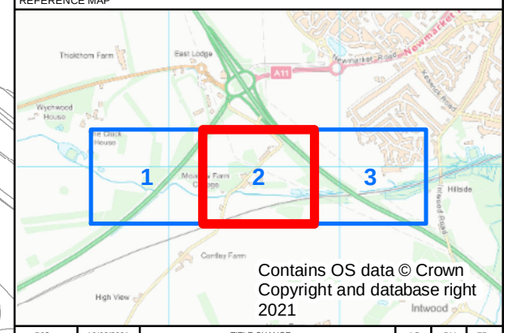
LEGEND

- Survey Areas
- Inaccessible land
- DCO Boundary

Otter field signs:
H - Holt
FP - Footprints
FR - Feeding remains
PH - Potential holt or hover
SL - Otter slide
SP - Otter Spraint

Water Vole Survey:
B - Burrow
FP - Footprint
FR - Feeding remains
L - Latrines

REFERENCE MAP



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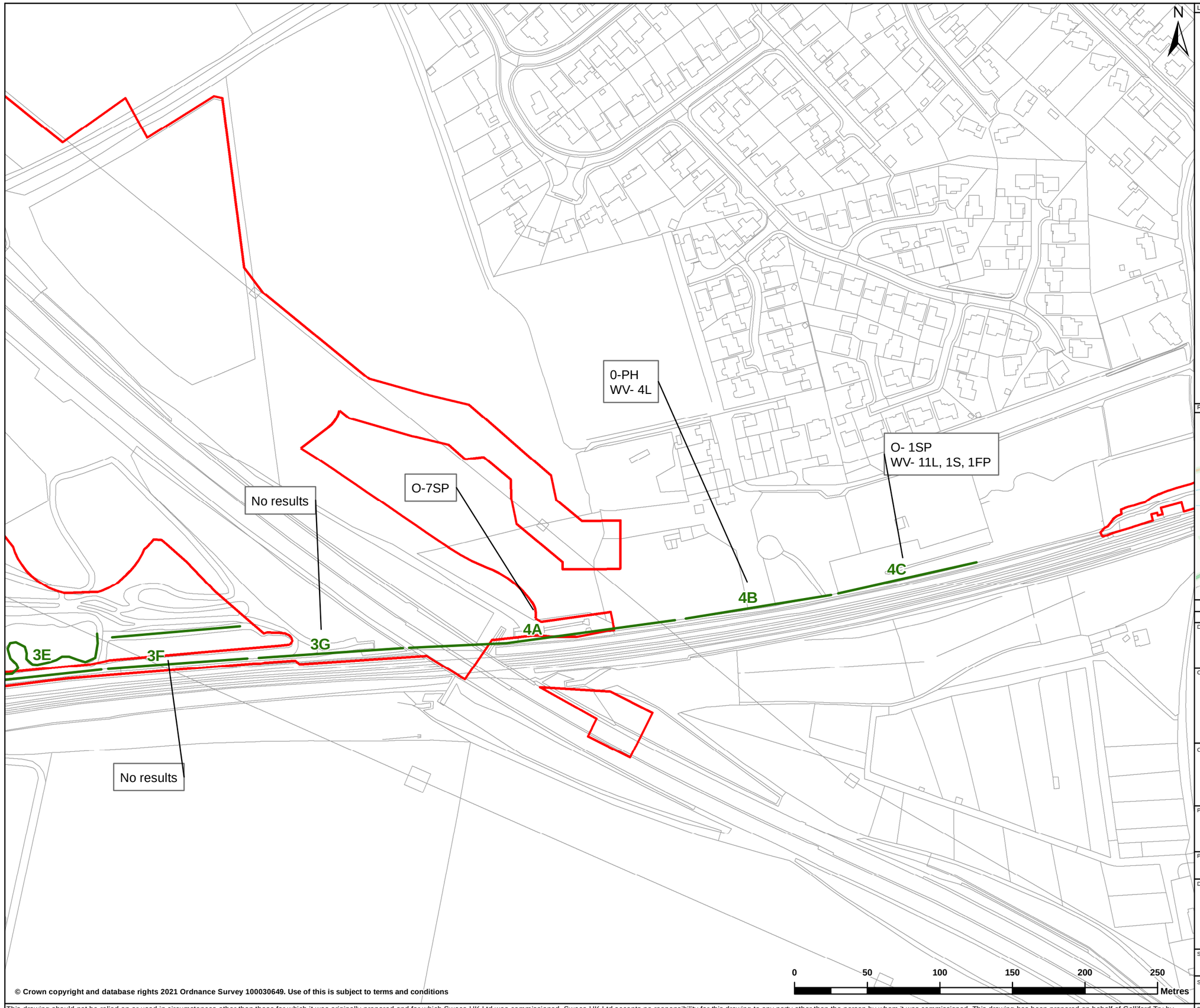

LEGEND

Survey Areas

DCO Boundary

Otter field signs:
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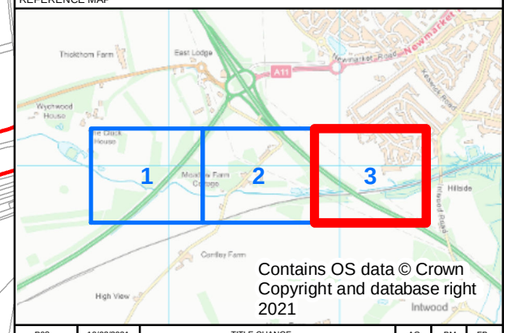
FP - Footprints
FR - Feeding remains
PH - Potential holt or hover
SL - Otter slide
SP - Otter Spraint

Water Vole Survey:
B - Burrow
FP - Footprint
FR - Feeding remains
L - Latrines

REFERENCE MAP



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MAY 2020 RESULTS
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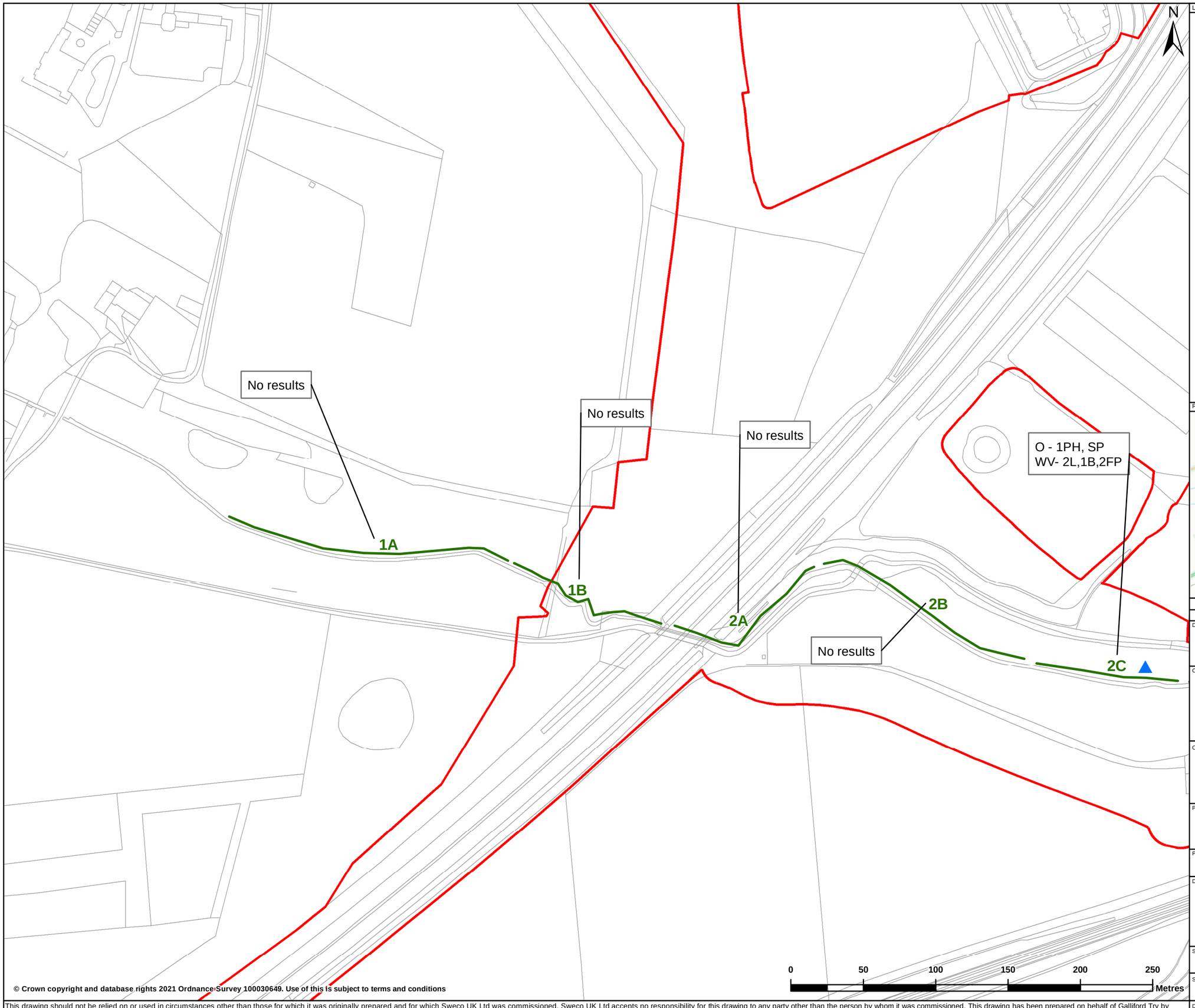


LEGEND

Survey Areas

DCO Boundary

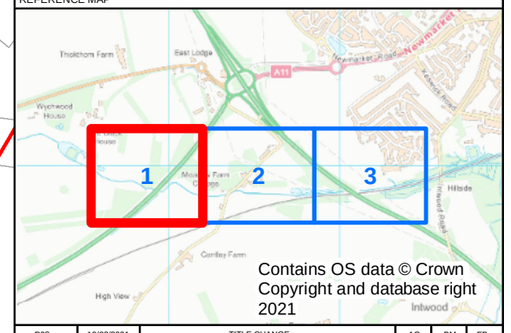
Wildlife Sighting

Kingfisher

Otter field signs:
PH- Potential holt
PHD- Potential disused holt
SP- Otter spraint

Water Vole Survey:
B- Burrow
PB- Potential burrow
PW- Pathway
FP- Footprint
L- Latrine

REFERENCE MAP



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OTTER AND WATER VOLE SURVEY - OCTOBER 2020 RESULTS
SHEET 1 OF 3

SUITABILITY

FOR INFORMATION

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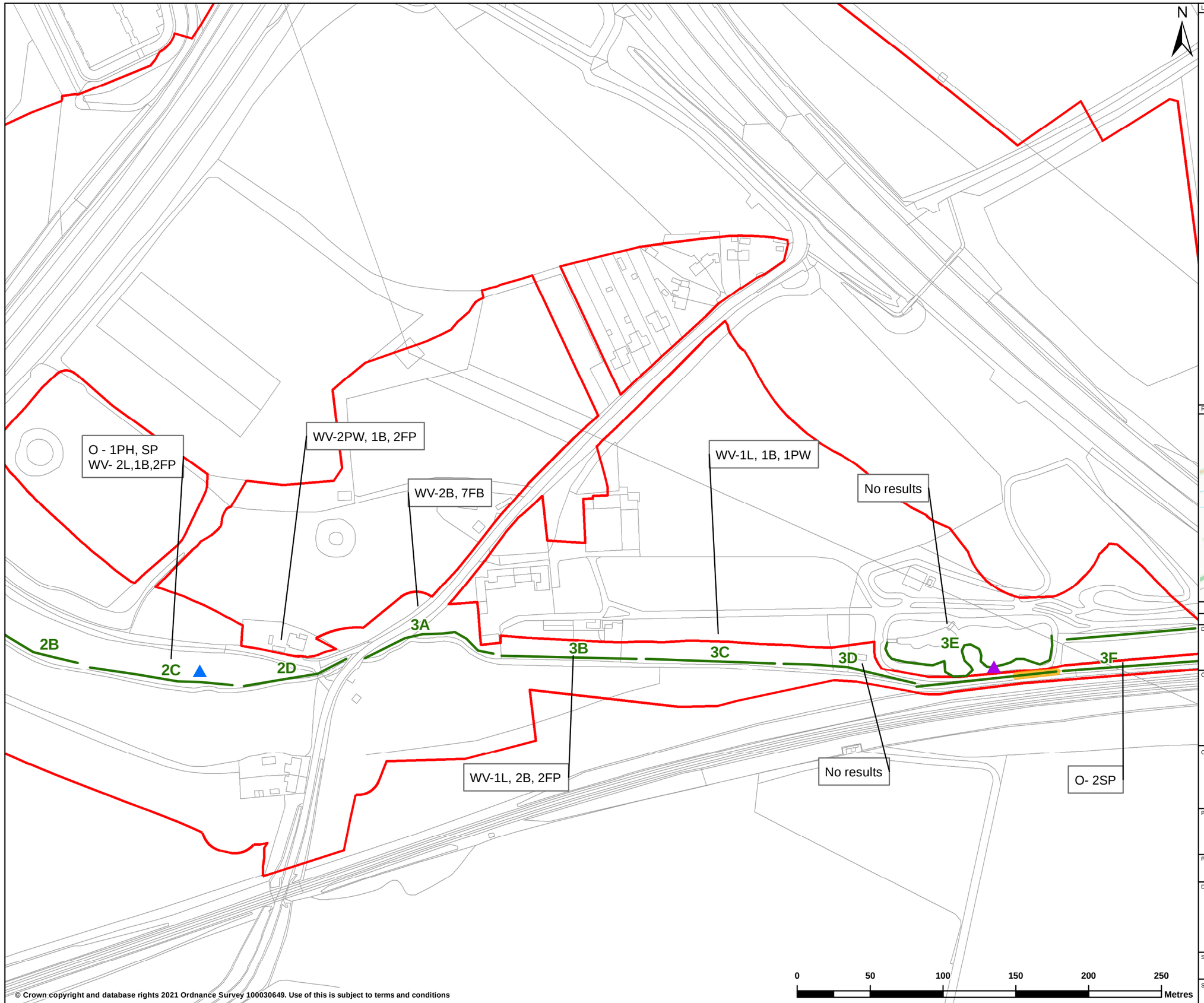


LEGEND

- Survey Areas
- Inaccessible land
- DCO Boundary

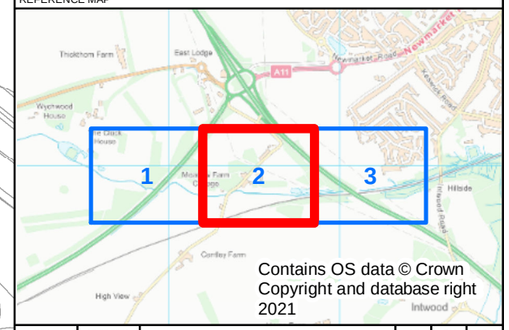
Wildlife Sighting

- Kingfisher
- Waterfowl

Otter field signs:
PH- Potential holt
PHD- Potential disused holt
SP- Otter spraint

Water Vole Survey:
B- Burrow
PB- Potential burrow
PW- Pathway
FP- Footprint
L- Latrine

REFERENCE MAP



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OTTER AND WATER VOLE SURVEY - OCTOBER 2020 RESULTS
SHEET 2 OF 3

SUITABILITY
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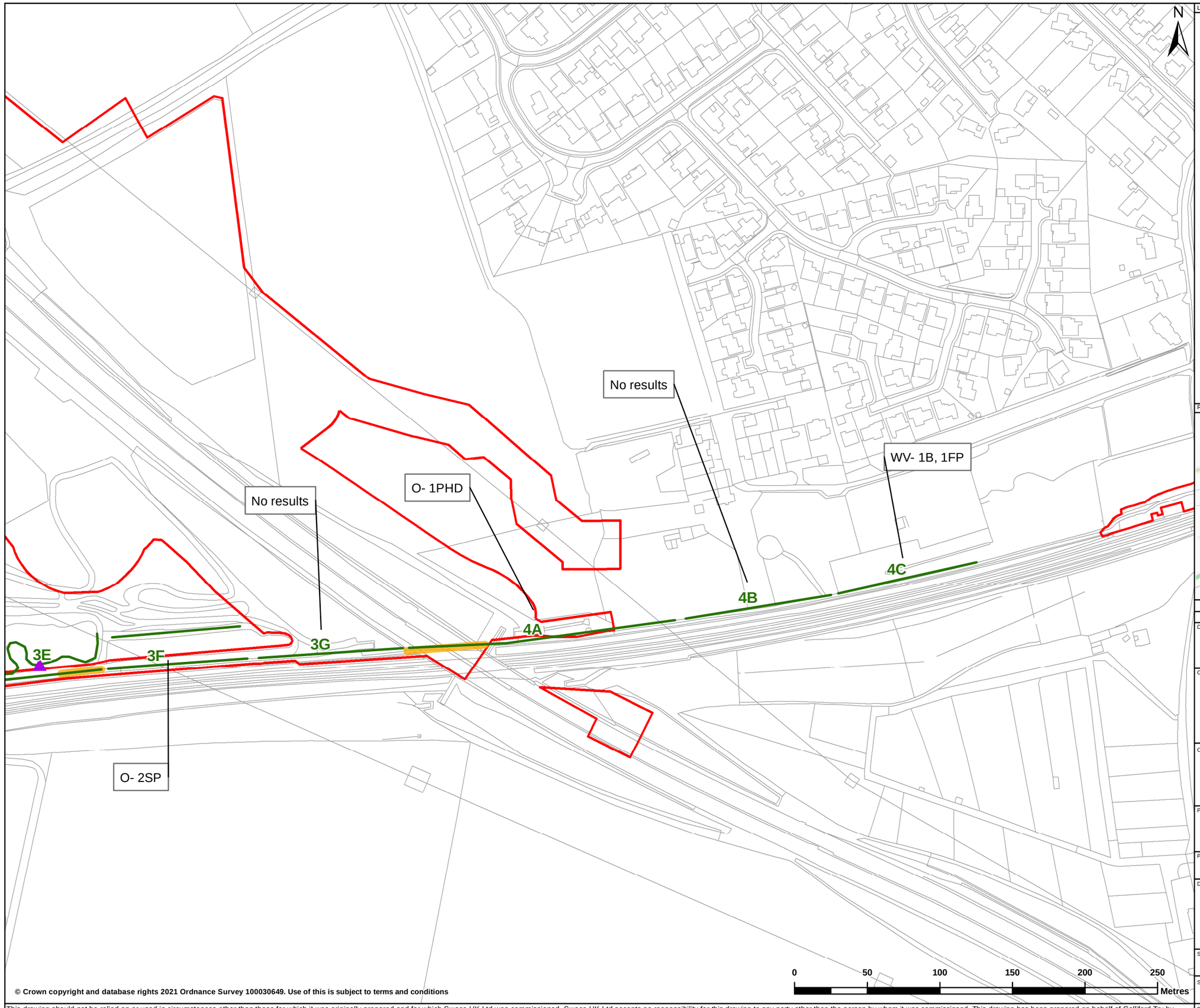

LEGEND

- Survey Areas
- Inaccessible land
- DCO Boundary

Wildlife Sighting

- Waterfowl

Otter field signs:
PH- Potential holt
PHD- Potential disused holt
SP- Otter spraint

Water Vole Survey:
B- Burrow
PB- Potential burrow
PW- Pathway
FP- Footprint
L- Latrine

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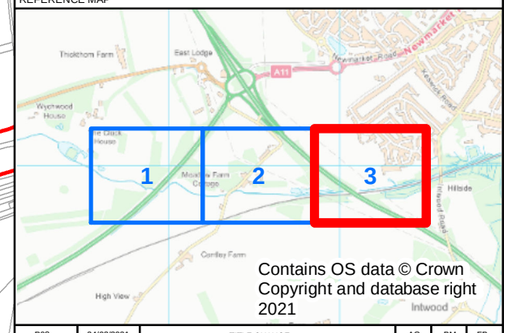

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OTTER AND WATER VOLE SURVEY - OCTOBER 2020 RESULTS
SHEET 3 OF 3

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FOR INFORMATION

SHEET SIZE	SCALE	STATUS
A3	1:2,500	S2

DRAWING NUMBER
HE551492-GTY-EBD-000-DR-LB-30027

Annex B. Site photographs

Photograph 1: Water vole feeding remains east of the A11 underpass.

Photograph 2: Water vole latrine east of the A47 culvert.

Photograph 3: Water vole burrow west of the A47 culvert.

Photograph 4: otter spraint on either side of the A47 culvert.

Photograph 5: Potential otter holt

Annex C. Habitat suitability assessment

Table C-1 below shows the raw data collected during the survey visit in October 2020 in the Cantley Steam watercourse.

Table C-1: Raw data recorded during the otter and water vole surveys of October 2020

Survey location	Bank	Bordering land use	Bank profile (º)	Depth (m)	Width (m)	Current	Wildlife information	Dominant vegetation	Notes
1a	Earth, poached	Grazing	>45 and <45	<0.5	1-2	Fast	None	D - short grass; A - bankside trees	50/50 of each bank profile
1b	Earth	Grazing	>45 and <45	<0.5	1-2	Fast	None	D - bankside trees; A - short grass	60/40 of each bank profile
2a	Earth	Permanent grass	>45	<0.5	2-5	Slow	None	D - bushes A - reeds/sedges	None
2b	Earth	Permanent grass	>45 and <45	<0.5	1-2	Slow	None	D - herbs D - reeds/sedges	50/50 of each bank profile
2c	Earth	Permanent grass / grazing	<10	<0.5	1-2	Slow	Pot. otter holt. Otter spraints Kingfisher 2 wv latrines 1 wv burrow 2 wv footprints	D - reeds/sedges A - herbs	50/50 of each bank profile
2d	Earth	Permanent grass	<45	<0.5	1-2	Sluggish	2 wv pathways 1 wv burrow 2 wv footprints	D - reeds/sedges A - herbs	Vegetation covers water channel and banks
3a	Earth	Permanent grass; mixed broadleaved woodland	<45	<0.5	2-5	Fast	1 rat dropping 2 wv burrows 7 wv footprints	D - herbs A - bushes	Muntjac footprints
3b	Earth	Grazing. Bank fenced	<45	<0.5	1-2	Slow	1 wv latrine 2 wv burrows 2 wv footprints	A - bushes	None
3c	Earth	Permanent grass	<45	<0.5	1-2	Slow	1 wv latrine 1 wv burrows 1 wv pathway	D - tall grass D - bankside trees	Muntjac footprints

Survey location	Bank	Bordering land use	Bank profile (º)	Depth (m)	Width (m)	Current	Wildlife information	Dominant vegetation	Notes
3d	Earth	Grazing	<45	0.5-1m	1-2	Slow	1 rat burrows	D - bushes A - herbs	None
3e	Earth	Permanent grass	>45	0.5-1m	1-2	Slow	waterfowl	D - bushes A - bankside trees	None
3f	Earth	Permanent grass	>45	<0.5	1-2	Slow	None	D - bushes	None
3g	Earth	Permanent grass	>45	<0.5	1-2	Slow	2 otter spraints	D - bushes A - herbs	None
4a	Earth	Permanent grass Grazing Fenced	<45	<0.5	2-5	Slow	Potential disused otter holt	D - bushes	None
4b	Earth	Permanent grass	<45	<0.5	1-2	Slow	None	D - bankside trees	None
4c	Earth	Permanent grass Grazing	<10	<0.5	1-2	Slow	1 wv burrow 1 wv footprint	D - bankside trees	None
4a	Earth	Permanent grass Grazing Fenced	<45	<0.5	2-5	Slow	Potential disused otter holt	D - bushes	None

Table C-2 below shows the raw data collected during the survey visit in July and September 2018 in the Cantley Steam watercourse.

Table C-2: Raw data recorded during the otter and water vole surveys of July and September 2018

Survey location	Bank	Bordering land use	Bank profile (º)	Depth (m)	Width (m)	Current	Wildlife information	Dominant vegetation	Notes
1	Earth	Grazing	>45	<0.5	1 to 2	Slow	Water vole signs	A - tall grass A - submerged reed	None
2	Earth	Arable	>45	<0.5	2 to 5	Slow	Water vole signs Badger Muntjac	D - herbs A - reeds/sedges	None
3	Earth	Mixed BL woodland	<45	<0.5	5 to 10	Slow	Otter spraint	A - herbs A - bankside trees	None
4	Earth	Mixed BL woodland Grazing	<45	<0.5	2 to 5	Slow	Otter spraint and footprints	D - herbs A - submerged reed	None