



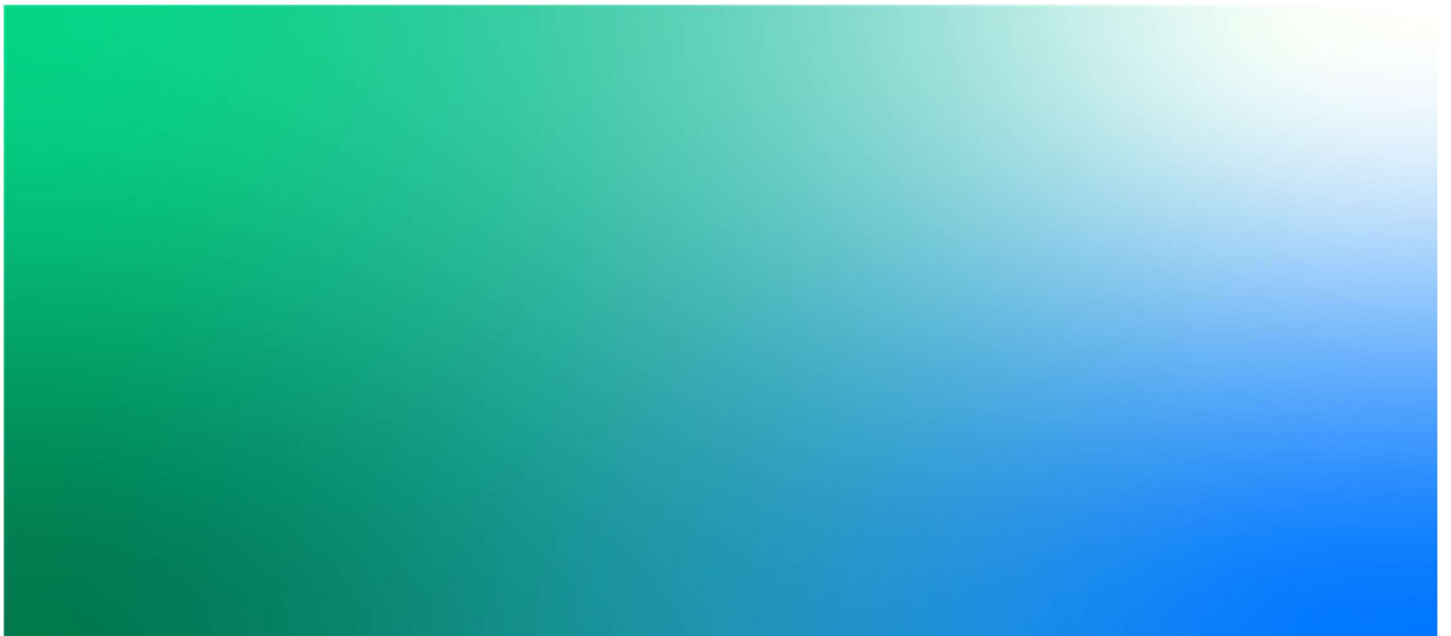
Oxford FAS

Water Vole Survey 2020

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Executive Summary

A water vole activity survey for the Oxford Flood Alleviation Scheme was undertaken in 2016 (CH2M, 2016) to inform the Environmental Impact Assessment and planning application submitted for the scheme in 2018.

Since submission of the planning application for the scheme, the Environment Agency are now pursuing some changes to the scheme, which may affect the scheme boundary. Consequently, Jacobs were commissioned by the Environment Agency to undertake a new water vole survey in the footprint of the revised scheme area. Additionally, as much of the 2016 survey data is now over two years old, an updated survey has been undertaken to locate any changes in habitats or activity and to establish how any changes to the scheme will affect the local water vole population.

Water vole surveys were first undertaken in 2016 with further surveys undertaken in Spring/Summer 2018 and between May and August 2020. These surveys identified suitable water vole habitat and signs within, and on the edge, of the scheme footprint. The surveys concluded that water voles are present but in low numbers and are of local importance in the area.

Based on the current construction proposals and survey information obtained to date, it is recommended that a pre-commencement survey is undertaken by an ecologist to ensure that water voles are not killed, injured or disturbed by construction activities. The timing of this survey should allow sufficient time prior to works to ensure mitigation can be enacted if required. This should include a field survey via a boat along the stretch of the River Thames where video footage was recorded in October 2020 and the length of the adjoining Hinksey Stream to be widened. This will determine the location and extent of any burrows to define appropriate mitigation options.

If water vole burrows are confirmed present and are considered to be at risk from the works, Natural England (NE) have issued Organisational Licences to the Environment Agency and Inland Drainage Boards to allow the intentional disturbance of water voles and damage/destruction of water vole burrows by means of 'Displacement'. However, trapping and translocation of water voles from the proposed works area under a Conservation Licence from NE may be required if the pre-commencement surveys record burrows along affected banks greater than 150m in length. Any trapping and translocation exercise will also require the provision of a suitable receptor site.

Suitable water vole habitat lost could be mitigated through landscaping of the wetland features and banks of the proposed two-stage channels with favourable plant species and a suitable profile to allow for burrowing. Design would need to consider bank gradient and water levels appropriate to their habitat requirements. It is anticipated that overall, it will be possible to enhance habitat availability for the species.

Should any water vole or signs of water vole be identified during the works, they should cease immediately, and a suitably experienced ecologist consulted to assess the situation and whether a licence may need to be sought from Natural England.

Subject to the recommendations set out above in relation to avoiding or reducing potential impacts to water vole, it is considered that the proposed Scheme could be implemented without significant adverse ecological impacts, will not be detrimental to the conservation status of water vole, and be in accordance with relevant legislation and planning policy.

1. Introduction

1.1 Background

The Environment Agency, together with their local partners, are proposing the Oxford flood alleviation scheme (FAS) comprising modifications to existing channels, the construction of a new two-stage channel and new flood defences, for which a planning application was submitted in 2018 for the scheme. The site is located on the River Thames floodplain to the west of Oxford City Centre on land that is part of both Oxford City Council and Vale of White Horse District Council centred on approximate National Grid Reference (NGR) SP506048. A water vole *Arvicola amphibius* activity survey was undertaken in 2016 (CH2M, 2016) to inform the Environmental Impact Assessment and planning application submitted for the scheme in 2018.

The Oxford FAS is critical in reducing the long-term risk of flooding to residential and commercial properties in the floodplains. The proposals will manage the flood risk to people and property in the floodplain, while avoiding an increase in peak river levels downstream of Oxford during flood events. The scheme will not only reduce flood risk to the built and historic environment, essential infrastructure and recreational assets, but will also seek to deliver habitat mitigation and creation, enhanced landscapes, Water Framework Directive (WFD) benefits and new recreational opportunities.

Since submission of the original planning application for the Oxford FAS (which has now been withdrawn), the Environment Agency are now pursuing some changes to the scheme, which may affect the scheme boundary. Consequently, Jacobs has been commissioned by the Environment Agency to undertake a new water vole survey of the footprint of the originally proposed Oxford FAS area, as well as additional areas that may be considered as part of a potential future planning application for the scheme (refer to the redline boundary as presented in Figures A1-A5, Appendix A).

An updated water vole survey has been undertaken to locate any changes in activity and to establish how any changes to the scheme will affect the local water vole population. This report supersedes the 2016 Water Vole and Otter Survey Report (CH2M, 2016) and documents the findings of the water vole surveys undertaken in 2020.

The FAS proposals (as presented in Temporary and Mitigation Areas Figure A6, Appendix A) comprise, in summary, the following:

- New "two-stage channel", between the A34 to the west and the Oxford to Didcot railway line to the east. To the north of the new channel, there will be a new second stage for Seacourt Stream;
- Various new hard defences (each a combination of bunds and walls) to protect houses and an industrial estate;
- New wetland features, scrapes, ponds and backwaters;
- Localised bank regrading and shelf creation; and
- New and localised replacement of culverts, bridges and other small structures needed to maintain access routes.

1.2 Objectives

The objectives of the water vole desk study and activity surveys carried out in 2016 - 2018 and updated in 2020 were:

- To determine presence or likely absence of water vole within the river channels, streams and ditches within the site boundary, including the banks and marginal habitat of each;
- To identify the location and activity levels of any burrows and areas used for foraging within the site;
- To determine how the site is being used i.e. burrow construction, foraging locations and consequently the value of the area to water vole;

- Where the presence of water vole is confirmed, to make a preliminary assessment of potential impacts and recommendations for avoidance of impacts through design; and
- Where impacts cannot be avoided, to recommend the level of appropriate mitigation measures to remove or reduce potential impacts and assess the requirement for a licence from Natural England.

1.3 Previous Studies

A water vole activity survey was undertaken by CH2M in 2016, which included initial visits to ground truth and rule out watercourses that were considered unsuitable for water vole (i.e. very over-grown, frequently dry channels holding no water).

Following scheme design changes, a further survey was undertaken by Jacobs ecologists in 2018 (unpublished, Jacobs, 2018), using floating 'rafts'. These were installed on watercourses considered suitable for water vole that could not be easily inspected on foot or via boat during the 2016 survey.

No conclusive evidence of water vole was found during these surveys.

If water vole were present in sufficient population densities to sustain a population, it is likely that reliable evidence would have been encountered. Due to the lack of conclusive evidence (i.e. feeding stations, footprints and latrines) it was concluded that water vole are currently unlikely to be present within the scheme area, unless in isolated patches and very low numbers.

2. Survey Methodology

2.1 Desk-top survey

Records of protected species, including water vole, were provided by Thames Valley Environmental Records Centre (TVERC) in 2020. These records, along with Multi-Agency Geographic Information for the Countryside website (MAGIC), were consulted to locate habitats that may be suitable for water vole within and adjacent to the proposed scheme.

This consultation exercise is valuable in identifying areas that are suitable for water vole and concentrating survey effort where records of water vole have previously been recorded. Understanding nature conservation issues within the wider area helps in the assessment of the ecological value of a site and the habitats and species that a site supports.

Where applicable, information supplied has been incorporated into the following account with due acknowledgement where they are particularly informative or relevant

2.2 Field Surveys

2.2.1 Habitat Suitability Assessment

The water vole habitat suitability assessment was undertaken by two experienced water vole ecologists during the week commencing (w/c) 18th May 2020. To facilitate the process a checklist of habitat suitability features was drawn up as shown in Table 1, based on the habitat requirements as described in the Water Vole Mitigation Handbook (Dean, M *et al.*, 2016 and Section 1.3 above) and the Water Vole Habitat Survey Guidance, supported further by the findings of the previous surveys.

The habitat was classed as “green” – highly suitable/optimal, “purple” (moderately suitable/sub-optimal), or “amber” (unsuitable).

Table 1: Habitat suitability assessment criteria

Class	Suitability	Comment
Amber	Unsuitable	Contains very little, if any vegetation with shallow or low banks, no berm and with no well-developed vegetation cover or permanent water.
Purple	Sub-optimal	Small number of positive features, but with open water and good vegetation cover. Good enhancement potential.
Green	Optimal	Presence of one or more berms, dense and varied vegetation with tall and structurally sound banks, permanent open water and lack of disturbance with suitable nesting building opportunities and refuge sites. An optimal habitat will often be bordered by a band of grass or rush tussocks.

2.2.2 Water Vole Survey

In 2016, all watercourses and associated habitats within the red-line boundary, up to 100m up and downstream were surveyed, mapped and described for their potential to support water vole. This information, along with the updated habitat suitability assessment undertaken in May 2020, was used to define the focus of the water vole activity survey in the field.

All ‘green (optimal)’ and ‘purple (sub-optimal)’ waterbodies within 100 metres of the site boundary, were surveyed further for signs of water vole. Where access allowed, both banks of the water bodies were systematically searched for evidence of:

- Burrows: oval shaped holes in the bank with a diameter of between 4-8cm, usually at the water's edge and sometimes with a cropped 'lawn' of grass;
- Latrines: piles of water vole droppings used in territory marking;
- Feeding stations: piles of small pieces of vegetation; and
- Footprints.

Where access to the banks and/or watercourse was restricted (i.e. due to dense vegetation cover or steep sided banks) water vole 'rafts' were installed, as shown in Figure A7, Appendix A. Rafts are used by water vole as latrine sites to mark their territory.

Rafts were constructed of collotex boards, approximately 30cm x 60cm, and were installed at 10m intervals in areas with restricted access (as shown in Plate 1). Rafts were tethered to the banks using canes or heavy-duty tent pegs to prevent them floating downstream. Canes and/or pegs were kept away from public footpaths and located to avoid creating trip hazards for the public. An EA flood risk Environmental Permit was required to install the rafts.

Rafts were checked two weeks after installation for signs of water vole activity and then removed from site, to be in compliance with the Environmental Permit.

The field surveys were carried out at the appropriate time of year in accordance with relevant guidance, when water voles are considered to be active; w/c 18th May (habitat suitability assessment, this included spot checks for evidence), w/c 10th August (check for evidence and installation of rafts) and w/c 24th August 2020 (check for evidence and retrieval of rafts).

The surveys were undertaken during suitable weather conditions and when no heavy rain had occurred within the previous 5 days (signs can be easily washed away during rainfall or following fluctuations in water levels).



Plate 1: Water vole 'rafts' installed along Bulstake Stream, Oxford.

2.2.3 Water vole population estimate

The number of latrines recorded during the survey were used to give an indication of the relative water vole population size; useful in identifying the most valuable part of the Oxford FAS site for water vole (Table 2). The number of latrines can help determine the level of activity to aid determining impacts or designing mitigation.

Table 2: Relative population size estimates (taken from Dean *et. al* 2016)

Relative population density	Approximate number of latrines per 100m of bankside habitat	
	First half of survey season (mid-April to end of June)	Second half of survey season (July to September, extended to October in the South)
High	10 or more	20 or more
Medium	3-9	6-19
Low	<3 (or none, but with other confirmatory field signs)	<6 (or none, but with other confirmatory field signs)

2.3 Limitations

Survey 'rafts' were only installed on receipt of the relevant flood risk permit from the Environment Agency and on watercourses where land-owner permission had been granted. Although every effort was made to secure and accurately record the location of the water vole rafts, two rafts could either not be found or pulled back in and inspected. This occurred in locations where the bankside vegetation had become very dense. At other locations, the rafts appeared to have been tampered with (string cleanly cut and rafts removed completely but were easily recovered from the bankside).

These limitations are taken fully into consideration in the evaluation and recommendations of this report.

All work carried out in preparing this report is based upon Jacobs current professional knowledge and understanding of current relevant UK standards, best practice and legislation. Changes in this legislation and guidance may occur in the future and lead to the conclusions needing to be reviewed.

2.4 Evaluation

The ecological value of the water vole population has been determined based on the guidance from the Chartered Institute of Ecology and Environmental Management (CIEEM, 2016). The level of value of specific ecological receptors is assigned using a geographic frame of reference, with international value being most important, then national, regional, county, district, and local.

The evaluation is made using a variety of characteristics, including the rarity of populations, either locally or within a wider area, the vulnerability of local species (for example, to disturbance or fragmentation from other populations), and statutory recognition of biodiversity importance through inclusion in local or national biodiversity action plans. Note that legal protection is not, in itself, a consideration in the evaluation of species.

3. Water vole legislation and licensing

3.1 Legislation

3.1.1 Water voles

In England and Wales water vole are fully protected under Schedule 5 of the Wildlife and Countryside Act 1981 (as amended). This legislation lists the following offences:

- Intentionally killing, injuring or taking water voles;
- Possessing or controlling any live or dead water vole, or any part or derivative;
- Intentionally or recklessly damaging or destroying a water vole's place of shelter or protection;
- Intentionally or recklessly disturbing a water vole whilst it is occupying a structure or place which it uses for shelter or protection;
- Intentionally or recklessly obstructing access to a water vole's place of shelter or protection; and
- Selling, offering for sale, or possessing or transporting for the purposes of sale, any live or dead water vole, or any part or derivative, or advertising any of these for buying or selling.

Water vole is also listed on Section 41 of the Natural Environment and Rural Communities (NERC) Act 2006. Section 41 places a duty on all public bodies to have regard to the conservation of biodiversity in England, when carrying out their normal functions (the biodiversity duty). This means that water vole must be treated as a material consideration within the planning process.

3.1.2 National Planning Policy Framework

Under the National Planning Policy Framework (NPPF) (2019) development plans should:

- Minimise impacts on and provide net gains for biodiversity; and
- Promote the conservation, restoration and enhancement of priority habitats, ecological networks and the protection and recovery of priority species; and identify and peruse opportunities for securing measurable net gains for biodiversity.

3.2 Licensing

Where proposed works would constitute an offence under the legislation licenses can be sought from Natural England (NE). There are three different licensing options, depending on the scope and nature of the works:

- *Licence to displace water voles for work on flood defences, water courses or drainage systems (Class Licence (CL)24)*

Permits intentional damage or destruction of water vole burrows, and/or disturbance to water voles occupying burrows, through displacement. Permits displacement to facilitate certain works to flood defences, water courses or drainage systems, to prevent serious damage or risks to public health or safety, or for the purpose of conservation, including the purpose of river restoration. Displacement must take place during the periods 15th February to 15th April and 15th September to 31st October and is limited to 150m sections of bank, where both banks are being affected.

- *Licence to displace water voles for development projects (CL31)*

Permits intentional damage or destruction of water vole burrows, and/or disturbance to water voles occupying burrows, through displacement, prior to carrying out lawful development works. Displacement must take place during the period 15th February to 15th April and is limited to 50m

sections of bank. There must be a demonstratable net conservation gain for water voles (i.e. habitat enhancement or creation).

- *Protected species licence for science, education or conservation (A29)*

Permits intentional damage or destruction of water vole burrows, and/or disturbance to water voles occupying burrows through the following methods:

- Displacement;
- Trapping and translocating; and
- Captive breeding and reintroduction

Displacement must take place during the periods 15th February to 15th April and 15th September to 31st October. Trapping and translocation must take place between the periods 1st March to 15th April and 15th September to 30th November (autumns trapping should only be considered as a last resort). There must be a demonstratable net conservation gain for water voles (i.e. habitat enhancement or creation).

4. Results

4.1 Context

The survey area is bordered to the north by allotment gardens and adjacent fields, to the west by Hinksey Stream, then to the north-east of Hinksey Hill Farm and along the A34 down to the Hinksey Hill junction and along the A423 to Kennington roundabout. The east of the survey area borders Osney industrial estate, Grandpont, Spragglesea Meadow and the fields and allotments around the University Sports ground at New Hinksey, and then Hinksey Stream at Cold Harbour to the east of the railway.

4.2 Desk Study

In 2014, a survey undertaken by URS (on behalf of Network Rail) confirmed water vole activity during a survey of Hinksey Stream south of the A423 and just to the north of the confluence with Weirs Mill Stream (URS, 2014). No other confirmed signs of water vole activity was recorded during this survey in 2014, although potential water vole burrows were recorded close to the rail depot within the study area. In addition, evidence of recent presence of American mink, an invasive species and a notorious predator of water vole, was recorded during this 2014 survey.

Video footage was received in October 2020 (via the Environment Agency community group; People at the Oxford Flood Alleviation Scheme), which claimed to show water voles foraging along the old northern branch of the River Thames, upstream of the A423 Southern By-pass road, outside the immediate site boundary (as shown in Plate 2 below). One recording was considered to be rat, but it could not be ascertained if the remaining footage was water vole. However, surveys undertaken in 2018 confirmed only low levels of activity in the adjoining Hinksey Stream at this location.



Plate 2: Approximate location¹ of potential water vole sighting (video footage)

A TVERC record search in 2020 (as presented in Table 3) returned records from 2011 to 2020, indicating that water voles had been present to the south and east of the scheme area, however there were no records of water vole within the scheme boundary. The nearest TVERC record was from 2014, 83m to the south of the scheme boundary, where two other records from 2014 were located in the general area. The record to the east was from 2018, approximately 850m from the scheme boundary in the Jericho area of Oxford.

The presence of American mink, as suggested by a mink trap seen on the Bulstake stream (URS, 2014), may be detrimental to the water vole populations within the site, although no direct evidence of mink has been encountered during the surveys in 2016 through to 2020. However, according to the Berks, Bucks & Oxon

¹ Image courtesy of Google Maps (Imagery ©2020 CNES/Airbus, Getmapping plc, Infoterra Ltd & Bluesky, Maxar Technologies, The GeoInformation Group, Map data ©2020).

Wildlife Trust (BBOWT, 2020²), Oxfordshire has some fairly healthy water vole colonies and is home to two large populations on the River Thames (between Lechlade and Chimney Meadow Nature Reserve), and the Abingdon area.

More recently, water voles have been recorded at Kennington Ditch, to the south of the scheme (Environment Agency, 2021).

Table 3: Water vole records received from TVERC

Date	Grid Reference	Location	Evidence
08/07/2014	SP5243502827	540m to the south of the scheme boundary, along the River Thames	6 feeding signs
30/07/2014	SP5216403203	82m to the south of the scheme boundary along Hinksey Stream	12 feeding signs; 2 droppings
30/07/2014	SP5236703094	315m to the south of the scheme boundary, within wetland habitat	1 feeding sign
01/05/2018- 31/05/2018	SP5071706483	850m to the east of the scheme boundary, close to Worcester College Pond in Jericho, Oxford	1 Individual

4.3 Habitat Suitability Assessment



Figures A1 – A5 (Appendix A) highlight the watercourses assessed for their suitability to support water vole. With accompanying target notes (TN, in Table 4). Of the 5km (approximate) surveyed in 2020, several lengths were considered sub-optimal due to the likely level of disturbance from dog-walkers, noise and visual disturbance from adjacent commercial/industrial units, and poor bank profile and lack of suitable vegetation cover.

Watercourses and habitats considered optimal to support water vole are presented in Appendix A and recorded at Seacourt Stream, north of Botley Road and the Park & Ride, Hinksey Stream, East Wyke ditch and the drain which runs north/south upstream of Abingdon Road.

Table 4: Field Survey Target Notes (TN)

Note ID	Comment/Photo (where available)
TN1	Potential burrow (no other supporting evidence)
TN2	Difficult access to bank
TN3	Potential burrows (no other supporting evidence)
TN4	Water vole latrine
TN5	No access to bank through barbed wire fence and dense nettle and balsam
TN6	Potential burrows

² <https://www.bbowt.org.uk/news/water-voles-thriving-oxfordshire-and-berkshire-and-given-helping-hand-buckinghamshire>

<p>TN7</p>	<p>Difficult view of watercourse, very dense vegetation/shaded and silty base</p> 
<p>TN8</p>	<p>Some sections difficult to view through dense bramble, in-channel vegetation and lack of stable bankside to gain access.</p> 

4.4 Field survey

No latrines were recorded on the *rafts* deployed in 2018 or 2020.

During the habitat suitability assessment (May, 2020), one water vole latrine (Target Note 4, Figure A2, Appendix A) was recorded on a muddy exposed ledge, confirming their presence on Bulstake Stream.

Potential burrows were recorded on Hinksey Stream (Target Note 6, Figure A2, Appendix A) and in optimal habitat along Seacourt Stream, north of Botley Bridge (Target Notes 1 and 3, Figure A1, Appendix A). However, the absence of other signs of water vole activity suggests that these burrows are considered unlikely to be water vole in these locations and are likely to be abandoned burrows or those used by rat or crayfish. Based on the limited field signs in the first and second half of the season, the population density of water vole is considered to be low.

5. Discussion, Impacts, Recommendations and Conclusion

5.1 Discussion

Since 2016, substantial lengths of watercourse within and adjacent to the Oxford FAS site boundary has been surveyed. If a moderate to high density water vole population were present, it is likely that more reliable evidence would be encountered.

The findings of the desk-top study and field surveys to date, supplemented by video footage of a potential water vole in October 2020, suggests a water vole population of low-density. There are extensive, well connected watercourses within and adjacent to the footprint of the scheme (ditches, rhynes, and the River Thames/Isis) providing habitat corridors (of varying suitability) for foraging, commuting and burrowing.

The presence of American mink, as suggested by the mink trap seen on the Bulstake stream (URS, 2014), may be detrimental to the water vole populations within the site, although no direct evidence of mink was encountered during the surveys in 2016 through to 2020.

Considering the level of activity recorded and the habitat available, the site is considered to be of Local value for water voles.

5.2 Impacts

The alignments of the proposed Oxford FAS (as presented in the Temporary & Mitigation Areas Figure A6) and its associated working areas could have direct and indirect impacts on the water vole population dependent on the final design and working methodology.

It is possible that water voles could be using habitats likely to be affected by mobilisation and construction processes as described below:

- Potential for incidental mortality or injury during site clearance and construction;
- Destruction, damage or disturbance to water vole and/or their burrows from vibration, lighting and noise (i.e. during creation of haul routes and site compounds);
- Removal and disturbance of habitats immediately next to the site, that individuals may use for travelling between feeding resources within their territory;
- Habitat fragmentation due to the introduction of new culverts, bridges and other small structures to maintain access; and
- Reduction in water quality (i.e. from a pollution incident during construction)

However, the proposed scheme will also introduce new wetland features, scrapes, ponds and backwaters, with localised bank regrading and shelf creation that could benefit water vole. This could help the existing low numbers to flourish and encourage them to spread out and eventually link up to create larger, more robust populations that are more sustainable in the long term.³

5.3 Recommendations and Mitigation

The works are due to commence in 2023; it is therefore recommended that updated water vole surveys will be required prior to any mitigation to determine population sizes and identify and record the location of burrows, and to identify and survey any potential receptor sites. The likelihood of surveys needing to be updated increases with time and is greater for mobile species such as water vole or in circumstances where the habitat or its management may change significantly since the surveys were undertaken (CIEEM, 2019). Surveys should follow

³ This supports the focus of the BBOWT Water Vole Recovery Project, set up in 1998 in partnership with the Environment Agency, the Canal & River Trust and Thames Water.

best practice guidelines, with one survey between mid-April/early May and the end of June and a second between July and September, with at least two months between visits.

The video recording was within 500m of the proposed channel-widening of Hinksey Stream, south of the A423 and the latrine was recorded on Bulstake Stream within the red-line boundary. Further surveys should consider the use of rafts or a boat at these locations, due to access restrictions on foot. The proposed works at these locations have potential to injure, kill and/or disturb water voles that may be present and will result in an increase in disturbance from human activity (noise and visual), with a temporary loss of approximately 200m of suitable habitat. The boat or raft survey will need to be undertaken by suitably qualified ecologists at a sufficient time to allow for mitigation measures to be implemented if water voles are found and discussions with Natural England.

If water voles are found in the wider scheme footprint during the pre-commencement survey and/or during construction, then on the guidance of Natural England, displacement may be considered a potentially useful technique, along short lengths of an affected water course and where trapping would be disproportionately expensive and could impact on animals outside the working area due to individuals moving into vacant territories. Such displacement can be conducted under a Class Licence by a registered person, the displacement of water voles in other circumstances would always require a site-specific licence (as outlined in Section 3.2 above).

However, if trapping is deemed necessary, this would need to take place between 1st March to 15th April and should follow the methodology detailed in Appendix B.

Suitable receptor sites would need to be provided, with a minimum of 500m or 0.1ha of optimal habitat in total, to provide sufficient habitat for the maximum number of water vole that could be caught and to cater for future population expansion. Receptor sites typically take 9-15 months to establish, but may take longer. Iffley Triangle has been identified previously as a potential receptor site, but this would require a re-survey to determine its suitability closer to when water voles are to be translocated. The named ecologist on the licence would determine when the site is suitably established to allow the release of water voles (following guidance in Appendix C).

Within the scheme boundary, site clearance and the permanent loss of terrestrial and riparian vegetation could cause fragmentation and remove habitats that would otherwise be used in the future. However, this could be mitigated for by providing suitable water vole habitat along the proposed new two staged channels between the A34 to the west and the Oxford to Didcot railway line to the east post-construction. This could involve the following (derived from the Water Vole Mitigation Handbook (Dean *et al.*, 2016);

- Creating banks using a substrate which is suitable for burrowing and not liable to collapse;
- Providing a suitable bank profile; and
- Establishing suitable bank side and marginal vegetation using a range of native herbaceous species to provide both food and cover throughout the year.

Bankside vegetation can be established through seeding, translocation of turf or plug planting. Marginal vegetation can be established by plug planting. Vegetation of local provenance should be used where possible. Any new habitat provided for water voles will need to be managed to ensure that it remains suitable.

Although no evidence was recorded during the water vole surveys, it is anticipated that American mink *Neovision* may have contributed to its decline within the study area and wider environs⁴. The Wildlife Trusts support strategic and humane control of mink for the purposes of water vole conservation. If deemed appropriate, in consultation with the relevant bodies, the Oxford FAS should consider mink control which must be planned, ecologically sound, properly surveyed and resourced, time-limited, monitored and documented. The mink

4

<https://www2.oxfordshire.gov.uk/cms/sites/default/files/folders/documents/environmentandplanning/countryside/protectedspecies/WaterVoleRecoveryProjectMinkControlGuidelines.pdf>

control must be accompanied by habitat restoration, as described above, to provide long-term protection for the water vole and would likely be a condition of a licence, if required to carry out trapping and/or displacement of water voles.

5.4 Conclusion

The 2020 water vole survey indicates a population of low density within and adjacent to the survey boundary of the Oxford FAS.

Over a period of eighteen months to three years, conditions on site may change. Based on the current construction proposals and programme, it will be necessary to undertake further detailed survey to inform the need for a licence and define the appropriate mitigation.

Subject to the recommendations set out above in relation to avoiding or mitigating potential impacts to water vole, it is considered that the proposed scheme can be implemented:

- without significant adverse ecological impacts;
- will not be detrimental to the conservation status of water vole; and
- be in accordance with relevant legislation and planning policy.

6. References

CH2M (2015) Oxford FAS Preliminary Ecological Appraisal (Environment Agency)

CH2M (2016), Oxford FAS Water Vole and Otter Survey Report (Environment Agency)

CIEEM (2019) Advice note on the lifespan of ecological reports and surveys.

Dean, M. Strachan, R, Gow, D and Andrews, R (2016). The Water Vole Mitigation Handbook (The Mammal Society Mitigation Guidance Series).

Harris, J, Blakeney ; Freshes Flood Defences Baseline Ecological Surveys, Water Vole and Otter. Report to the Environment Agency, June 2002

Thames Valley Environmental Records Centre (TVERC) 2016.

The Multi Agency Geographic Information Service (MAGIC), www.magic.gov.uk

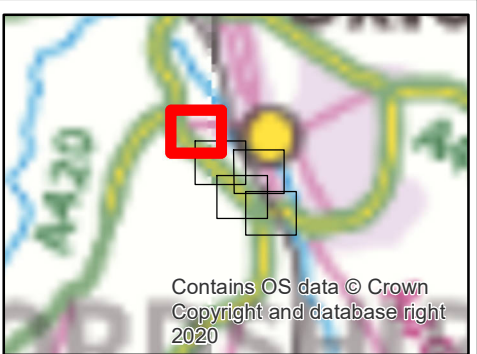
URS (2014), Hinksey Flood Alleviation Scheme Otter and Water Vole Survey

<https://www2.oxfordshire.gov.uk/cms/sites/default/files/folders/documents/environmentandplanning/countryside/protectedspecies/WaterVoleRecoveryProjectMinkControlGuidelines.pdf>

<https://www.bbowt.org.uk/wildlife/wildlife-conservation/water-vole-recovery-project>

Appendix A. Survey Results & Figures

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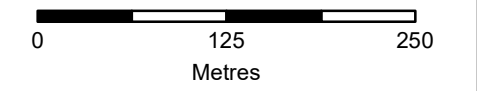
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Legend

- TN1 Target Note
- Survey Boundary

Water Vole Suitability

- Not surveyed
- Not Suitable
- Sub-Optimal
- Optimal



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Project:
Oxford Flood Alleviation Scheme

Drawing:
Water Vole Habitat Suitability Survey 2016

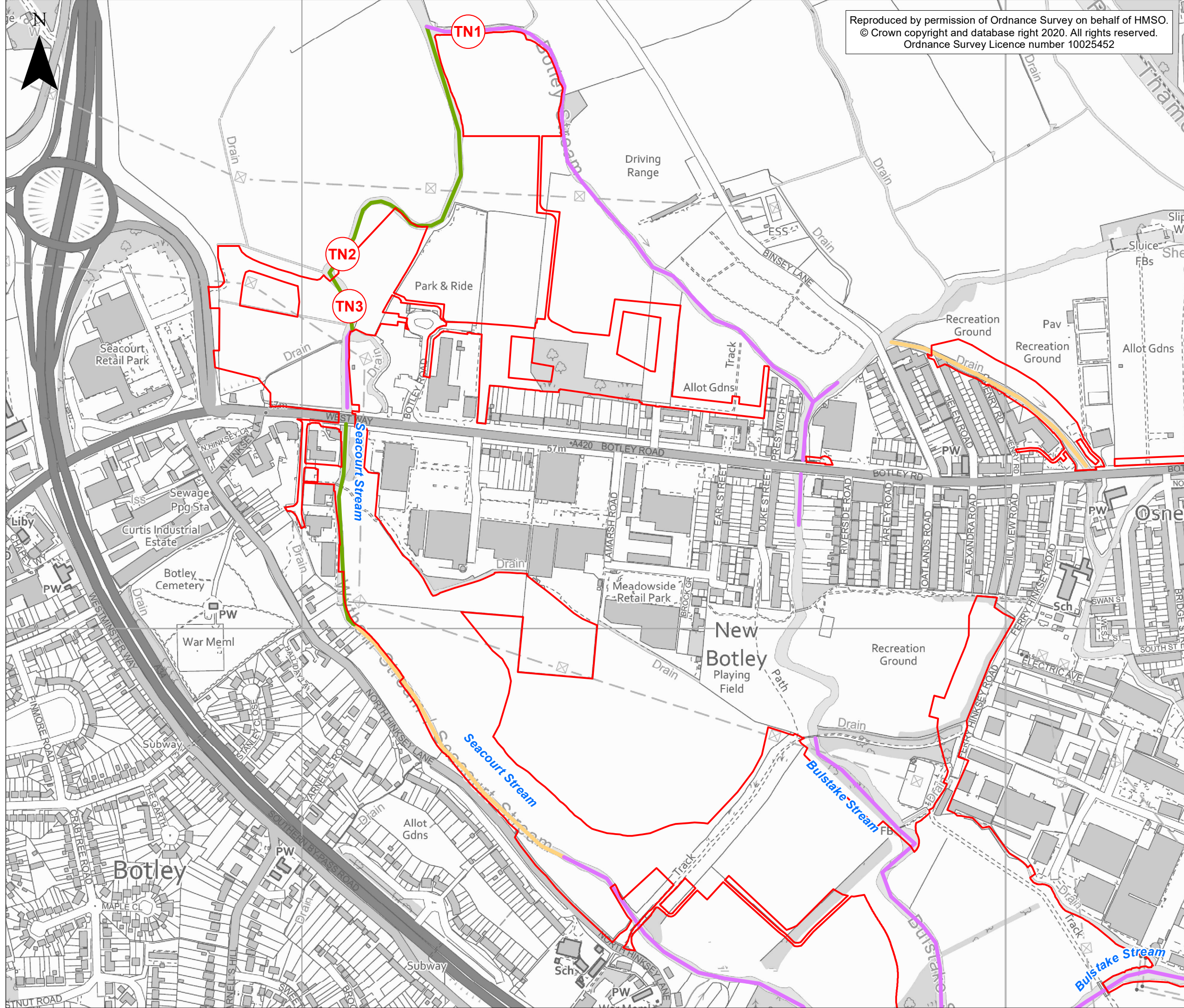
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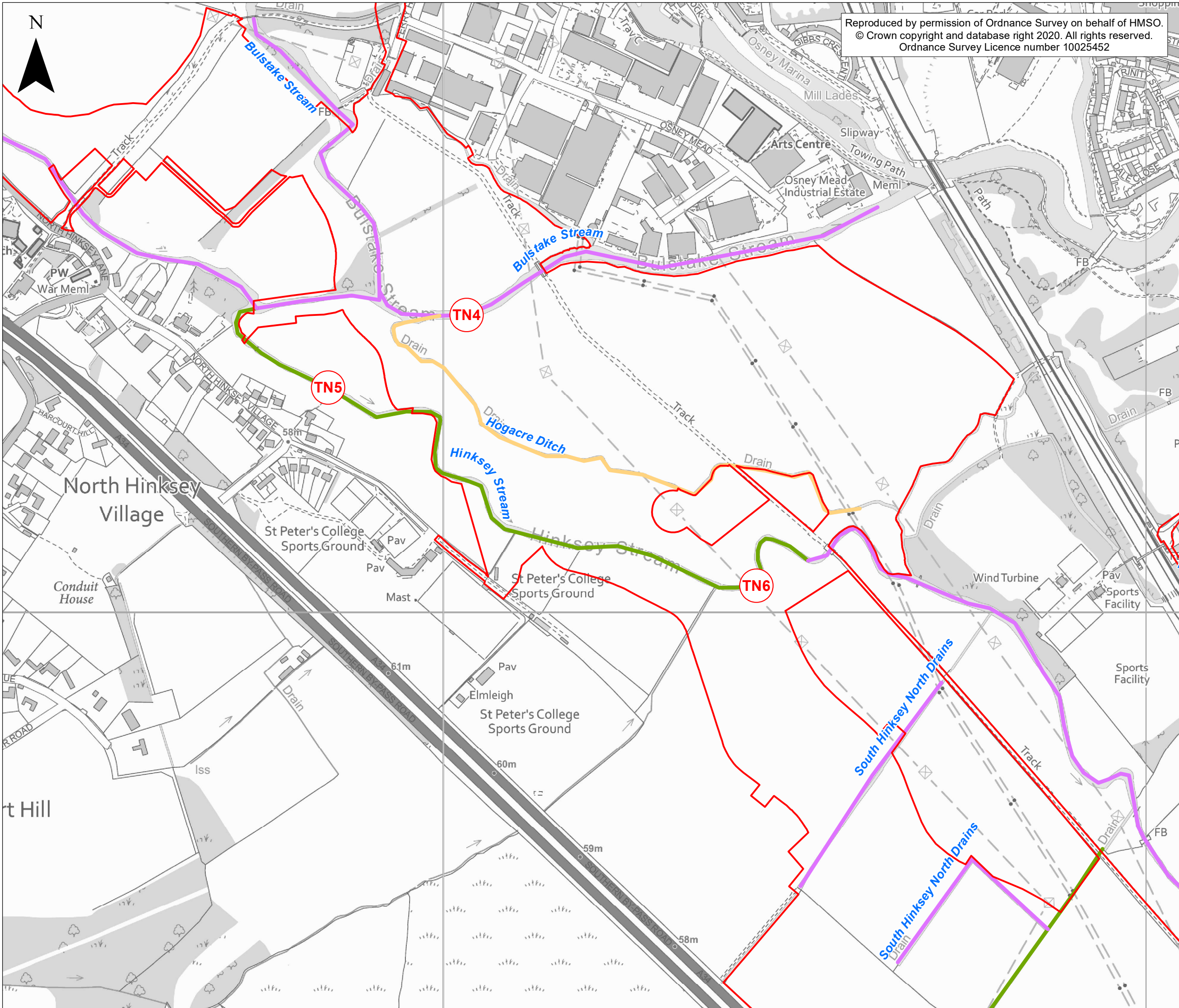
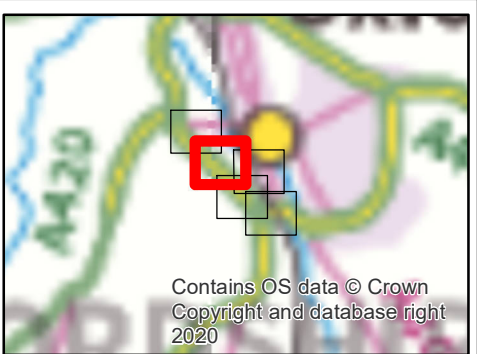
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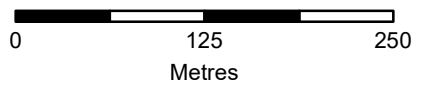


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Legend

- TN1 Target Note
- Survey Boundary
- Water Vole Suitability**
- Not surveyed
- Not Suitable
- Sub-Optimal
- Optimal



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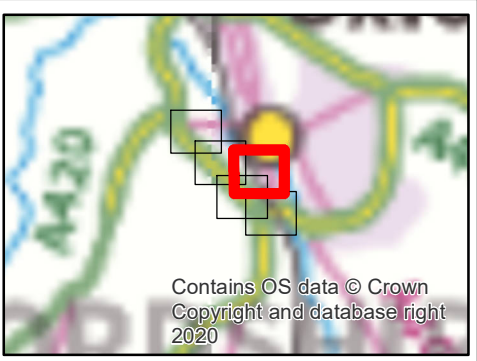
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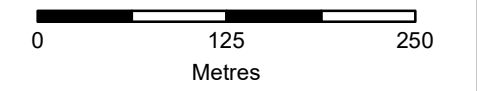
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Legend

- TN1 Target Note
- Survey Boundary

Water Vole Suitability

- Not surveyed
- Not Suitable
- Sub-Optimal
- Optimal



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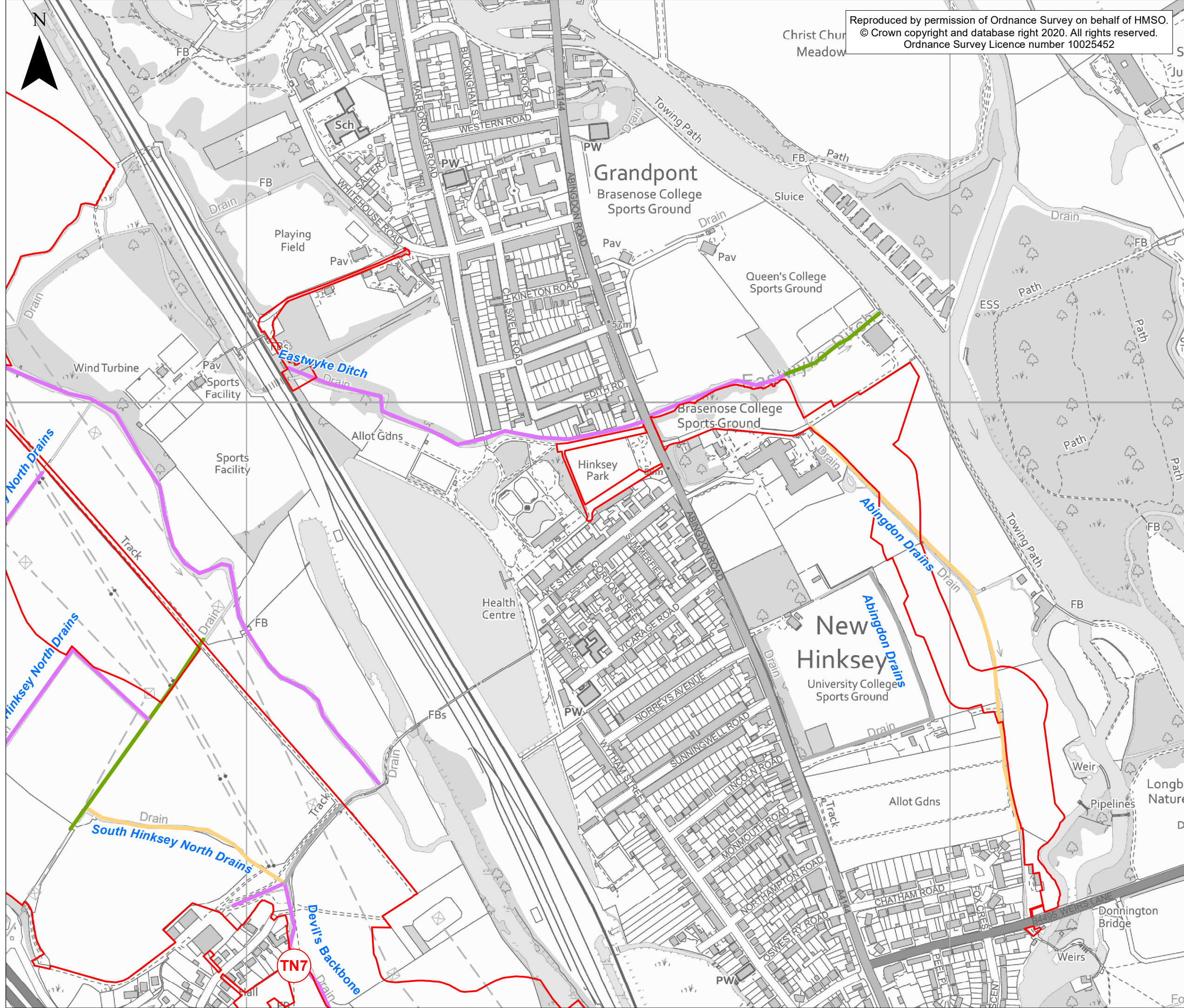
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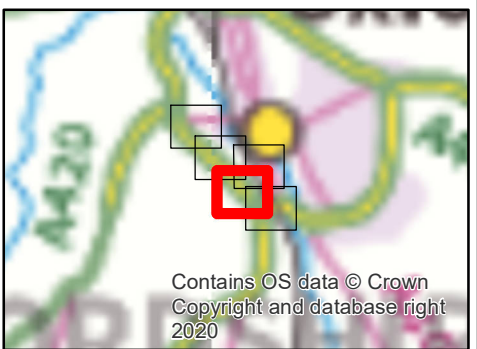
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Drawing No. :
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Drawing Scale : 1:5,000



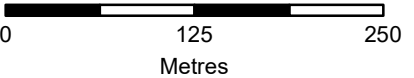
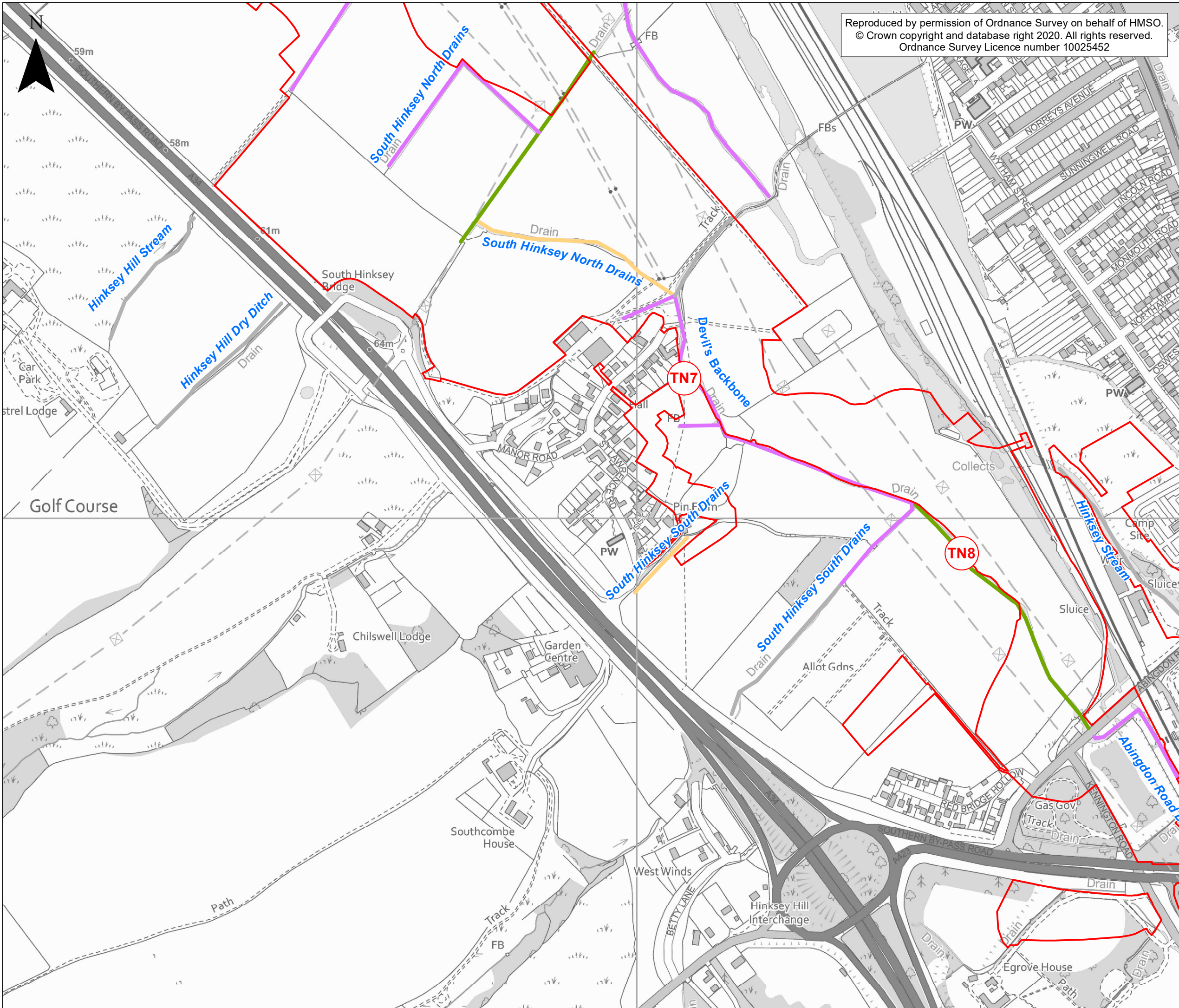
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Legend

- TN1 Target Note
- Survey Boundary
- Water Vole Suitability**
- Not surveyed
- Not Suitable
- Sub-Optimal
- Optimal



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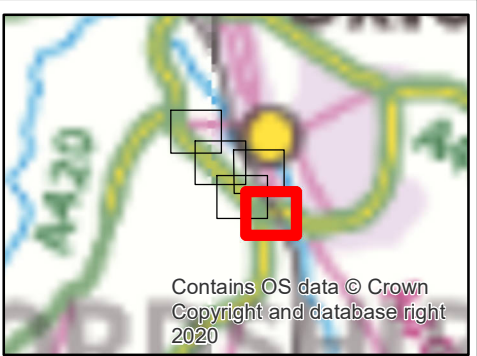
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 Checked By : RM Date: 15/12/2020
 Approved By : GH Date: 15/12/2020

Drawing No. :
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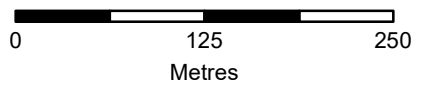
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Legend

- TN1 Target Note
- Survey Boundary
- Water Vole Suitability**
- Not surveyed
- Not Suitable
- Sub-Optimal
- Optimal



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Project :
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Drawing :
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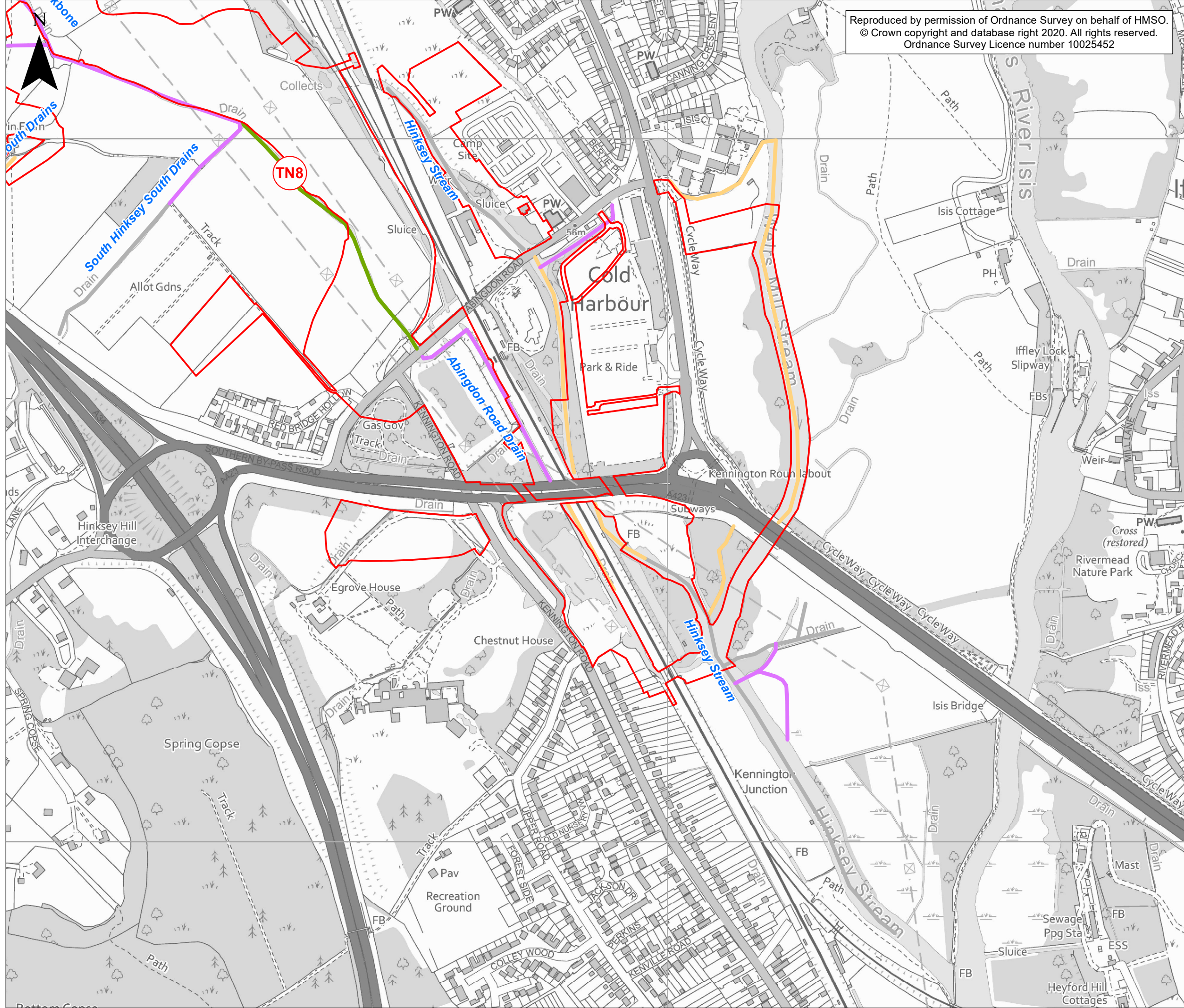
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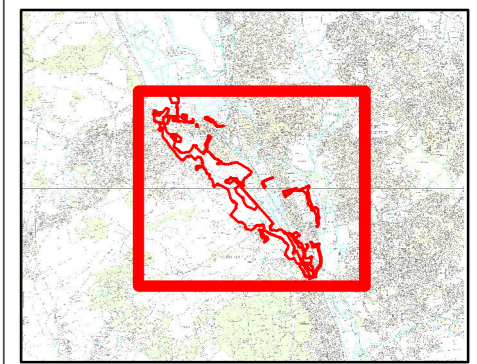
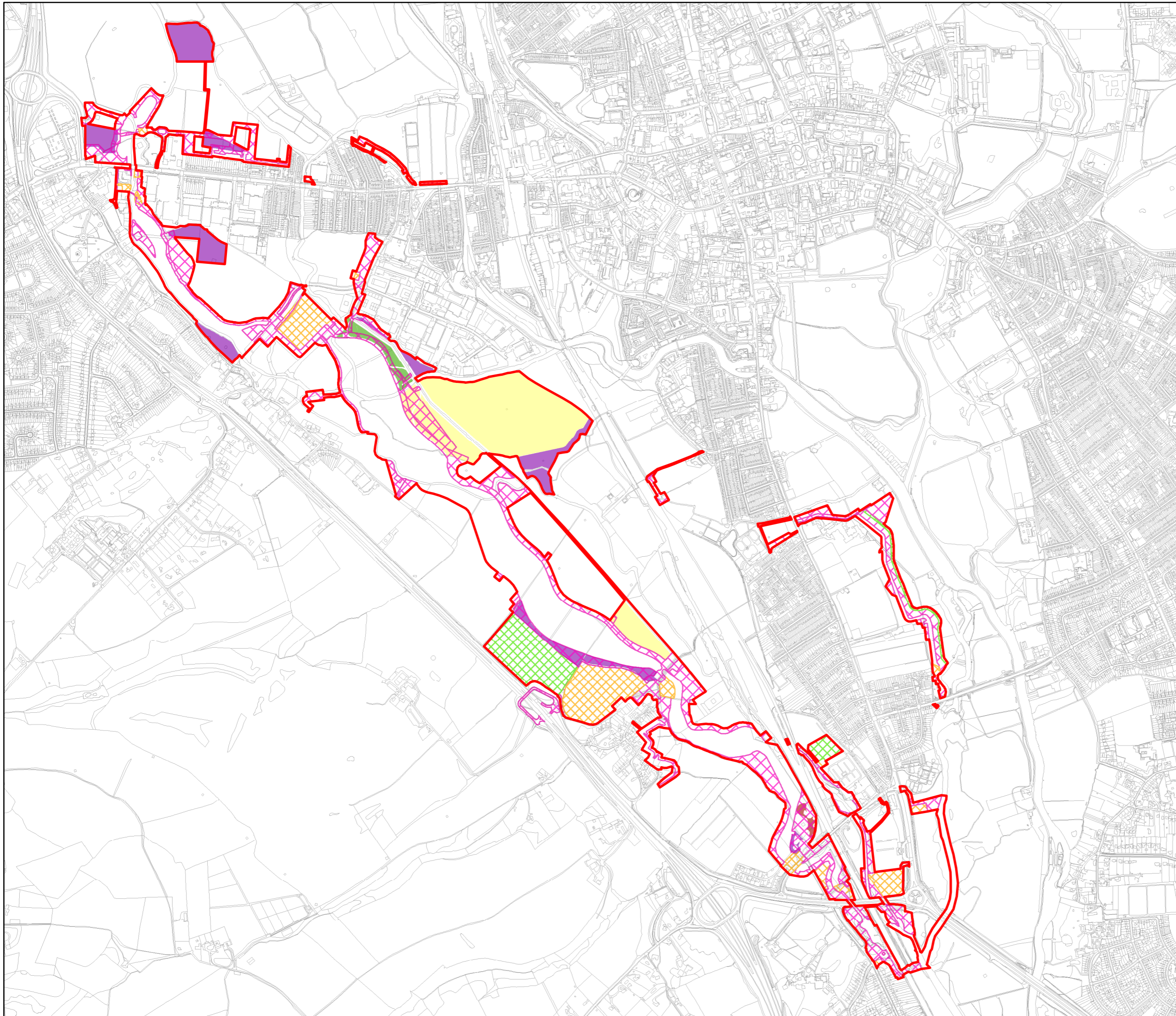
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Legend

- Oxford_RedLine_rev0
- Temp_Area**
- Compound Storage
- Soil Storage Area
- Temporary access track and Working
- Type_Mitig**
- Habitat creation
- MG4 Creation
- Shrub tree planting
- Woodland creation

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Project :
 Oxford Flood Alleviation Scheme

Drawing :
 Temporary & Mitigation Areas

Drawn By : VHJ Date: 29/01/2018

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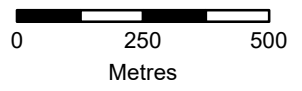
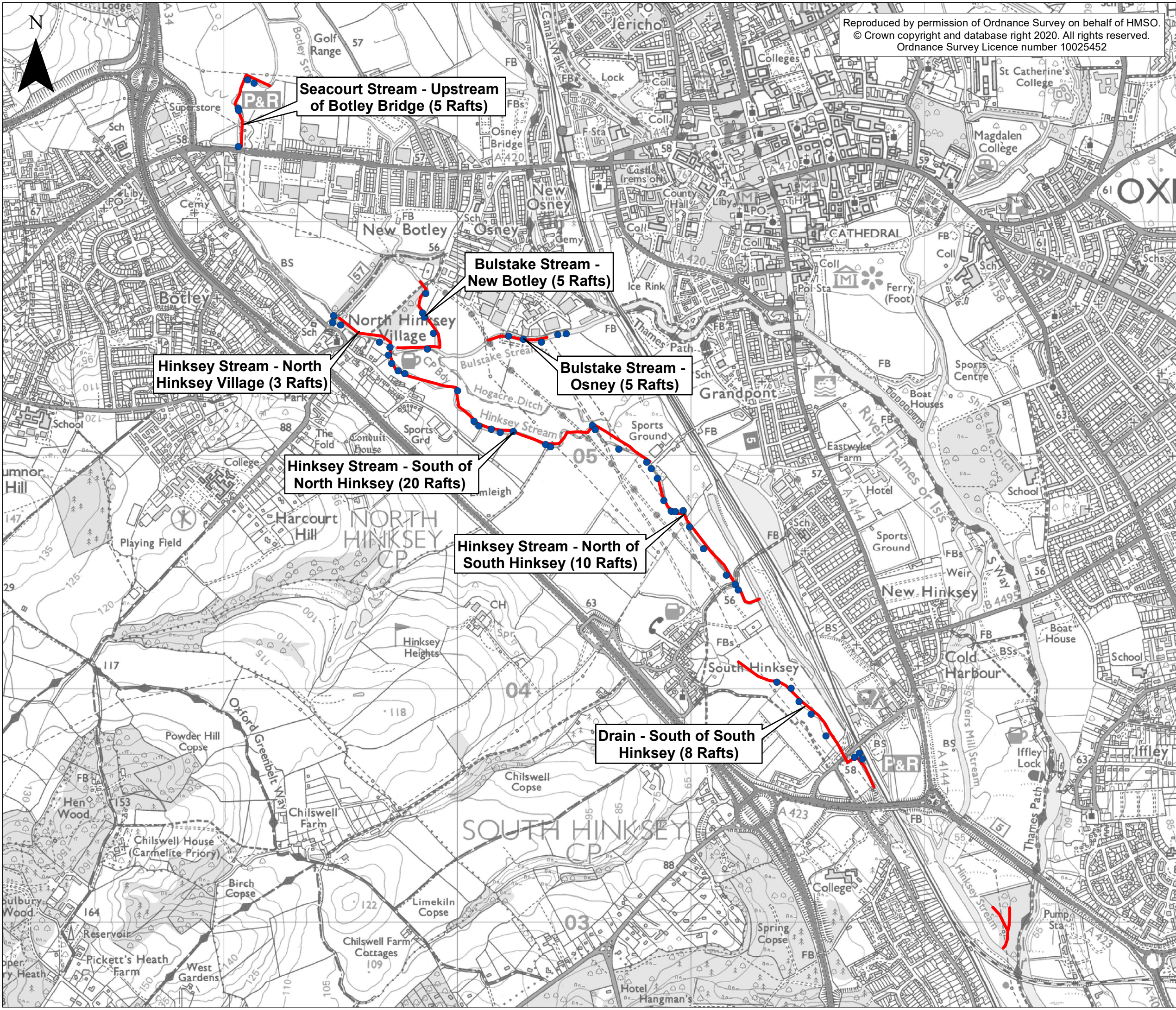
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Legend

- Water Vole Raft Location and Number
- Raft Survey Extent



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Project:
 Oxford Flood Alleviation Scheme

Drawing:
 Water Vole Raft Locations & Results

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 Checked By: RM Date: 15/12/2020
 Approved By: GH Date: 15/12/2020

Drawing No.: Figure A7 Revision: -

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Appendix B. Trapping Protocol

Trapping of water voles can only be undertaken by a person licensed to do so by NE and should only be carried out by those with sufficient experience to ensure the welfare of the animals.

Before any water vole trapping project begins the site must be checked and verified clear of the presence of mink. If mink is present then they must be eliminated before water vole trapping begins wherever practical (failure to do so can result in their killing captured water voles).

B.1 Time of year/weather conditions:

Trapping of water voles should only be undertaken at an appropriate time of year, ideally between 1st March and 15th April inclusive. Trapping can also be undertaken between 15th September to 30th November, but this should be considered as a last resort as water vole numbers are likely to be higher following the breeding season and water voles rely on food caches stored within their network of burrows to provide food over winter.

In lowland habitats in England water voles can be trapped in autumn as a last resort. However, given their high levels of winter mortality, and the fact that they store food for autumn in burrow systems, it is not recommended to release animals at this time of year. It will require the animals to be over wintered in captivity and should only be undertaken as a last resort. Licence applications where autumn trapping is proposed will need to be supported by an appropriate justification for this approach.

Trapping should not be undertaken during the following conditions:

- Cold conditions - night-time temperatures below freezing;
- Hot conditions – daytime temperatures above 20°C;
- High rainfall/flooding – where water level rises could be sufficient to flood the traps (the use of floating platforms may allow trapping to continue during minor water level fluctuations, but not during major flooding events which will capsize the rafts).

The weather forecast should be monitored daily during a trapping exercise, and the traps should be securely closed or removed if adverse weather conditions arise or are forecast.

B.2 Traps

An ideal metal trap type for capturing water voles is constructed from 1cm x 1cm weld mesh with an aluminium or wooden shelter at one end. Its basic dimensions are 50cm long x 15cm wide x 15cm high. The aluminium shelter sits over the far end of the trap and is 215mm in length. The traps have a simple locking bar fitting in their doors which activates on closure.

Traps should be thoroughly cleaned, disinfected, rinsed in clean water and dried after use and between trapping sites. In areas with bovine tuberculosis, care needs to be taken to ensure that the agent is effective against mycobacteria.

Traps must be checked prior to use to ensure that they are in complete working order.

B.3 Locating and securing traps

Traps should be placed at a density of at least one per 10m of bank and should be located parallel to the bank edge and immediately adjacent to latrine sites or in areas where runs are obvious. The ground beneath the trap should be flattened as far as possible without damaging the bank, to allow the trap to sit securely, but ideally placed on a slight incline with the nest chamber highest, to prevent submersion in the event of minor of fluctuations in water level. All traps should be secured with pegs, to prevent them being dislodged.

Traps must not be set in precarious positions where the movement of captured animals could lead them to fall into water, or in situations where human interference is likely to occur. Where it is necessary to trap in locations used by the public, they should be set in locations that are difficult to reach and be covered in vegetation.

Traps can also be set on floating platforms (such as mink rafts). This approach is useful where banks are absent or inaccessible, or where disturbance by dogs or foxes is likely. They must be sufficiently buoyant to ensure they can support a water vole's weight and the traps must be secured to the platform, to ensure that they do not roll into the water and the platforms must be secured to prevent them floating away. They also need to be tethered in a way which allows them to rise and fall with changes in water level and should not be used in situations where there is significant water wash from boat traffic, which could cause them to capsize.

Each trap must be uniquely numbered, and locations mapped accurately to ensure they can be relocated, ideally using a handheld GPS.

B.4 Provisioning traps

Traps must be provisioned with dry straw bedding and half a fresh, sweet apple. Additional food can also be provided (e.g. carrot). These materials must be checked daily and changed at least every second day.

B.5 Checking traps

Traps should be checked at least twice daily:

- Early morning check, between 6am and 10am, with all traps checked by 10am; and,
- Late afternoon/evening check, before dusk.

During warm conditions a third check in the middle of the day should be undertaken.

B.6 Handling captured animals

Where captured water voles are to be released into an on-site receptor area, they should be examined upon release from the trap to determine their sex and approximate size/weight. They should be placed in a suitable container for transportation, such as a standard rodent laboratory cage. Animals should also be marked (either by fur clipping or by the insertion of micro-transponders by appropriately trained individuals) to ensure that any animals which escape from the release site can be identified. Water voles can only be handled and marked by individuals holding a licence from NE for the work, or their accredited agents.

Where captured water voles are to be released at an off-site receptor area or taken into captivity, they may be transported to a central care facility in their traps or appropriate holding cage as described above. If traps are used for transport, then the doors must be secured using wire or cable ties prior to movement.

When water voles are captured, traps should be replaced on the same spot, as it is likely that more than one animal will be present. Particular care should be taken to ensure that more than a single trap is placed side by side at any location where very small juveniles (30–50g in weight) have been captured. The chance of catching other sibling litter mates at the same point is high. These can be placed in holding cages together if they are captured at the same location but should not be mixed with other adults.

B.7 Completion of trapping

Trapping can be considered complete once there has been a period of five days or more when overnight temperatures are above freezing, with no captured animals, and there are no field signs within the capture site. Once completed a destructive search of the area should be undertaken (following protocol outlined in the Appendix B). Any animals found during the destructive search should be captured with nets or by hand and transported as described above.

For large sites it may be appropriate to consider completing trapping in some parts of the site before others, to prevent the chances of animals recolonising the cleared areas.

Appendix C. Receptor Site Selection

C.1 Receptor site criteria

Receptor sites for relocated water voles will need to be sufficiently large to support the maximum number of water voles that could be captured and must cater for their future expansion (i.e. until fencing around the receptor site is removed). The receptor site should therefore provide at least the same quantity of habitat as the area from which water voles are to be trapped.

Water vole should ideally be absent from potential receptor sites. Receptor sites with low water vole populations could be considered if significant habitat enhancement or creation works could be conducted.

Receptor sites should, ideally, be located on-site. However, consideration of their location should take account of the long-term survival prospect of the population. Translocation of water voles to off-site receptor sites can be appropriate where an on-site receptor site would result in the population being fragmented and unviable. Such off-site relocation should remain within the same river catchment where possible. Off-site translocations can be effective for sites with a guaranteed stability of use, where extensive habitats are available for population expansion, willing partner organisations exist and effective mink control can be secured in the long term.

A lead-in time for the creation of receptor sites is likely to be at least 9-15 months (dependent on the time of year and the method used to establish the habitat) but can take longer to establish in some cases. The vegetation within the receptor site must be established with friable soils to allow burrowing, and complete bankside cover and dense marginal vegetation before water voles can be released into it (see Figures C1 and C2).



Figure C1. Receptor site not efficiently established to receive water voles (Photo taken from The Water Vole Mitigation Handbook, Dean *et al.* 2016)



Figure C2. Receptor site ready to receive water voles (Photo taken from The Water Vole Mitigation Handbook, Dean *et al.*, 2016)

Receptor sites should be fenced to prevent ingress of water voles from adjacent habitat. Where this is not possible the receptor site should be between 50% and 100% larger than the area affected.

C.2 New habitat creation

The design of new habitat for water voles should:

- Ensure that the watercourse/wetland area contain water throughout the year. Watercourses should ideally be designed with a slow, stable flow rate;
- Create banks using a substrate which is suitable for burrowing and not liable to collapse;
- Provide a suitable bank profile, which allows water voles to access the water easily and create a network of burrows above highwater level;
- Provide established bankside and marginal vegetation using a range of native herbaceous species to provide both food and cover throughout the year; and,
- Provide established herbaceous vegetation on the face of the bank and up to 2m back from the top of the bank and establish marginal or in-channel vegetation.

Bankside vegetation can be established through seeding using a seed mix appropriate for the production of a tussocky, species-rich sward. Alternatively, turves can be translocated to reduce the establishment time.

Marginal vegetation can be established by plug planting at suitable intervals, or through the translocation of existing suitable vegetation on site. This can help reduce the establishment time. A planting shelf immediately below normal water levels can help to ensure a fringe of marginal vegetation. Pre-planted coir fibre rolls can also be used to reduce establishment time and to provide additional support at the toe of the bank.

Dry areas of wetland vegetation adjacent to a watercourse can be re-wetted by cutting narrow channels back to the watercourse.

New habitat provided for water voles will need to be managed to ensure that it remains suitable in the long term.

