



Transforming the Trent Valley:

Natural Heritage Audit Report

A report produced for project funder Heritage Lottery Fund.



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Staffordshire Wildlife Trust and Derbyshire Wildlife Trust 2018



LOTTERY FUNDED



Scope of the Report

This report was commissioned for the development phase of the Transforming The Trent Valley Landscape Partnership Scheme (TTTV LPS) (LP - 15 - 03743) funded by the Heritage Lottery Fund (HLF). The report forms an element of a series of audits that were undertaken to identify and refine the aims, targets and objectives of the delivery phase of the resulting project. The following report focuses on the natural heritage of the project area.

The report aims to:

- i) Collate, analyse and present existing natural heritage data both from the partnership and other sources.
- ii) Collate, review and update the 2006-2007 Audit of the Tame and Trent river valleys.
- iii) Update the 2009 Staffordshire Washlands Assessment and recommendations for key sites including input from Derbyshire Wildlife Trust (Reports available from centralrivers.org.uk/downloads and titled CRI Biodiversity Audit part 1 and 2).
- iv) Use existing data sets that is publically available or held by partners, to undertake biodiversity opportunity assessment and mapping for areas that are not covered by existing biodiversity opportunity maps within the scheme area.
- v) Undertake a desk-based audit of river restoration opportunities in the project area with reference to maps showing historic channel patterns and floodplain character and current flood risks.
- vi) Establish the condition of floodplain grasslands and water meadows in the project area and prioritise restoration opportunities across the project area. The Staffordshire Historic Water Meadow Survey, carried out in 2007-2008, is available on the Staffordshire County Council's website.
- vii) Undertake an audit to identify opportunities for woodland restoration and opportunity areas for 'Woodland for Water' as part of Natural Flood Management (NFM).
- viii) Identify opportunities for key species using existing data from across the partnership or publically available sources.

Executive Summary

- A biodiversity opportunity mapping drop-in session was undertaken with key partner organisations to develop project ideas and discuss potential opportunities throughout the 19,950 hectare project area.
- 3,877 ha (19%) of the TTTV project area was identified as potential Coastal Floodplain Grazing Marsh (the largest proportion of any Priority Habitat in the TTTV area); 112 ha (2.9%) of which was in the 1 in 30 year incidence floodplain (3% chance of flooding), 185 ha (4.8%) in the 1 in 100 year floodplain (1% chance of flooding) and 658 ha (17%) in the 1 in 1000 year floodplain (0.1% chance of flooding).
- 388 ha (10%) of the 3,877 ha of potential grazing marsh was identified as having an Environmental Stewardship Scheme in place, of which 271 ha (7%) was considered to have beneficial options for the grazing marsh habitat.
- Within the TTTV area, 2,931 hectares of potential water meadow were identified based on historical features and incidence of surface water flooding.
- 284 ha (10%) of potential water meadow were considered to have a high potential for restoration, 1,232 ha (42%) was considered medium priority and would be high potential with a suitable Environmental Stewardship Scheme in place.
- Key sites were reviewed in detail and a suite of projects were reviewed for each site. The review covered approximately 3,050 hectares in 31 key sites between Burton upon Trent and Tamworth outlining approximately 70 individual potential project proposals.
- Carried out a review of project recommendations made in the 2009 Staffordshire Washlands Assessment. The review covered approximately 290 hectares of land excluding overlaps with the 2006-2007 review identifying 11 individual potential project proposals.
- A further 6 wider potential project opportunity areas were identified in the TTTV area and specific recommendations have been made in addition to those made in reviews of previous audits.
- If suggested targets for creation and restoration of BAP habitats within the project area are met through carrying out opportunities suggested, this would be roughly be worth £173,000 of natural capital per year.

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Evidence Base

Introduction

Between 2006 and 2012 Staffordshire Wildlife Trust (SWT), in partnership with a variety of organisations, prepared an extensive inventory of habitats and species within the Staffordshire part of the project area. This data has been used to inform and influence a series of projects including the Local Plan process for local authorities and for the Central Rivers Initiative (CRI), in the form of biodiversity opportunity mapping. Derbyshire Wildlife Trust worked with a number of partners to establish a Trent Valley Vision that included assessments of Local Wildlife Sites (LWS) and included biodiversity opportunity mapping.

In order to inform the development of natural heritage projects to be carried out as part of the TTV HLF project, an updated and extended audit, covering the entire scheme area, has been carried out to develop ecological network mapping. This will also help guide spatial planning and investment in nature throughout the project area through linking with projects such as the Burton+ Landscape Vision. The initial part of the process was to collate various data sets and update them if required. The data set selection was based on various habitat and environmental data that would form the baseline information to map opportunities and develop a suite of projects which will contribute towards the creation of a 'Living Floodplain' landscape. A full inventory of data sets used can be found in **Appendix 1**. A number of analyses were then conducted to inform the opportunity mapping, these analyses included:

- Determining local biodiversity action plan targets that were in line with the TTV project area.
- Estimating the condition of the most predominant Habitat of Principal Importance (HPI) in the project area; Coastal and Floodplain Grazing Marsh.
- Estimating the condition of historical water meadows to link with the Cultural Heritage Audit.
- Targeting palaeochannel 'hotspots' where restoration options could be further investigated through future survey work to link with the Cultural Heritage Audit.

- Extracting recommendations from Environment Agency (EA) walkovers in order to target river restoration opportunities, which would contribute towards achieving good ecological status in the rivers and stream network within the project area in order to meet European Water Framework Directive (WFD) targets.
- Incorporating Woodland for Water opportunity mapping to inform tree planting, which could contribute towards WFD targets.
- Linking to Natural England's (NE) statement of priorities for reference in case Countryside Stewardship (CS) is carried out as part of natural heritage projects.
- Investigating the potential value of natural capital that habitat restoration and creation could provide as part of a natural heritage delivery project.
- Ensuring opportunities are in line with the findings from, the East Staffordshire Biodiversity Opportunity Mapping (SWT 2013) which shows where priority habitats could be enhanced.

The methodology for the various analyses carried out on the above data sets are detailed in the methodologies section below. Broad-scale opportunities derived from the analysed data sets are detailed in the broad-scale opportunities section (see [page 23](#)). More detailed project opportunities, which were developed through updating existing audits and through an opportunity mapping drop-in session held on the 28th February 2018, are included in the review of existing audits section (see [page 30](#)).

Methodologies

Staffordshire and Derbyshire Biodiversity Action Plan analysis

The UK Biodiversity Action Plan (UK BAP) was published in 1994 in response to the 1992 Rio de Janeiro Convention on Biological Diversity (UK BAP, 2008). The aim of the BAP was to describe the biological resources of the UK and compile a strategy or ‘action plan’ for the conservation and recovery of threatened or at risk UK BAP habitats and species, which are now known as, Habitats of Principal Importance and Species of Principal Importance (SPI), respectively. For the strategy, local targets for

habitats and species were compiled as part of Local Biodiversity Action Plans (LBAP) or Ecosystem Action Plans (EAP) in Staffordshire. The area boundaries of which, broadly followed the National Character Areas but were refined using local habitat and species knowledge and expertise. In order to determine the focus of conservation work in the TTTV project area, the LBAP for habitats in Derbyshire and the Staffordshire EAP targets were utilised. This would enable the formation of realistic and prioritised habitat targets that could contribute towards natural heritage projects in the TTTV project area.

The targets were arrived at through Staffordshire's EAP zones and Lowland Derbyshire's LBAP areas, which covered significant areas within the TTTV project boundary. The most significant EAPs were the River Gravels and a small area of Central Farmland in Staffordshire and in Derbyshire the most significant LBAPs were the Trent and Dove Valleys and a small area of the Claylands.

To arrive at possible targets for priority habitat restoration and/or creation in the TTTV area, the amount of existing priority habitat within the TTTV boundary needed to be collated from the most up to date Geographic Information System (GIS) data, so that potential targets would be realistic. This would ensure target habitat restoration and/or creation was relatable to what existing resource there was, for example, if the habitat restoration and/or creation target exceeded the amount of existing resource, the target would be unlikely to be achievable as part of a project such as the Living Floodplains natural heritage project.

Furthermore, the targets for rivers are to achieve 'good ecological status' across the project area. Using Catchment Data Explorer (EA, 2018), the individual status for each catchment is listed with what it is failing on and the reason why it is failing. Using walkover surveys provided by the Environment Agency (see **page 17**) it was possible to compile a suite of targeted projects, in order to help improve the ecological status of the rivers and streams network in the TTTV area, which fed into the broad-scale opportunity mapping.

Table 1. SBAP habitat restoration and creation targets

Habitat	Unit	Proposed Restoration target	Proposed Creation target
Coastal and Floodplain Grazing Marsh	ha	50	0
Purple Moor-grass and Rush Pasture	ha	5	5
Lowland Meadow	ha	40	25
Arable field margins	ha	~	10
Hedgerows	km	~	5
Native Woodland	ha	~	~
Wet Woodland	ha	5	5
Eutrophic Standing Water	ha	~	~
Ponds	Ponds	100	50
Reedbeds	ha	5	10
Swamp/Fen	ha	5	10
Total	N/A	110	65

Coastal and Floodplain Grazing Marsh

Coastal and Floodplain Grazing Marsh is a UK priority habitat listed as a HPI, defined as periodically inundated meadow and pasture land which has ditches to maintain water levels and contains standing brackish or freshwater. Although England has the largest proportion of grazing marsh, only a small amount of this is species-rich semi-natural grassland habitat (Biodiversity Reporting and Information Group (ed. Ant Maddock, 2008). Grazing marsh represents the priority habitat with the largest coverage across the project area, and is also considered by both the Staffordshire and Derbyshire Local Biodiversity Action Plans, an important resource to restore, as they provide important breeding wader habitat. Although it covers such a significant area not much data is available on its condition. In order to give a broad overview of the potential condition of the grazing marsh resource from a desk-based position, sites were considered to be in a positive management regime if they were managed under a Stewardship Scheme and

determining surface water flooding incidence could give an indication of how much of the grazing marsh was still connected to the floodplain.

A broad assessment of the coverage of the grazing marsh was collated from existing GIS data sets from sources including Natural England's priority habitat data and in-house analysis of Phase 1 habitat data for Staffordshire. This data has varying reliability in its assessment of its interpretation of the target habitat and verification, therefore the mapping serves as an indication that the habitat could be present rather than it definitely is present. To further refine the data set it was compared to the surface water flood risk data set produced by the EA and supplied under an Open Government Licence. This flood risk data set considers the incidence of surface water flood risk displaying likelihood of flooding for 1 in 30 years, 1 in 100 years and 1 in 1000 years. From analysing the data sets, this provided an indication to what extent (percentage) the total habitat is likely to flood. The results are displayed in **Table 5** on **page 24**.

The assessment of the condition of Coastal and Floodplain Grazing Marsh considered the percentage cover of land in an Environmental Stewardship Scheme using the latest available data set, which in this case was the 2016 data (data is released annually in May). As a further indication, the percentage cover of grazing marsh in a beneficial wetland option was also calculated and the results are collated in **Table 6** on **page 24**. Positive options which were present in the analysed area included:

1. EK2 - Permanent grassland with low inputs
2. EK3 - Permanent grassland with very low inputs
3. HK7 - Restoration of species-rich semi-natural grassland
4. HK9 - Maintenance of wet grassland for breeding waders
5. HK10 - Maintenance of wet grassland for wintering waders and wildfowl
6. HK11 - Restoration of wet grassland for breeding waders
7. HK12 - Restoration of wet grassland for wintering waders and wildfowl
8. HK13 - Creation of wet grassland for breeding waders

9. HK15 - Maintenance of grassland for target features
10. HK16 - Restoration of grassland for target features

This analysis will allow the targeting of areas to investigate further by ground-truthing for restoration potential and areas where the greatest benefit from reconnecting this habitat can be gained.

Historical Water Meadow

Historical water meadows are an important part of our agricultural heritage for managing land in the floodplain. The control of water by a system of channels, sluices and ditches, enable farmers to manage the water levels manually on a field with the aim of encouraging early and lush growth of the sward which differ from floodplain meadows that flood naturally (Historic England, 2017). The water was allowed to continually flow in order to prevent stagnant pools forming which could harm the grass (Historic England, 2017). The presence of water meadow features can also be an indication of relatively undisturbed semi-natural grassland, an important resource which has declined across the UK, the preservation of such can have both biodiversity and cultural benefits. Additionally, water meadows can capture excess



nutrients before they enter watercourses, store water and reduce flood risk. The extent of historical water meadow coverage was analysed for the TTV project area, before assessing its potential condition from a desk-based position using information such as whether it was in an Environmental Stewardship Scheme and flooding incidence.

The assessment of the historical water meadow resource in the project area heavily utilised the Staffordshire Water Meadows Survey (Breeze, Challis and Kincey, 2008). This project produced a GIS data set for known water meadows across Staffordshire using historical maps which were assessed for condition using aerial photography image comparison between the years 1963 and 2000 to determine the state of water meadow earthworks and features. A sample of these were further investigated by field survey and the meadows were broadly found to have the target features.

Table 2. Scale of condition of historical water meadows (Breeze, Challis and Kinsey 2008).

Code	Description
0	Unable to ascertain water meadow condition from aerial photographs due to woodland cover.
1	Well-preserved water-meadow with upstanding earthworks, notable carriers (over 50% total area) across most of the meadow.
2	Upstanding earthworks with carriers surviving as earthworks across 10-50% of the total area.
3	Partial survival, only the basic elements of the water meadow survive as earthworks, such as the head and main drains. Carriers may survive as earthworks in less than 10% of the total area and drains as crop or soil marks.
4	Combination of conditions 3 and 5. Part of the water meadow, usually the head main drains survive as earthworks while carriers and drains survive as crop or soil marks.
5	Flattened water meadow now only identified as crop or soil marks.
6	Former water meadow now completely destroyed.
7	Uncertain - aerial photographic image insufficient to provide condition estimation.

As the Derbyshire section of the TTTV project area has not had a historical water meadow assessment carried out, in order to identify opportunities within this element of the project audit, analysis used on the aerial photography layer within Staffordshire, particularly focusing on water meadow identification features, was used to determine water meadow identification features within Derbyshire from aerial photography, in order to estimate the potential water meadow coverage. From the aerial photography you can see features such as earthworks, drains and carriers resembling ridge and furrow in the floodplain. Without archaeological expertise, as this was a desktop study, the confidence on correct identification of a historical water meadow is lower, so this data is considered indicative of potential water meadow presence rather than definite water meadow presence, until field evidence is collected and data is checked by the Historic Environment Record.

Once additional potential historical water meadow areas had been identified, the data was analysed for potential restorability. This required the Environmental Stewardship data from 2016, which displayed areas that have a live scheme on them and these areas were considered to be under positive management. It also looked at the surface water flood risk data set, produced by the Environment Agency and supplied under an Open Government Licence. This flood risk data set considered the incidence of surface water flood risk displaying likelihood of flooding for 1 in 30 years, 1 in 100 years and 1 in 1000 years. Further information considered important in the analysis included; whether the identified water meadow had a direct connection to a watercourse; whether there were any barriers such as roads or railways; coverage of trees or scrub; change in land use and known incidences where the water table could be lowered, for example the proposed removal of Dovecliff Weir is expected to result in a water level drop of up to 1.5 metres in the watercourse. Where there was insufficient data related to water meadow condition the restoration potential was mapped as low. The data structure contained the following information fields for the analysis (**Table 3**):

Table 3. Metadata collected for the analysis of potential restorability of historical water meadows in the TTV project area.

Metadata required	Description
Current land use	Pasture, arable etc.
Historical identification features	Estimated percentage coverage of the area of earthworks, carriers drains etc.
Confidence in identification	Definitely is (if identified using the Staffordshire Survey of Water Meadows); Possibly is (clear signs of carrier ditches and ridge and furrow like earthworks in the floodplain); Some uncertainty (some evidence of earthworks).
Management	Is it in a scheme?
Management option	If it is in a scheme, what management options are on the field unit
Restoration potential	High (no known barriers to restoration, e.g. it is in a scheme and has a high incidence of flooding, connected to the floodplain); Medium (possible barriers to restoration, e.g. no scheme); Low (More than one barrier to restoration / not enough information).
Restoration comments	Comments on potential barriers to restoration such as a lowered water level, whether the field floods 1 in 30 years, 1 in 100 years or 1 in 1000 years, is it in an Environmental Stewardship Scheme, does it need scrub removal etc.

The resulting map enabled a traffic light colour code system illustrating areas of high, medium and low potential for restoration (**Appendix 2**). This will serve as an indicator for targeting further field survey work and selection of water meadow restoration projects. The data was provided for the broad-scale opportunity mapping exercise.

Palaeochannels

Palaeochannels are important sediment deposits from ancient river channels and contain evidence of historical environmental and landscape formations. Sometimes they can support diverse assemblages of species associated with water bodies that have been cut off, such as the Old River Dove, Marston on Dove Site of Special Scientific Interest (SSSI) being one example within the project area. Palaeochannels are under threat from aggregate extraction and infrastructure enhancement as well as lowered water levels due to water abstraction (Malone and Stein, 2017).

Palaeochannels have been mapped across the Trent catchment as part of a project for Historic England and demonstrate a historically highly mobile river system which has created widespread palaeochannel formations. The mapping was based predominantly on aerial photography and LiDAR data. Within the TTV project boundary, target areas can be identified where there is a high density of palaeochannels, in particular around Willington, Rolleston-on-Dove, between Marchington and Uttoxeter and between Wychnor and King's Bromley.

As target areas, these should be investigated further to ascertain their condition, threats and potential conservation and restorability. Palaeochannel restoration such as re-wetting or reconnection to the floodplain may be considered to conserve the existing resource. They may serve as a Natural Flood Management system storing flood waters and in some cases acting as Sustainable Drainage Systems (SuDS), as well as providing small open water bodies for a variety of associated wetland species. Where palaeochannel restoration could be an opportunity, the decision for restoration should be taken on a site by site basis, depending on a variety of factors such as existing biodiversity or contaminant status. Palaeochannel sediments near historical mining activity could contain contaminants which may be detrimental if released into a watercourse.

Environment Agency walkover surveys

The European Water Framework Directive requires rivers to be in 'good ecological status' by 2027 and Local BAP targets highlight this as a key aspiration for the project area. The TTV project area has four broad river catchments within it including the Dove catchment, the Lower Trent and Erewash catchment, Tame, Anker and Mease catchment and the Trent Valley Staffordshire catchment. Information from the most recent 2016 data which was accessed from the Catchment Data Explorer (EA, 2018), indicates that the majority of catchments within the project area were either in moderate or poor condition with the Pyford Brook (a tributary of the River Trent) being the only catchment which was reported as being in bad condition. Broad recommendations have been made by the EA for various stretches of river which had completed the more detailed walkover surveys.

These included the following river sections:

- River Dove from River Churnet to Hilton Brook.
- River Dove from Hilton Brook to Trent.
- River Trent from Anker-Mease confluence to River Dove.
- River Trent from River Sow to Moreton Brook.
- River Tame from River Anker to River Trent.



The walkover surveys provided in depth details of the watercourse features in these sections highlighting various influences on water quality, chemistry, hydrology, biodiversity and the general condition of each walkover area. For each walkover survey there was a breakdown of actions, which were listed according to priority. The data from the walkover surveys was mapped throughout the TTTV project area, and then these specific case studies were used to target aspirations in the broad-scale opportunity mapping.

Woodland for Water

Woodland planting to improve water quality and reduce flood risk is a key priority particularly across the National Forest area, and can contribute towards objectives for the WFD and targets for Countryside Stewardship. Additionally as indicated through the analysis of the EAP and LBAP targets (see **Table 1**), creation of the priority habitat 'Wet Woodland' is one of the key priorities for the TTTV project area. The Burton iTree project also indicated that Burton upon Trent in comparison to other cities included in the iTree project, has a comparatively low coverage of urban woodland (Burton-upon-Trent Tree Project, 2017).

The Woodland for Water opportunity mapping was done as a collaboration between the Forestry Commission England, Environment Agency, Forest Research and ADAS. The GIS data produced was supplied under an Open Government Licence. The data sets include:

1. Floodplain woodland planting
2. Riparian woodland planting
3. Floodplain reconnection planting
4. Tree planting in the wider catchment to reduce flooding and/or to improve water quality
5. Constraints to woodland planting

Floodplain water planting and riparian woodland planting show opportunities across much of the project area. In order to refine the opportunities to where they would be of most benefit, it was important to ensure that they did not conflict with opportunities for any priority habitats, in particular Coastal and Floodplain Grazing Marsh which was identified as being a key habitat to deliver as part of the priority habitat analysis (see [page 23](#)). Specific opportunities for Wet Woodland has also been identified as part of the 2006-2007 biodiversity opportunity mapping for the Tame and Trent river valleys which represent more detailed projects that are closer to a deliverable state.

Countryside Stewardship statements of priorities

The statements of priorities are to identify priority features and issues which are being targeted in an area, and should be used to inform Countryside Stewardship applications. They are separated according to National Character Area (NCA) with the TTTV project area including the following NCA's:

1. Trent Valley Washlands
2. Needwood and South Derbyshire Claylands
3. Melbourne Parklands
4. Mease-Sense lowlands

Maps identifying priorities and accompanying targeting statements are supplied for targeting Countryside Stewardship options, and should be taken into consideration when trying to achieve targeted benefits for biodiversity through Countryside Stewardship.

Ecosystem Services / Natural Capital

Our natural assets such as water, soil, air, biodiversity and geology form the natural capital needed to provide many ecosystem services that we rely on. We depend on this natural capital to provide resources such as raw materials like food and water

as well as providing services such as pollution regulation, flood water storage, climate regulation, pollination, education, recreation activities as well as health and well-being. Degradation of these natural assets can lead to an under supply of ecosystem services (Hölzinger and Everard, 2014), due to high quality habitats such as HPI have a higher natural capital than degraded and altered habitat types.

To estimate the potential natural capital of restored and/or created priority habitats, the calculations from the document "Staffordshire Ecosystem Assessment" by Hölzinger and Everard (2014) were used. This will help demonstrate the value of the Living Floodplains project with the area for one year and across the five years of the project period. This exercise will provide a way of evaluating the monetary benefits that priority habitat creation in the project area will provide. There is no calculation for units which are not in hectares, for example kilometres or number of sites.

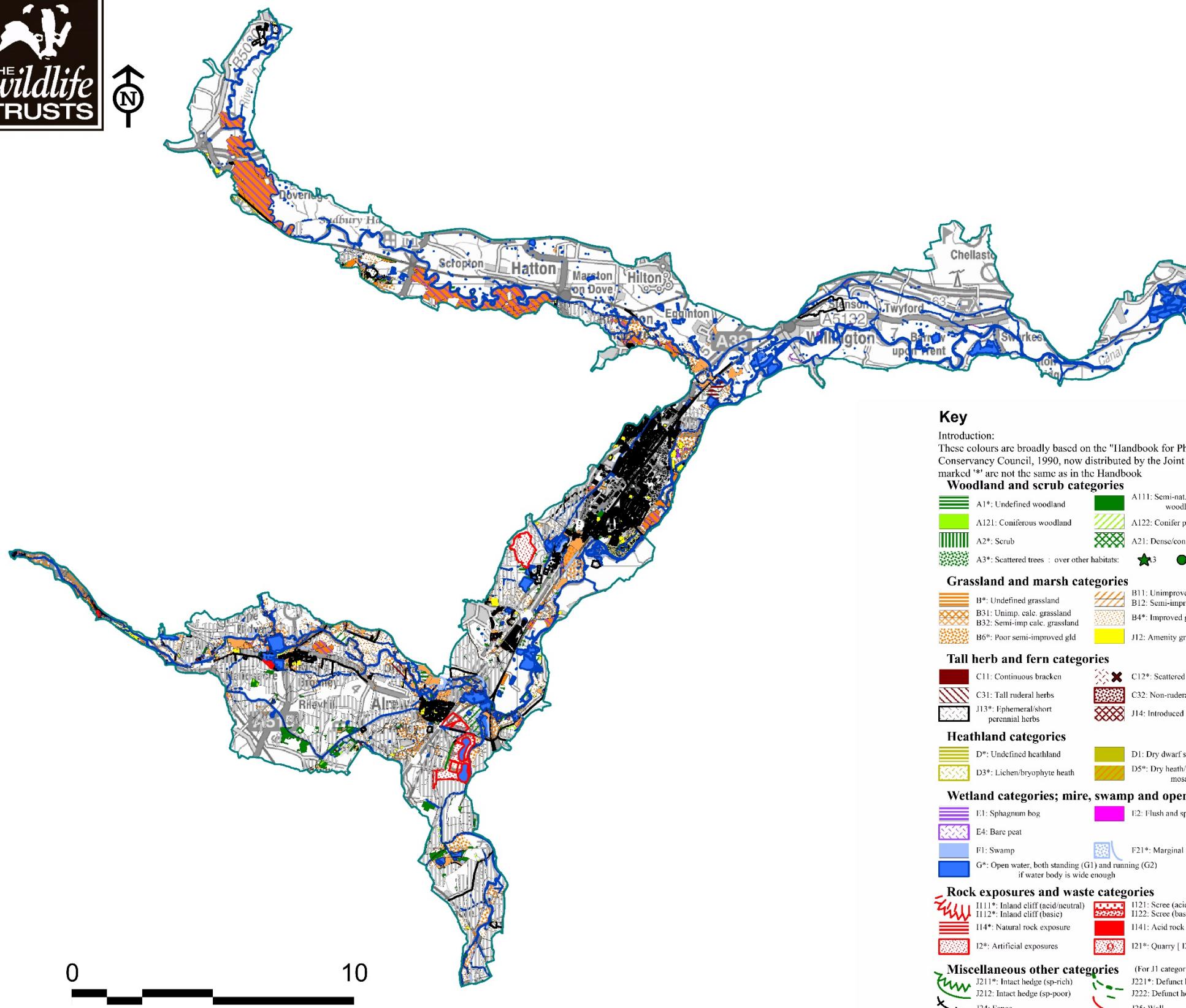
As part of the Burton upon Trent Flood Risk Management Scheme (FRMS), (see [page 94](#)), the 'Burton+ Landscape Vision' is proposing to establish a natural capital and ecosystem services register for the area included with the scheme. The register will include parameters such as type of natural capital asset, their state/condition, area/quantity, type of ownership, types of ecosystem services provided and their values, benefits and beneficiaries. When completed the register will be reviewed for the potential wider use across the TTV project area.

Table 4. Ecosystem service/ natural capital values of BAP habitats identified in the 'Staffordshire Ecosystem Assessment' by Hölzinger and Everard (2014).

Habitat	Unit	Proposed Restoration target	Proposed Creation target	Value per annum		Value of 5 years	
				Restoration	Creation	Restoration	Creation
Coastal and Floodplain Grazing Marsh	ha	50	0	£61,076.88	£0.00	£305,384.41	£0.00
Purple Moor-grass and Rush Pasture	ha	5	5	£6,107.69	£6,107.69	£30,538.44	£30,538.44
Lowland Meadow	ha	40	25	£22,212.68	£13,882.93	£111,063.42	£69,414.64
Arable field margins	ha	~	10	~	£12,883.47	~	£64,417.37
Hedgerows	km	~	5*	~	~	~	~
Native Woodland	ha	~	~	~	~	~	~
Wet Woodland	ha	5	5	£7,077.41	£7,077.41	£35,387.05	£35,387.05
Eutrophic Standing Water	ha	~	~	~	~	~	~
Ponds	ponds	100*	50*	~	~	~	~
Reedbeds	ha	5	10	£6,107.69	£12,215.38	£30,538.44	£61,076.88
Swamp/Fen	ha	5	10	£6,107.69	£12,215.38	£30,538.44	£61,076.88
Total	N/A	110 ha	65 ha	£108,690.04	£64,382.25	£543,450.20	£321,911.25

* Numbers with an asterisk are not in hectares and are therefore not included in the total creation or restoration targets.

** Potential values of created or restored habitat were not calculated for number of sites or km units



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Map 1. Habitats within the TTV area.

Broad-scale Opportunity Mapping

Introduction

Broad-scale opportunity mapping was conducted across the project area following the format used for opportunity mapping across the CRI project area in 2012, to ensure a standardised vision. The opportunities identified as part of the CRI have been updated and presented alongside the additional opportunity mapping across the TTV project area and these are presented in **Map 2 (page 29)**. The mapping across the remainder of the project area uses the collated evidence described in the evidence base section (see **page 6**). Key projects and target areas were identified at an opportunity mapping drop-in session held on the 28th February 2018 with project partners. A full inventory of the data sets which were interrogated can be found in **Appendix 1**. A summary of the findings of analysed data sets for grazing marsh and historical water meadows are presented in **Table 5, 6, and 7**. These findings together with the collated evidence base helped to inform the opportunity mapping process. The mapping methodology for the CRI project, which was adapted for the wider TTV project area is also described.

Coastal and Floodplain Grazing Marsh

Coastal and Floodplain Grazing Marsh Habitat of Principal Importance is identified through the Joint Nature Conservation Committee (JNCC) Phase 1 Habitat mapping in Staffordshire, and through Natural England's 2007 priority habitat interpretation mapping. The potential coverage of the mapped area of this priority habitat measures 3,877 hectares of the total 19,950 hectare project area (19%). Therefore this priority habitat represents the highest proportion of the project area. As the data for the grazing marsh habitat has variable certainty in the interpretation, it may be that some of this area is not the target habitat, however this cannot be further investigated without field surveys.

Table 5. Analysis of the area of potential Coastal and Floodplain Grazing Marsh habitat which experiences surface water flooding.

Analysis data	Total area in project boundary (hectares)	Percentage cover of grazing marsh
Potential Coastal and Floodplain Grazing Marsh habitat	3,877	100%
Surface water flood risk 1 in 30 years (highest risk)	112	2.9%
Surface water flood risk 1 in 100 years (medium risk)	185	4.8%
Surface water flood risk 1 in 1000 years (low risk)	658	17%

Table 6. Analysis of potential Coastal and Floodplain Grazing Marsh habitat which is in positive management.

Analysis data	Total area in project boundary (hectares)	Percentage cover of grazing marsh
Potential Coastal and Floodplain Grazing Marsh habitat	3,877	100%
Registered Environmental Stewardship Scheme on landholding	388	10%
Beneficial Environmental Stewardship option coverage	271	7%

The data was analysed for percentage cover of high, medium and low incidence of flooding as determined using the surface water flood layer produced by the Environment Agency and provided under an Open Government Licence. (**Table 5**) displays the percentage coverage of surface water flooding across potential grazing marsh habitat. The data indicates that only a very small proportion of what is considered grazing marsh, actually floods on a regular basis with just 2.9% of the

area at the highest risk for flooding, 4.8% at a medium risk for flooding and 17% at a low risk for flooding. The remaining area is considered not at risk of flooding and may only get wet in unusual circumstances.

The grazing marsh area was also analysed for what percentage of it was in an Environmental Stewardship Scheme (**Table 6**). The 2016 data was used as the 2017 data will not be released until May 2018. **Table 6** summarises the results, indicating that 10% of potential grazing marsh is in a live scheme and 7% is in a positive management option.

Interpretation

The low incidence of surface water flooding across the area that is considered to be potential grazing marsh suggests a possible disconnect between the watercourse and the floodplain. This could be due to a variety of factors, such as lowering of the water table through water abstraction, artificial engineering of watercourses such as deepening and realigning the channel to speed up the water flow therefore reducing the time taken for water to pass through an area, installation of flood defences, lack of management of historical ditch systems, sluices and land drainage. Further ground truthing could indicate why the land is subject to flooding or not.

In terms of positive management 7% of the area is considered to be in a beneficial option for the grassland. This information can help targeting in a couple of ways; firstly that the remaining 93% of grazing marsh that is not in a scheme could be targeted for applications, focusing on areas which regularly flood, as determined by the surface water flood analysis. Secondly, the areas that are in positive management could be further refined to take into account the flood risk data and working to increase the flooding potential of these sites.

Historical Water Meadows

Historically many of the meadows in the floodplain were managed as water meadows. The analysis demonstrated that the total amount of potential water meadow covered 2,931 hectares within the project area (see **Table 7** and **Appendix 2**). This was broken down into restoration potential based on surface water flooding incidence and positive management. A high restoration potential is indicated across 10% of the water meadow area, a medium potential was found for 42% of the water meadow area. If they had more than one barrier to restore then they were considered to have low restoration potential and these covered approximately 48% of the water meadow area. Many of the sites were given a medium restoration potential due to a lack of an Environmental Stewardship Scheme coverage, however they should still be considered for restoration as part of the project. Therefore the main target areas for water meadow restoration are between Tutbury and Sudbury, north of Rolleston on Dove and around Wychnor. All of these areas are flooded regularly and should be targeted for ground truthing for restoration projects either by a Countryside Stewardship scheme or by alternative means. North of Uttoxeter and near Rocester there are several larger areas of water meadow, which are in an Environmental Stewardship scheme across a proportion of these landholdings, however the surface flooding is low and meadows may require more ambitious ground works to reconnect the floodplain to the river. Although ground truthing is needed to further determine the status of each site, there may be opportunities through links with Uttoxeter Quarry to look at some of the water meadows around Uttoxeter.

Table 7. Analysis of the restoration potential for water meadows in the TTTV area.

Analysis data	Total area in project boundary (hectares)	Percentage cover of water meadow
Water meadow coverage	2,931	100%
High restoration potential	284	10%
Medium restoration potential	1,232	42%
Low restoration potential	1,415	48%

Central Rivers Initiative biodiversity opportunity mapping

The Central Rivers Initiative (CRI) conducted opportunity mapping within its project area, a large part of which is encompassed in the TTTV project area (Central Rivers Partnership, 2013). This data set contained GIS polygons with a mixture of broad and specific opportunities across the whole CRI project area and categorised the areas as existing assets, aspirations and unknown opportunities requiring further investigation, definitions of which are detailed below.

Existing Assets: Designated sites, Habitats and Species of Principal Importance that are priorities in Biodiversity Action Plans.

Aspiration: Opportunities for habitat restoration and creation, increasing ecological connectivity or improving condition for species either through existing mechanisms such as minerals site restoration or as yet unsecured means.

Unknown: Areas with potential that has not yet been established due to insufficient information.

The analysis of opportunities was informed by the sand and gravel extraction industry which plays a large role in shaping the landscape of the area and the scope this offers for restoration of semi-natural habitats within the project area; the

Making Space for Nature report (Lawton, *et al.*, 2010) to focus on reducing fragmentation of habitats through creating effective connections and expansion of existing assets and target species habitat requirements (including European Water Voles, European Otters, Trout, Spined Loach, European Eel, Ruddy Darters, Red-eyed Damselflies, Lapwings, Barn Owls and Tree Sparrows); the National Ecosystems Assessment report to demonstrate natural capital (UK National Ecosystem Assessment, 2011); and at a local level Ecosystem Action Plans produced as part of Staffordshire Biodiversity Action Plan (SBAP). The majority of the broad opportunities identified as part of the CRI are still relevant.

Key priorities developed were focused around:

River enhancement: In appropriate locations the river should be restored to a more naturally functioning ecosystem. This can be done through reprofiling and braiding, creating back-waters, incorporating woody debris into the river, removing barriers to wildlife movement and reconnecting the river to its floodplain;

Wetland habitat creation: Minerals restoration should focus on the creation of reed-beds, wet grassland, and wet woodland with species-rich grassland on dry margins and small-scale features such as ponds, scrapes and ditches;

Lakes and ponds: These habitats should have varied profiles with shallows and complex margins providing habitat diversity;

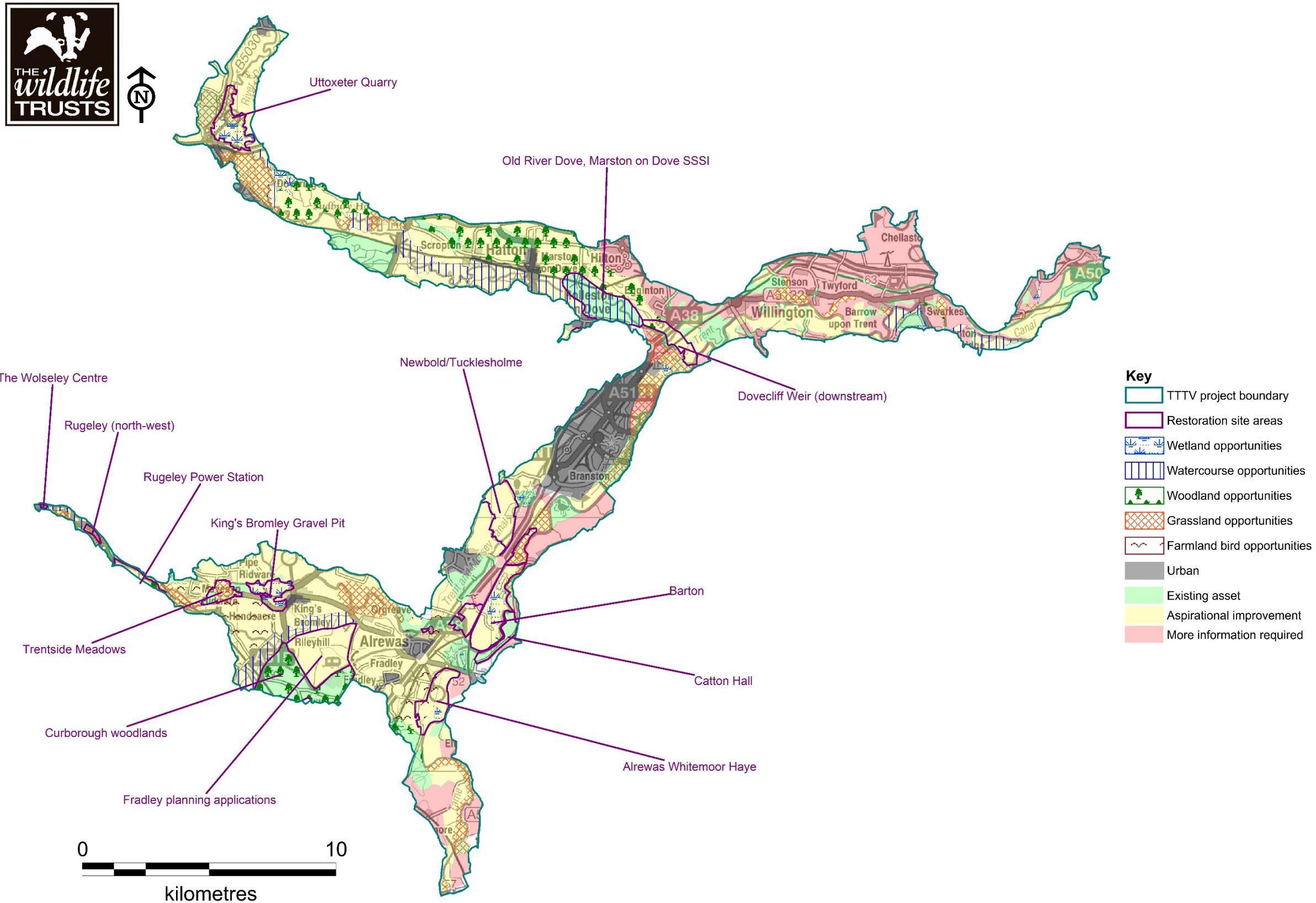
Connected farmland: Management, enhancement and creation of farmland habitats such as field margins and headlands, hedgerows and hedgerow trees, small woods and field ponds promoting a landscape permeable for wildlife;

Farmland for birds: Arable and pasture management that gives opportunities for farmland birds to breed, feed and thrive;

Green Infrastructure in Urban Areas: Multi-functional green space supporting wildlife habitats and recreational opportunities with Sustainable Drainage Systems (SuDS) designed with wildlife in mind;

Provision of ecosystem services: Identification and exploitation of opportunity services such as flood alleviation, soil protection, water quality improvement, fisheries support and recreation;

Working together to achieve a healthy attractive environment for all.



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Map 2. Biodiversity opportunity map illustrating key priority areas throughout the TTV project area.

Review of Existing Audits and Detailed Restoration and Creation Opportunities for Habitats and Species in The TTV Area

A review and update of the 2006–2007 Biodiversity Audit of the Tame and Trent River Valleys in Staffordshire.

Introduction

One of the key elements of the Transforming The Trent Valley project's Natural Heritage Audit (NHA) was to undertake a review and update the 2006-2007 Tame and Trent Biodiversity Audit. The original 2006-2007 audit was commissioned by the Environment Agency for the Central Rivers Initiative area and detailed the key findings from biodiversity surveys from the Trent and Tame river valleys from the Staffordshire and Warwickshire border at Middleton Hall Quarry on the River Tame to the Staffordshire and Derbyshire Border at the confluence of the Rivers Trent and Dove near Newton Solney. The emphasis of the report was to use the updated ecological data gathered during 2006-2007 to list a series of site-specific and more general recommendations aimed at promoting measures to enhance biodiversity and deliver targets in the Staffordshire Biodiversity Action Plan within the project area.

The purpose of this review as part of the NHA was firstly to identify sites and specific recommendations made during the original audit, assessing whether any of the prescribed biodiversity enhancement recommendations had been carried out in the 10 years since the report was published and identifying where any recommendations had not been acted upon but were still relevant to the site and landscape presently. Finally, a set of updated recommendations were produced for each site to provide a "wish-list" of practical projects with differing levels of aspiration and achievability.

Recommendations for key sites

The original 2006-2007 report identified 17 target site areas of which 13 are present either wholly or partly within the TTTV project area. Four are located outside of the boundary to the south within Tamworth. The report included a brief site overview, a set of opportunities based on liaison with relevant managers, landowners and interested parties, and results of the audit itself, costings were not included within the audit. The main objective of providing site recommendations was to encourage the formation of partnerships and landowners to plan, fund, co-ordinate site projects which translate to significant practical work on the ground. It is anticipated that this review will replicate the good work carried out in the 2006-2007 audit.

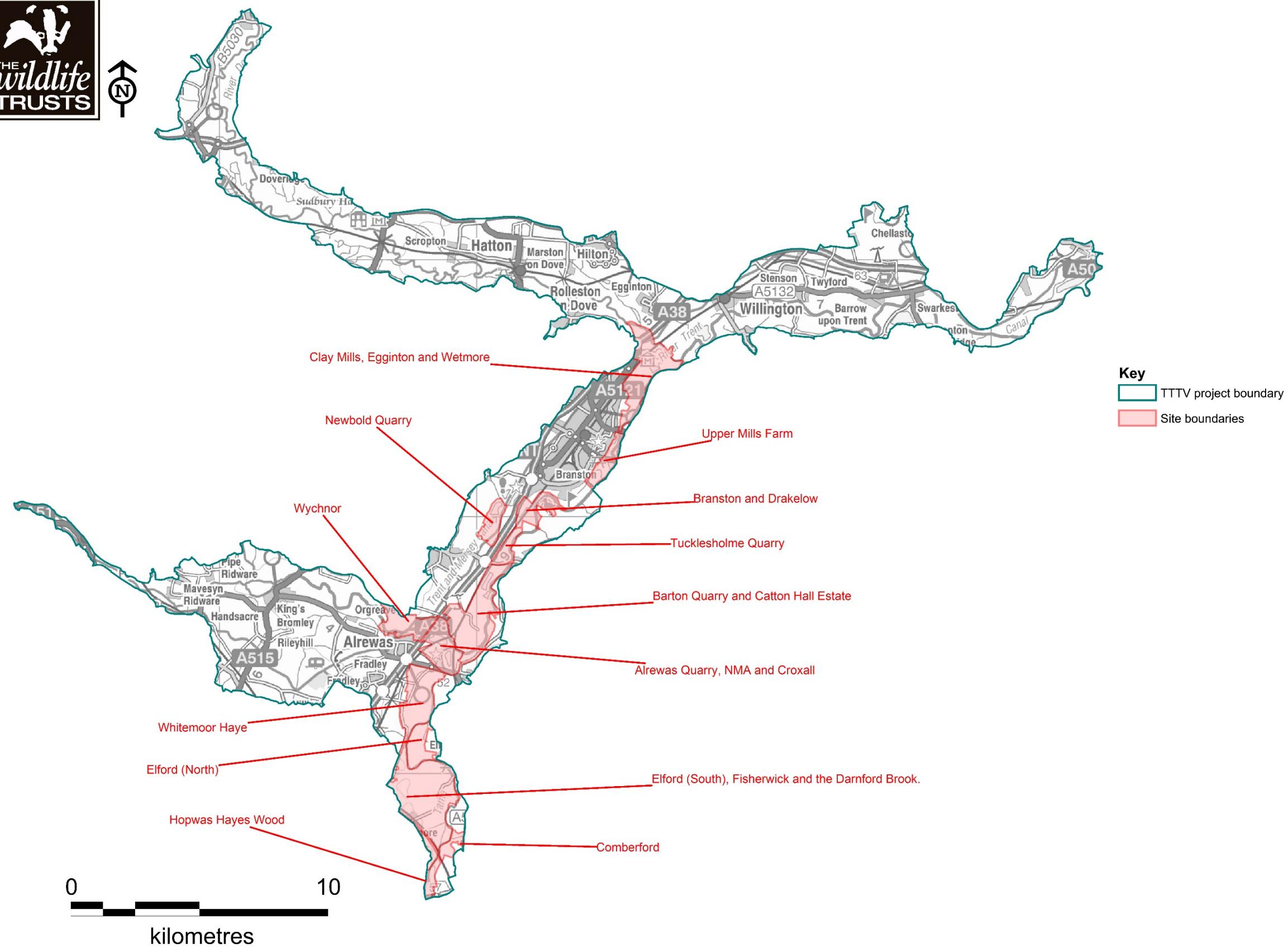
Caveat regarding recommendations in mineral extraction sites:

There are multiple sites which either partly or wholly include mineral extraction sites, recommendations made for these areas are purely aspirational with no obligation for the operator to fulfil any recommendations laid out. Costings do not include the submission of planning applications or the cost to the quarry operator such as drawing of new plans etc. therefore minor variations to existing plans may be quite expensive. Operators may choose to deliver recommendations as part of their Corporate Social Responsibility (CSR) which could be used as match funding to deliver further enhancements.

The 17 sites are listed in order below from north to south:

Table 8. Sites listed in the 2006-2007 Biodiversity Audit of the Tame and Trent River Valleys in Staffordshire and their presence in the TTTV area.

Site Number	Site Name	In TTTV area?
1	Clay Mills, Egginton and Wetmore	Yes
2	Upper Mills Farm, Burton	Yes
3	Branston and Drakelow	Yes
4	Newbold Quarry	Yes
5	Tucklesholme Quarry	Yes
6	Barton Quarry and Catton Hall	Yes
7	Alrewas Quarry, National Memorial Arboretum (NMA) and Croxall	Yes
8	Wychnor	Yes
9	Whitemoor Haye Quarry	Yes
10	Elford (North)	Yes
11	Fisherwick Woods, Elford Quarry (South) and Darnford Brook	In part
12	Comberford	In part
13	Hopwas Hays Wood	In part
14	Broad Meadow	No
15	Warwickshire Moor (West)	No
16	Tameside Nature reserve	No
17	Dosthill and Middleton Hall Quarries	No

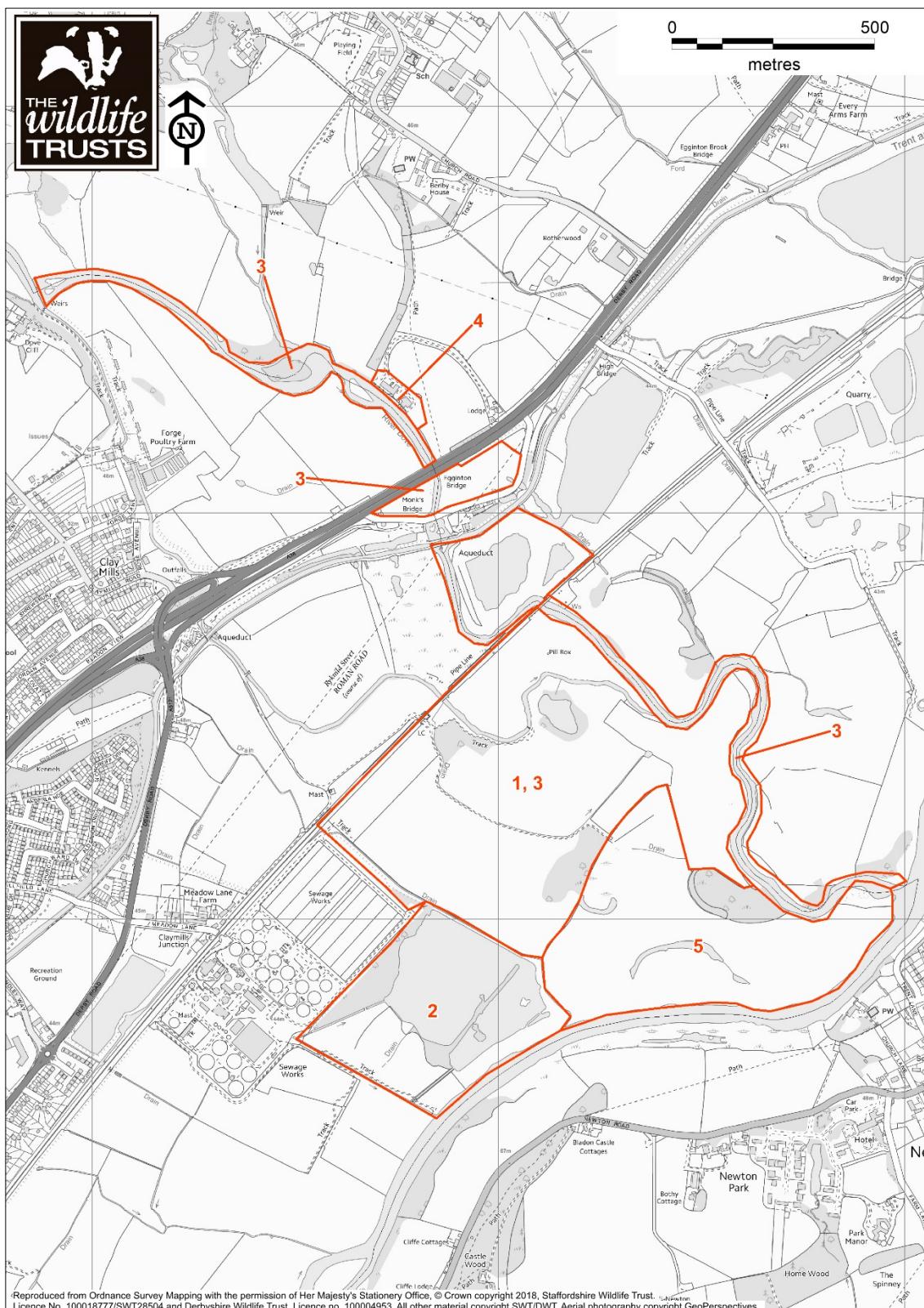


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Map 3. Sites listed in the 2006-2007 Biodiversity Audit of the Tame and Trent River Valleys in Staffordshire and their presence in the TTV area

Review of 2006-2007 Sites

Clay Mills, Egginton and Wetmore



Map 4. Specific project recommendations for Clay Mills, Egginton and Wetmore, map numbers refer to written recommendations outlined in the following sections.

Overview

A large site approximately 306 hectares in size located in the north of Burton upon Trent situated on the confluence of the River Dove and the River Trent, which was identified as having significant opportunities for promoting measures to enhance biodiversity; the site also links to Derbyshire Wildlife Trust's Repton Nature Reserve.

The 2006-2007 audit identified multiple landowners throughout the whole area, most notably Severn Trent Water (STW), as a landholder for one large strategic site in the area. Communication between key landowners and stakeholders will potentially need to be refreshed in 2018 as contact between Staffordshire Wildlife Trust and the landowners may have been limited or lapsed since the original survey.

The 2006-2007 recommendations remain relevant and would still be feasible, subject to the necessary permissions and landowner consents, however specific funding measures such as grant bids identified at that time will obviously no longer be applicable. This site has the potential to be one of the most significant areas in terms of the projects delivering outcomes on the ground, throughout the entire TTV area.

Recommendations from 2006-2007 still relevant

1. Surveys and feasibility studies at STW Clay Mills site, EA LiDAR data, soil samples, test pits, dipwells and bathometric data to inform the re-wetting project which could help create new areas of marshy grassland encouraging reed swamp and wet woodlands. There is planned restoration by STW between 2020 and 2025 as part of AMP7. PR14.
2. Link the small STW lagoon to the River Trent, spoil from which could be used to infill margins in parts of the larger lagoon to create shallower areas to aid in the formation of reedbeds.

New opportunities and recommendations

3. Off the back of the removal of Dovecliff Weir there is a possible suite of projects which could be carried out as part of a sediment management

programme including elements such as lowering an area of ground between the A38 and the river at Clay Mills, installation of Engineered Log Jams and Large Woody Debris (LWD) to act as natural alternatives to heavily engineered structures aiding with sediment and silt management, protect existing good geomorphology alongside the River Dove. In terms of monitoring the impacts of the Dovecliff Weir removal, SWT may be able to fill gaps in monitoring which the EA does not undertake. These recommendations will be complementary to works being carried out by the other partners and external organisations within this section of the project area.

4. Meet with the adjacent quarry on the Derbyshire side of the Dove regarding deposition of gravels and silt from the abstraction plant into the quarry and ensure the quarry deposit clean gravels back into the river further downstream to make the existing process easier.
5. Protect and celebrate palaeochannels and good quality habitats on an area opposite Newton Solney.

Key species' opportunities

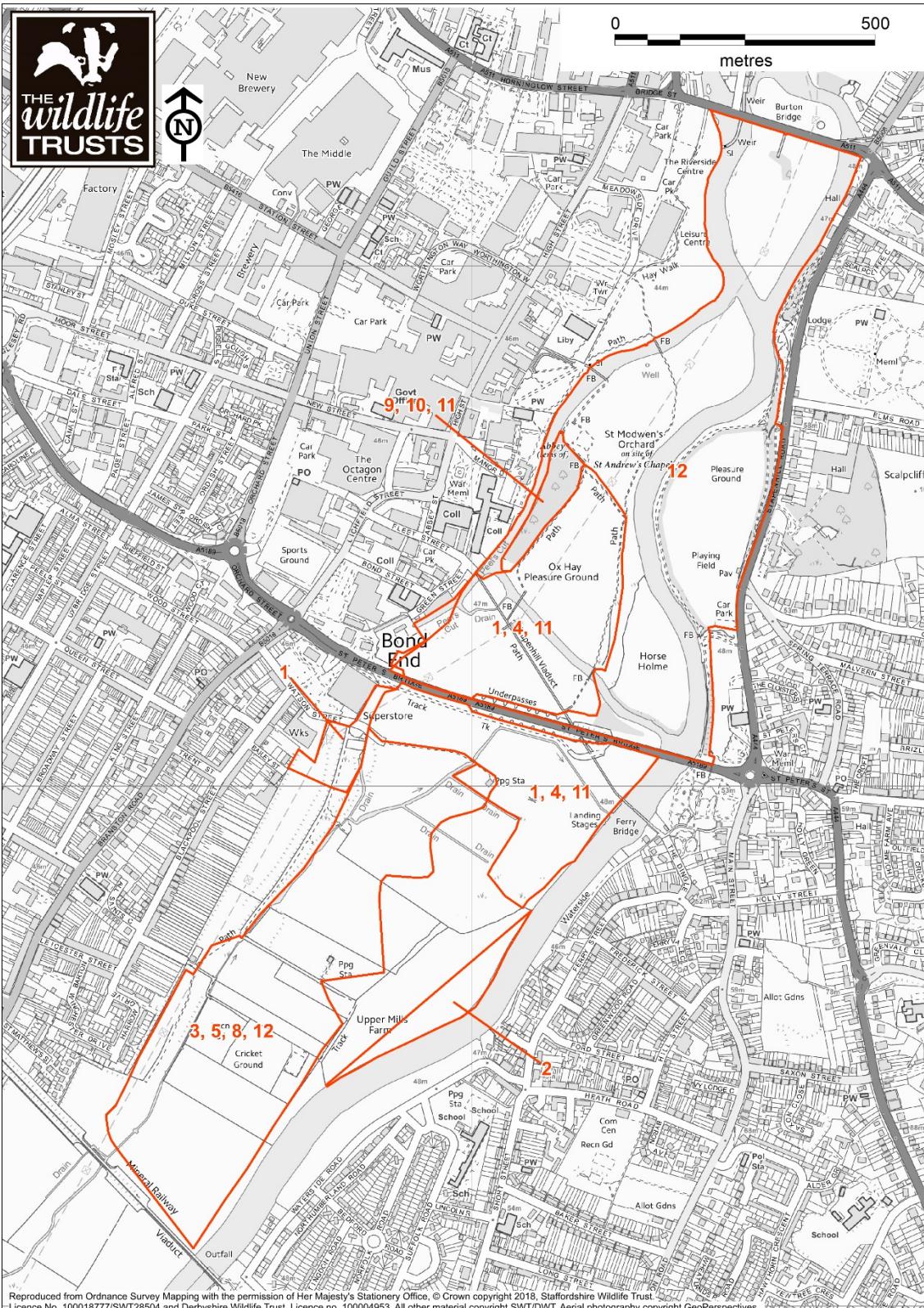
- European Otter
- Bittern
- European Eel
- Lapwing
- Skylark

Costs

Total £50-100k

Dependant on the level of statutory requirements in terms of feasibility study, modelling and monitoring, which may be carried out by the EA regarding the removal of Dovecliff Weir. There may be varying degrees in cost where other partner organisations may step in to provide time and/or expertise as project costs, for example drone surveys, invertebrate surveys to species level, digital terrain modelling and Exposed Riverine Sediments (ERS) species surveys.

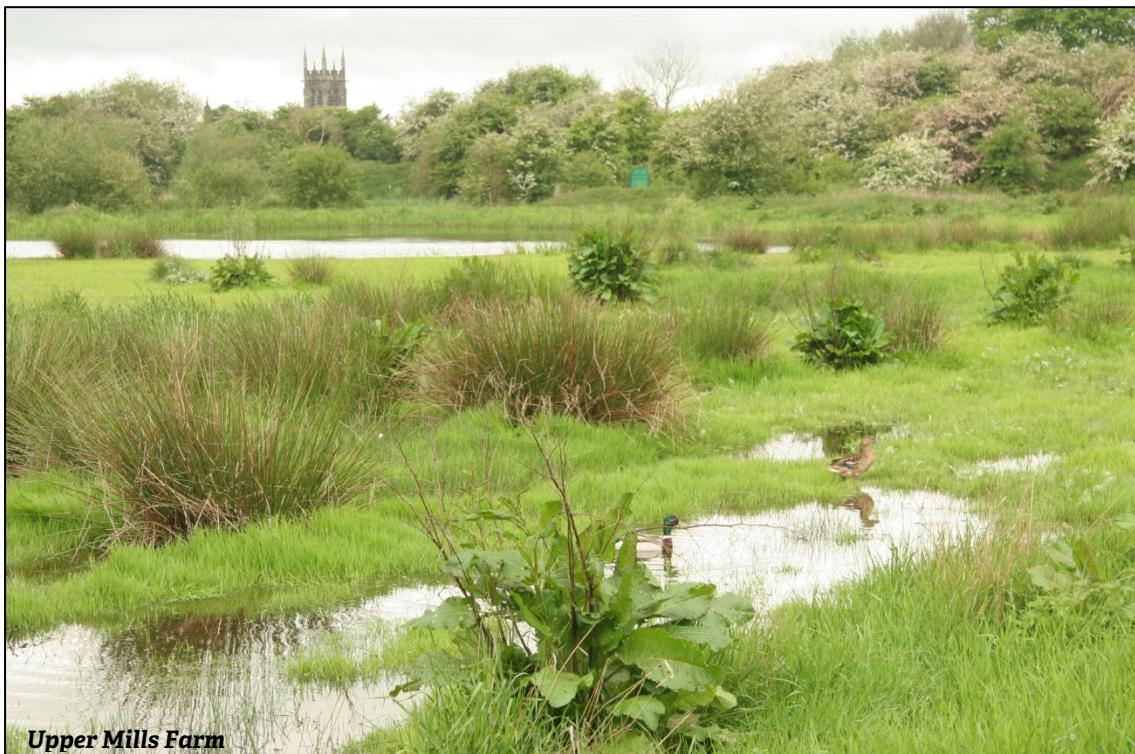
Upper Mills Farm, Burton



Map 5. Specific project recommendations for Upper Mills Farm, Burton, map numbers refer to written recommendations outlined in the following sections.

Overview

A 60 hectare site located in the centre of Burton upon Trent, at the southern end of the Trent Washlands forming part of a strategically important green corridor through the centre of Burton upon Trent. The site provides space for water during floods, amenity areas and good habitat mosaics to benefit multiple species. The site attracts a high footfall of people every year due to its central location within the town, but also possesses some good areas of semi-natural habitat as well as strategic flood storage areas.



The recommendations made in the 2006-2007 audit included continuations to existing projects looking at the alteration of the water levels in certain areas of the site to be able to hold more water, removal and treatment of invasive species, changing the management of sections of the site to alter habitats and grazing regimes.

Recommendations from 2006-2007 still relevant

1. Treat remove and monitor Japanese Knotweed located in the Northwestern part of site close to the main entrance.

2. Undertake a major re-profiling project on the inside of the main meander on the River Trent at this site (approximately 6,000 cubic metres of spoil). This will require a land drainage consent and planning permission which will require liaison with East Staffordshire Borough Council (ESBC) planning department. Remove all topsoil and fine sediments from the 1 to 100 year floodplain. As part of land drainage consent seek to re-position any larger accumulations of gravel back in channel to create important spawning habitats for fish. Works similar to this, carried out in the Trent catchment from the mid-1990s have in most cases been extremely successful at starting natural geomorphological processes, for example exposed and submerged gravel shoals. This will also increase the river channels capacity and therefore does not carry any additional flood risk.
3. Continuation of works undertaken by ESBC and the Environment Agency between 2003-2006 by identifying sections where water levels can be raised or impeded. Create additional scrapes, pools, oxbows and 'dragonfly' ponds along existing ditch networks. Check for any additional land drains from previous agricultural activity which could be broken or blocked to further re-wet sections of the site.
4. The large area of amenity grassland in the northeastern part of the site, which is already seasonally wet, could be formalised and managed to increase species richness either through a new grazing regime or traditionally managed hay meadow techniques.
5. Grazing of the fields at the southern end of the site was introduced using a hardy, rare breed of cattle after recommendations from the 2006-2007 audit. Fence off further areas using post and rail fencing which matches the specification of that carried out previously, establish a hay cutting regime with aftermath conservation grazing with native hardy, rare breeds. Installation of pasture pumps for watering cattle. There is a need to find areas with higher ground to allow refuge for animals when the river is in flood.
6. Notify Upper Mills Farm and Trent Valley Washlands as a continuous Local Nature Reserve (LNR).

New opportunities and recommendations

7. Enter site into Countryside Stewardship with beneficial options for restoration.
8. Creation of additional 'wader' scrapes, pools, oxbows and 'dragonfly' ponds in areas with a high water table and adjacent to buffer strips and areas of reed swamp. Remove all soil to a deposition site off the floodplain, landscape and re-seed.
9. Creation of two large underground otter holts.
10. Source or import additional deadwood into woodlands for stag beetle and other saproxylic invertebrates.
11. Investigate the possibility of working with Burton College to carry out smaller-scale project works and Himalayan Balsam control.
12. Ongoing grassland monitoring and resurveys of LWS.
13. Rust Fungus trials for treatment of Himalayan Balsam

Key species' opportunities

- Breeding waders such as Lapwing.
- Breeding Warblers (including Lesser Whitethroat)
- Reed Bunting
- Scrub loving birds
- Spined Loach

Costs

£3-5k Japanese knotweed treatment for 3 years.

£30k river reprofiling including removal of material off floodplain (capital) + £10k for consents, consultation and feasibility planning.

£15k excavation of new scrapes, pools and ditches.

£15k new fencing and grazing regime.

£10-15k reversion of amenity to wet grassland and/or species-rich grassland.

£500 x 2 for otter holts.

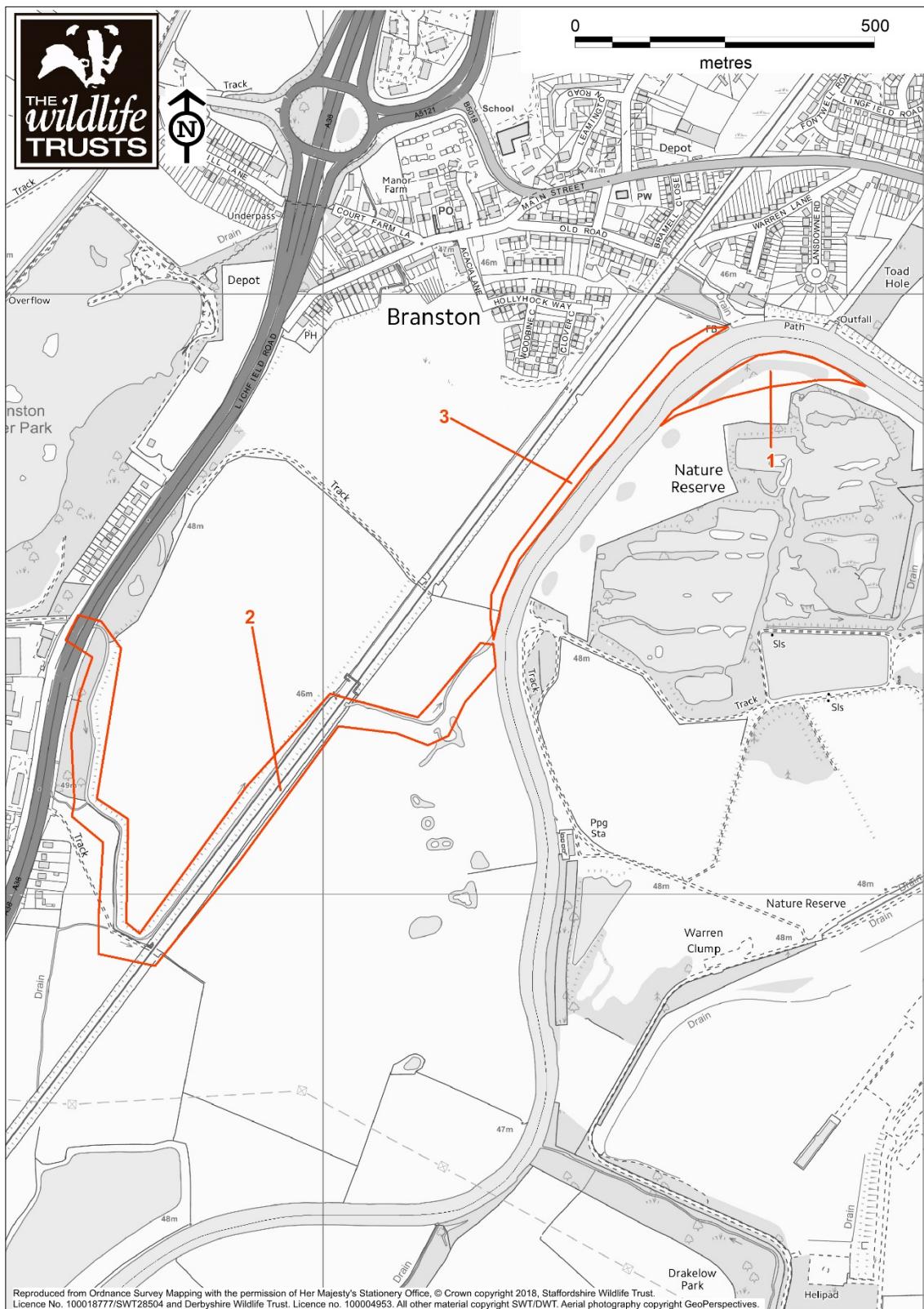
£5k for import of deadwood and forestry contractor to selectively cut and create standing deadwood.

£2k for grassland monitoring and LWS surveys.

£6k for Himalayan Balsam Rust Fungus trials.

Total £50-100k some work could be carried out together, for example tie works in with EA flood defence consultations.

Branston and Drakelow



Map 6. Specific project recommendations for Branston and Drakelow, map numbers refer to written recommendations outlined in the following sections.

Overview

This site is 114 hectares in size located on the southern end of the Trent Washlands in Burton upon Trent where the Trent floodplain has been squeezed by the railway and infilling of former Branston Gravel Pit. The site has gained industrial developments since the original 2006-2007 audit, incurring a loss in part of a stronghold site for breeding Skylark in the project area. This may also have compounded problems associated with culverts blocking up preventing the movement of European Otter between Branston Water Park, the River Trent and DWT's Drakelow Nature Reserve, forcing them to cross over the railway line and A38, which has caused several deaths in the past as noted in the 2006-2007 survey. The site was formerly part of the main River Trent floodplain but retains important links through the Branston Brook corridor, part of this area would be better used as a washland and engineered to store water during major floods.

Recommendations made in the 2006-2007 survey have been partially carried out and some are no longer suitable owing to the changes to the site since the original audit surveys were carried out, particularly with relation to the industrial development site. Some re-profiling to the inside of the bed at DWT's Drakelow Nature Reserve was carried out, however more could be done at this location.

Recommendations from 2006-2007 still relevant

1. Undertake a river re-profiling scheme on the inside of the large meander at DWT's Drakelow Nature Reserve. 'Lenses' of gravels should be repositioned back into the River Trent to create crucial spawning habitats for fish. Remaining spoil could be used in the open parts of the lagoons to create additional shallows and reedbed habitats. This was carried out after the original 2006-2007 survey, however this could be revisited and expanded in line with point 3 below.
2. Address the European Otters, rail and road issues on the Branston Brook, as European Otters are unable to move through the two culverts at high flow due to poor capacity and are forced to cross the road and railway line, options need to be investigated such as thrust boring underpasses.

New opportunities and recommendations

3. Explore further river widening possibilities on the outside of the meander on the Staffordshire side of the bend. The proximity of this stretch to the railway would require detailed modelling and surveys to ensure there is no impact on the railway line itself. There is a visibly thin topsoil and good depth of gravels on the outside of this meander, however test pits would still be needed to be dug as well as disposal of any fine sediments or sands. Deposition of gravels back into the outside of the river channel in order to start natural processes. Alternatively, scraping and grading the bank and planting willows level with the height of the water would provide further habitats and stabilise the banks.

Key species' opportunities

- European Otter
- Skylark
- Native Black-poplar
- Spined Loach

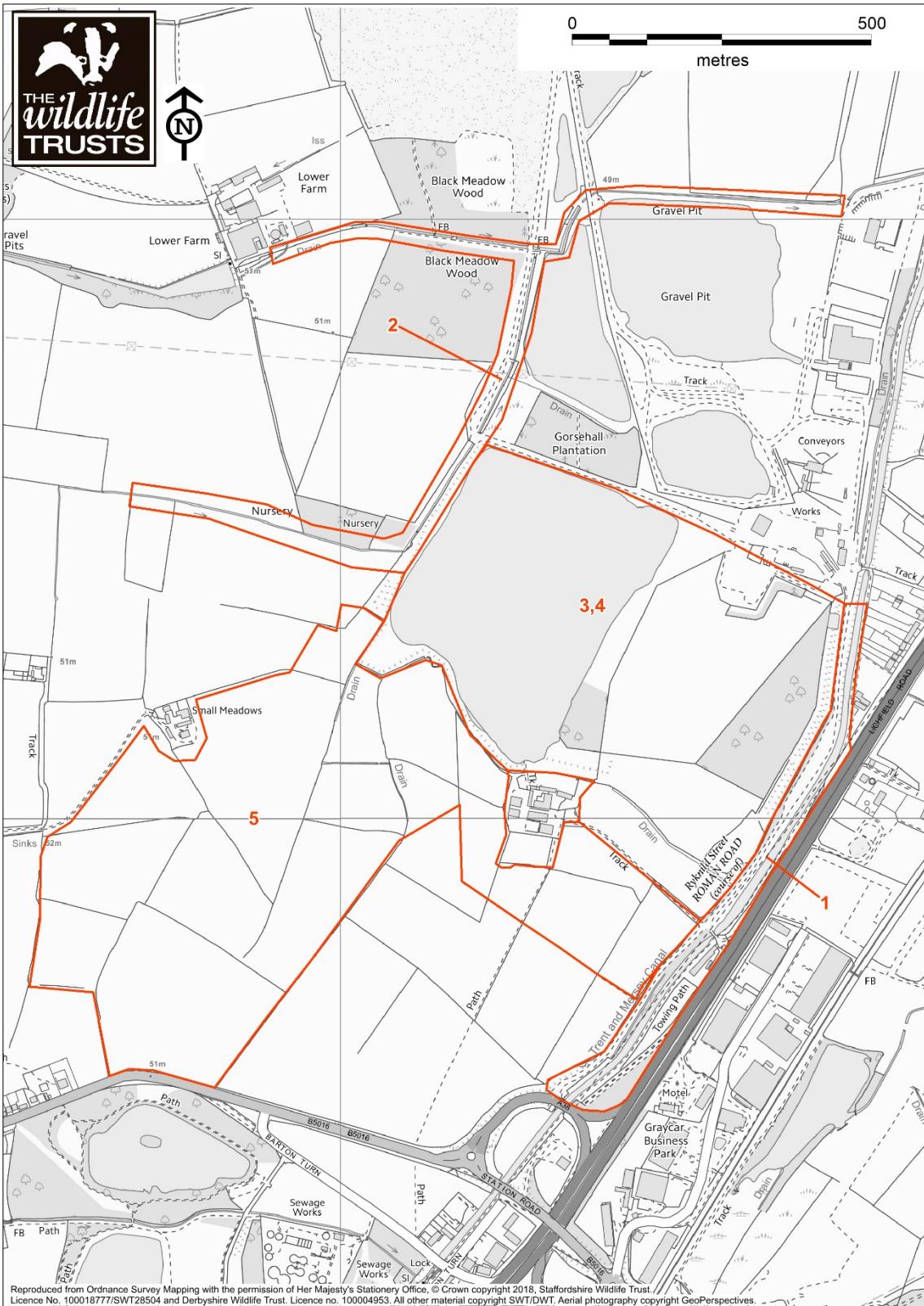
Costs

£5-10k for widening the outside of the river meander including disposal of topsoil (Capital), £10k for supervision, design, consents and modelling.

£25k for removing more material from inside of river bend at Drakelow, £5k for supervision, design, consents and modelling.

Total: £10-50k

Newbold Quarry



Map 7. Specific project recommendations for Newbold Quarry, map numbers refer to written recommendations outlined in the following sections.

Overview

An active sand and gravel quarry approximately 100 hectares in size, providing a natural link between Branston Water Park to the north and Barton Quarry and Tucklesholme Quarry to the South. The southern part of the site is being managed as part of an agreement with SWT. Staffordshire Ecological Services (SES) were commissioned by Aggregate Industries (AI) to carry out detailed surveys of the site in 2004-2006, which provided more in-depth recommendations, however these are now very likely in need of reviewing and updating to align with current issues. SES also carried out mitigation surveys subsequent to the 2006-2007 audit. A female native Black-poplar was identified on site in 2006-2007 and was at the time the only known female native Black-poplar in the county.

The area of mineral extraction has expanded since the original audit for which restoration plans have been produced. SWT has examined these and are satisfied with the proposals.

Recommendations from 2006-2007 still relevant

1. Tree Preservation Order (TPO) needed for the female native Black-poplar tree at this site. It is imperative that the tree is protected from damage or future developments.
2. Opportunity to connect two sources of running water to the silt lagoon which would bring in future silt and sand inputs and provide scour during rain storms.
3. Use natural processes to help generate a range of early, mid and late successional habitats including habitats such as running water, bare sediments, pioneer vegetation on sediments, fully vegetated sediments, reed swamp, shallow open water, deeper pools scoured out by high flows and scrub habitats.
4. Sporadic low density livestock grazing introduced in future to help diversify habitats further.

New opportunities and recommendations

5. Extension of the original 2006-2007 site further to the south and west to incorporate the new area of mineral extraction. Maintain communication with AI to ensure restoration plans are delivered effectively and discuss

further potential restoration measures which could be delivered following mineral extraction ceasing.

6. Use extensions to extraction area and other commercial developments in the A38 corridor to undertake and promote SuDS schemes to create stepping stones between larger areas of land with better ecological features.

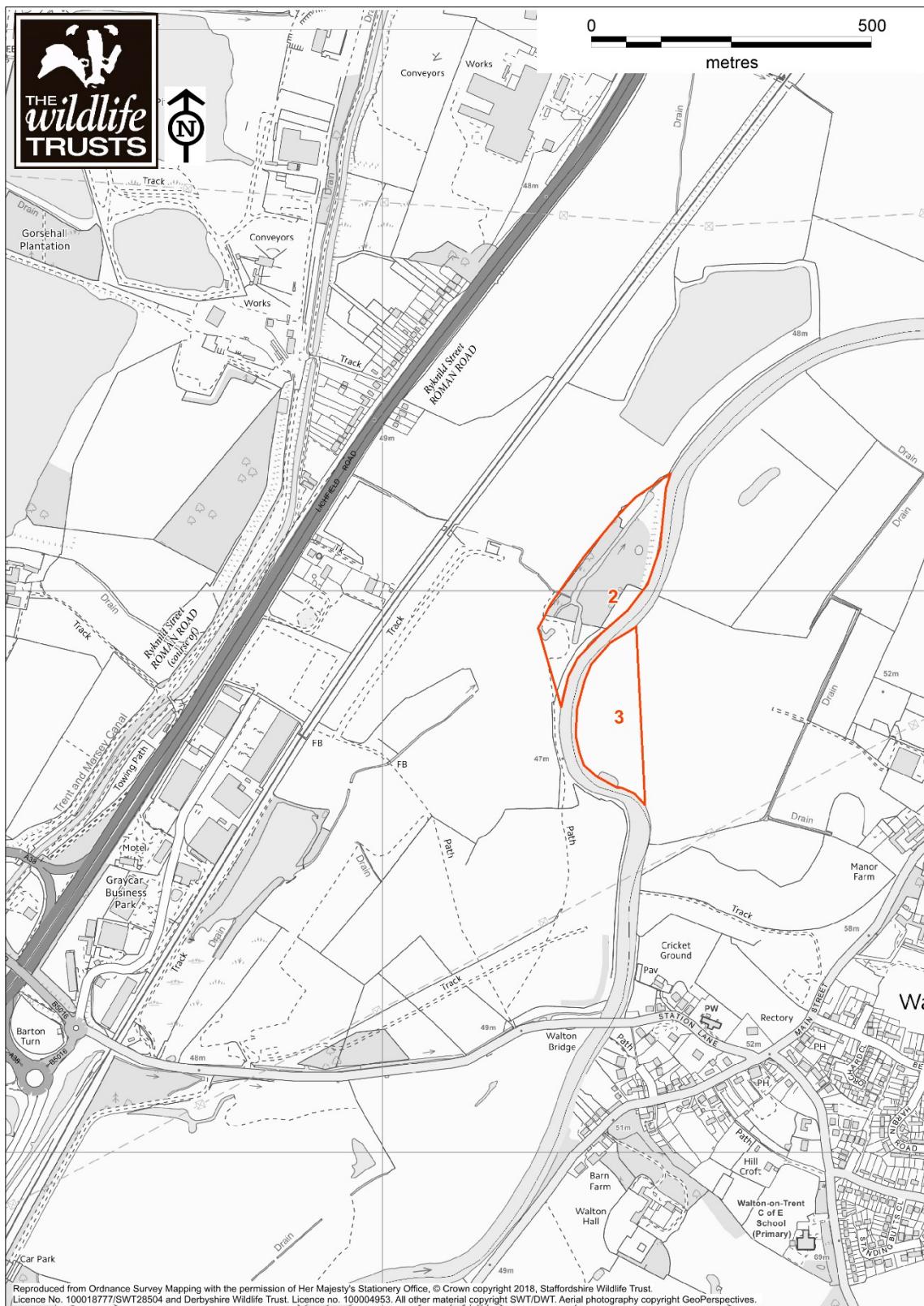
Key species' opportunities

- Native Black-poplar
- Common Tern
- Breeding waders
- Black-necked Grebe
- Wintering wildfowl
- Solitary bees and wasps

Costs

£Unknown - maybe lots of discussions with regards to influencing the restoration plan which will only have small costs associated with it.

Tucklesholme Quarry



Map 8. Specific project recommendations for Tucklesholme Quarry, map numbers refer to written recommendations outlined in the following sections.

Overview

This site is an active quarry approximately 75 hectares in size located on the opposite side of the A38 to Newbold Quarry and is in the latter stages of sand and gravel extraction prior to being restored. The 2006-2007 audit identified the site as being an area of sheep grazed pasture with a network of hedgerows interspersed with mature and veteran trees with areas of wet woodland and reed swamp. Several key species were identified including European Otter, Sand Martin and Reed Bunting. The southwestern part of the site was a Biodiversity Alert Site (BAS – a Local Wildlife Site designation which is of local importance rather than county importance) in 2006-2007 and still remains so in 2018.

SWT have purchased the site from AI and will take over ownership once extraction and restoration has finished at the end of 2018. SWT have been present and liaised with AI throughout the restoration period supervising several large restoration schemes such as successfully braiding the inside of a large river meander which will help in times of peak flow, creating scrapes, shallows, reedbeds, islands and other associated habitats within the main restored lake areas on site. Plans are also in place to create a series of spits, islands and reedbeds throughout the larger, deeper southern lake. The periphery of the entire site is due to be sown with a native species-rich seed mixture for wet grassland.

Recommendations from 2006-2007 still relevant

1. Recommendations made during the 2006-2007 survey have been fulfilled during the restoration period post mineral extraction.

New opportunities and recommendations

2. Potential reprofiling of the inside of further meanders on the Staffordshire side of the River Trent by SWT following handover of the site from AI. This will predominantly be focused on the northern end of the site, however care will be needed as this could end up connecting the river to the lake at peak flows and risk destruction of reedbeds. Possible connection of ditch course to the river itself to raise water levels in section of wet woodland.

3. Liaise with the landowner on the opposite side of the Trent in Derbyshire, downstream of where river reprofiling has previously been carried out to discuss reprofiling this section of river where the outside of the river bend is eroding.

Key species' opportunities

- Breeding waders (Little Ringed Plover in particular)
- Reed Bunting
- Sand Martin
- European Otter
- Wintering wildfowl
- Bittern
- Spined Loach
- European Eel

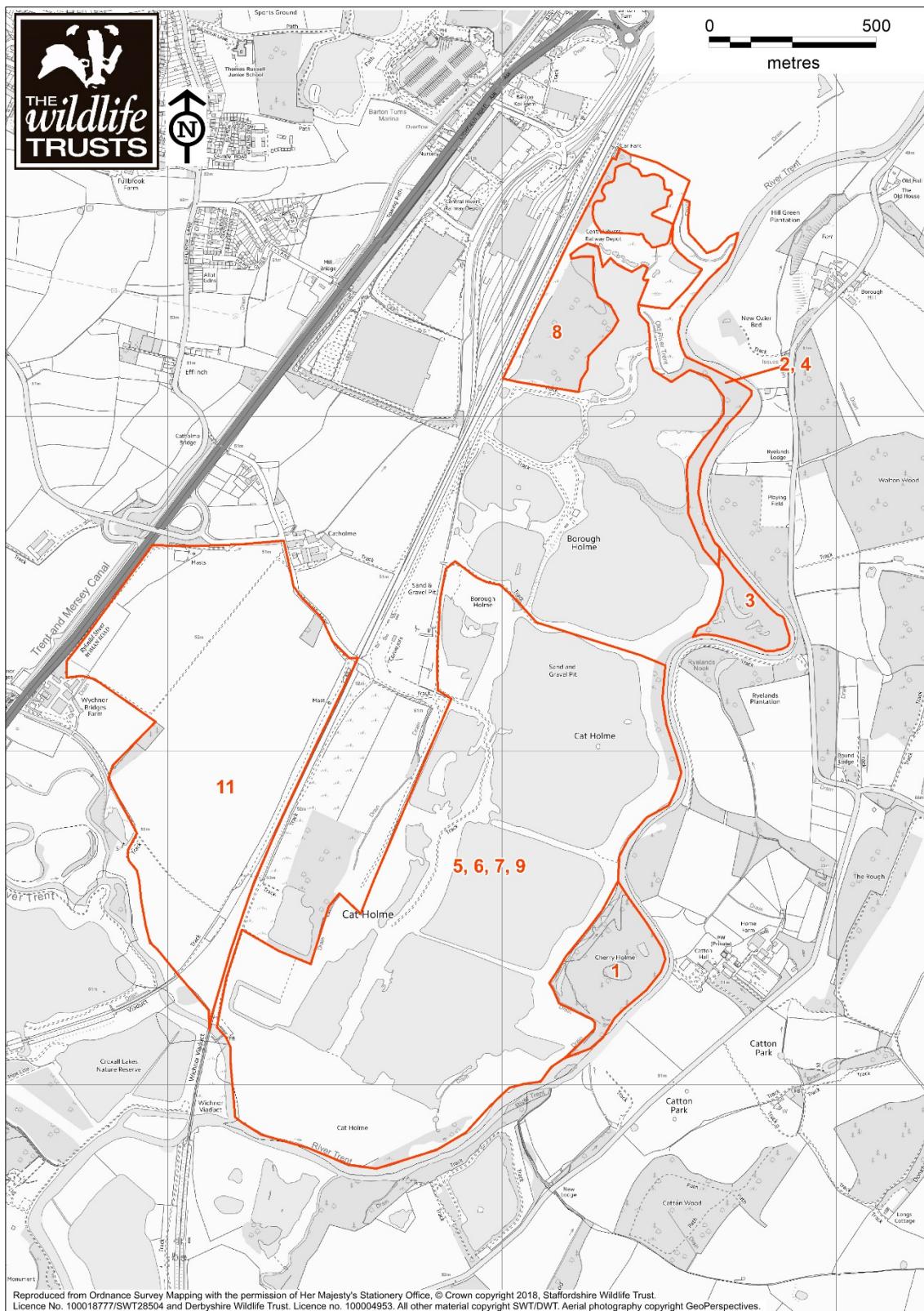
Costs

Total: £10-100k depending on the scope of works and amount of excavation and reprofiling.



Restoration at Tucklesholme

Barton Quarry



Map 9. Specific project recommendations for Barton Quarry, map numbers refer to written recommendations outlined in the following sections.

Overview

A large site approximately 370 hectares in size located to the south of Tucklesholme owned by Hanson Aggregates. The site, as with many others along this stretch of the Trent is currently undergoing a phase of simultaneous sand and gravel extraction and restoration. The 2006-2007 audit refers to Hanson having carried out imaginative restoration works to create new habitats such as bare sediments, reedbed and shallow water. Oxbows, pond and wildlife ditches have also been excavated and large fallen deadwood was left in the floodplain at key places. This has now all thoroughly bedded in and weathering well, forming new areas of semi-natural habitat. Proposals from Sport England to create a two kilometre long regatta lake in the south of the Hanson owned area appear to have fallen through, which was proposed following the original audit, however it is still unclear what the restoration of this section of the site will involve or whether there is a need for inclusion of any quiet recreational sites.

The Catton Hall estate to the south of the site area was identified as providing a good range of semi-natural habitats, in particular an important wooded corridor for the movement of European Otter, this is still currently the case.

A large population of Signal Crayfish was identified at Catton Lake Fishery during 2006-2007 with the population estimated to be in the tens of thousands. This was deemed to be a major conservation issue for the area as during major floods the lake connected to the Trent. It is now confirmed that Signal Crayfish and Demon Shrimp have colonized the River Trent from Croxall to Tucklesholme and the nearby River Mease Special Area of Conservation (SAC).

A number of recommendations were made during 2006-2007 related to the future designs of several of the southern lakes during the restoration phase of the quarry a large focus of which, was whether the southern end of the site would give way to the creation of a large sports and leisure facility and whether a final decision was made regarding this. The southern end of the site is still yet to be fully restored and

therefore, there is still opportunity to influence the restoration plans to deliver more large-scale habitat improvement works as part of this.

Since the original audit there has also been a proposed extension called Barton West in the minerals plan allocation areas which incorporates land between the A38 and the railway line on the western edge of the existing Barton Quarry. SWT's Planning Officer and the County Ecologist at Staffordshire County Council have both been notified and will work closely with regards to restoration plans and mitigation. SWT would like to see some river braiding on the Trent at the southern end of the site, which would be in keeping with works carried out on the Trent and Tame confluence in 2007 and potential proposed restoration works for the NMA and Lafarge Quarry on the other side of the Trent.

Recommendations from 2006-2007 still relevant

1. Re-establish Cherry Holme (part of the Catton Hall estate) as a river island. This is still desirable despite complications since 2007 where the river breached into one of the large lakes at Barton Quarry. There is a current abstraction license for the area in question, however the other consents have yet to be approved. It is likely that both would need to be re-applied for owing to changes in the way consents are processed since the original applications. Plans will need to be discussed with The Catton Estate and Hanson and if achieved would restore a 7ha river island on this stretch of the Trent. Excavated material could be deposited into lakes to create additional reedbed and reed swamp habitat.
2. Selective river braiding where there are opportunities to do so with a host of ephemeral pools, ditches and oxbows providing suitable conditions for European Water Vole, amphibians and invertebrates, conditions which would be absent from larger lakes and pools.
3. The river re-profiling project at Catton Estate for the inside of the large meander downstream of Ryelands plantation, this would need to be re-evaluated with respect to plans put forward by Hansons for an area of river braiding.

4. Creation of additional river islands by planting freshly cut willow into riffles allowing roots to begin the natural process of island formation. This was successfully carried out at a site between Croxall and the National Memorial Arboretum in 2007, therefore further works of this kind would greatly contribute to starting geomorphological processes.

New opportunities and recommendations

5. The key to this site is determining the ultimate end-use of the quarry. Discussions with the County Ecologist will be necessary to determine the goal of Hansons in the full restoration of the site, if it is considered unfavourable for nature conservation, then many of the proposals laid out may not come to fruition.
6. If it is decided that the largest lake(s) are to be retained for leisure or recreation, then continuation of the successful restoration works carried out by Hanson in the past would be preferable, such as creation of more lake islands, spits and peninsulas in the main lake without affecting the open water required for regatta events. This would help to break up erosion patterns and reduce shore erosion, simultaneously providing good habitats for key species such as European Otter and Common Tern. There may be a possibility to alter plans to redesign the southern section of the site once proposed as a regatta lake to form a large nature reserve either through partnership with SWT or the RSPB, to both provide a leisure facility as well as biodiversity benefits. The site would have to be bought out and would therefore need significant investment from any organisation wishing to take the site on.
7. Build on existing works carried out by Hansons to provide more shallow scrapes and pools on the insides of the large meanders on the northern section of the site.
8. Parts of the restored section of the site located to the north were being cattle grazed up until the Foot and Mouth outbreak in the UK in 2001. It would be beneficial to reinstate some of this grazing to restore the species richness of the grasslands.
9. Liaise with Hansons to establish proposals for the restoration of the most recent area of mineral extraction on the western side of the railway line

called Barton West, which could provide further ecological benefits in the project area.

Key species' opportunities

- European Otter
- Common Tern
- Breeding waders
- Spined Loach
- Amphibians
- Invertebrates

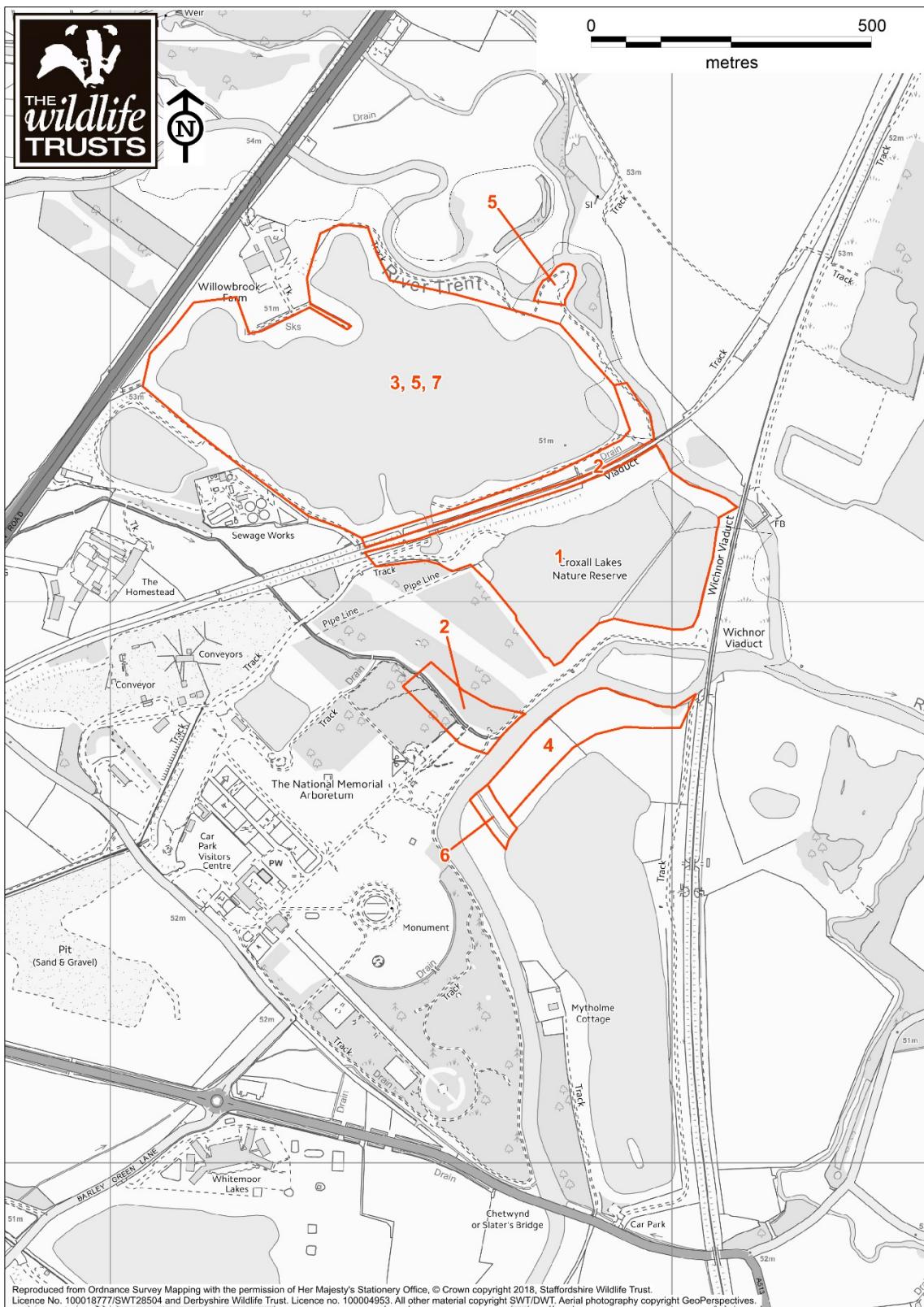
Costs

£30-50k for re-establishing the river island at Cherry Holme

Unknown for the future of Barton Quarry as it is nearing the end of its life as a quarry, therefore the future decisions will all hinge on discussions with the County Ecologist and the ultimate end-use and whether a conservation Non-Governmental Organisation (NGO) could buy the site. Much of the restoration may be carried out as part of refined restoration plans and therefore would incur little cost to the project aside from staff time for advising.

Total: £30-50k (known)

Alrewas, National Memorial Arboretum and Croxall.



Map 10. Specific project recommendations for Alrewas, National Memorial Arboretum and Croxall, map numbers refer to written recommendations outlined in the following sections.

Overview

This is an approximately 220 hectare site that covers a key area in the landscape where the River Tame and the River Mease SAC join the River Trent. Quarrying had almost completely ceased at this site during the 2006-2007 audit but is still ongoing now albeit in a restricted area to the north of the site. There have been significant changes to the site since the original 2006-2007 audit, the most notable change is a result of a large-scale river restoration project on the Tame and Trent confluence between the NMA and SWT Croxall Lakes Nature Reserve. This resulted with the river channel being widened and several new river islands created using living willow in shallow sections of the river bed. This measure was described in the 2006-2007 report alongside a number of other recommendations for the site. SWT's Croxall Lake was connected to the River Tame via a narrow channel on the western side of the railway line after recommendations were made in the 2006-2007 report. This was successful, however it is currently being reviewed by SWT and the EA.

Part of Alrewas Quarry was handed to the NMA prior to the 2006-2007 audit, which was reverted to amenity grassland and planted with trees. These have since become more formalised and the expanse of the NMA has also increased to include further sections to the north of the site formerly part of Alrewas Quarry. The large section of mineral extraction north of the railway is due to be handed to the NMA in the future. There is feasibility to discuss restoration plans with Lafarge and the NMA to generate a multifunctional site which benefits people and biodiversity.

Recommendations from 2006-2007 still relevant

1. The key area at this site is Junction Pit Lagoon which needs to be restored sensitively, maintaining existing habitats. A potential feed of running water should be identified to divert into the lagoon to help maintain areas of mud flats and bare sand to help scour deeper pools within the reedbeds as well as create delta channels which will change with time. Although this recommendation is still relevant it would appear as though a great deal of the lagoon itself has completely silted up and is now becoming more vegetated, possibly as a result of water being pumped out into the main lake opposite the railway line. There is an area of open water still present at

Junction Pit Lagoon, however this is greatly reduced and should not be allowed to dry out completely. Speaking with the NMA with regards to the future of this area with the possibility of creating a complex of pools spanning from the River Trent, wildlife ditches, reedbeds and wet woodlands within the silted up extents of the northern and western side of Junction Pit Lagoon adjacent to the railway.

2. It was identified that there are opportunities to carry out a series of small-scale enhancements at the NMA including the excavation of a backwater fish refuge area at the junction of the main drain and the Trent. The drain could also be selectively re-profiled with scalloped edges, bays and on-line ponds. It is unknown whether this option will be able to be fulfilled as this area has now been landscaped as part of works carried out by the NMA.
3. The 2006-2007 audit identified that the shoreline at the main lake at Alrewas Quarry is developing some marginal habitat but is generally quite sparse, this will have developed more since then, however the lake would benefit from additional features such as shallows, peninsulas, spits and islands. It was also noted that the site would be a good receptor site for inert fill or spoil from floodplain excavations which is still the case now. Discuss the restoration plans with the County Ecologist with regards to the future of this area.

New opportunities and recommendations

4. Carry out another extensive river reprofiling scheme on the western side of the railway at Croxall Lakes SWT Nature Reserve mirroring that which was carried out previously at the confluence of the Trent and Tame and also partially on this side of the railway. The land in this section is much higher than the river, the swales which have been dug at the northern end of the main lake are not as effective as they could be and do not hold as much water as desired. This whole area could be lowered, reprofiled to create a braided channel retaining large willows and utilising freshly cut material planted to the river bed to create more small gravel islands. Excavated material could be used to infill Croxall Lake as with material excavated during the previous restoration to provide more shallow edge habitat to aid in the formation of reedbed and reed swamp.

5. Re-profile the inside of the river meander to the north of the main Alrewas Quarry lake and place spoil in shallows of one of the larger lakes to create additional reedbed and shallow water habitats.
6. Re-assess the river linkage between Croxall Lake and the River Trent which is the ford across the new channel which is barely used. There is a possibility that the large aggregate could be removed or spread wider to enable passage of larger fish for example.
7. NMA will be acquiring land north of the railway, post extraction, where there is currently a large lagoon, this is ideally a site where Lafarge, the NMA and SWT could work together to inform restoration, carrying out reprofiling on the inside of the large river meander and use the spoil to create a more diverse range of features in the lagoon such as shallow, exposed sediments, spits and reedbed and/or reed swamp.
8. Retain the connection between Croxall Nature Reserve and the NMA.

Key species' opportunities

- Common Tern
- European Otter
- Wintering wildfowl
- Spined Loach

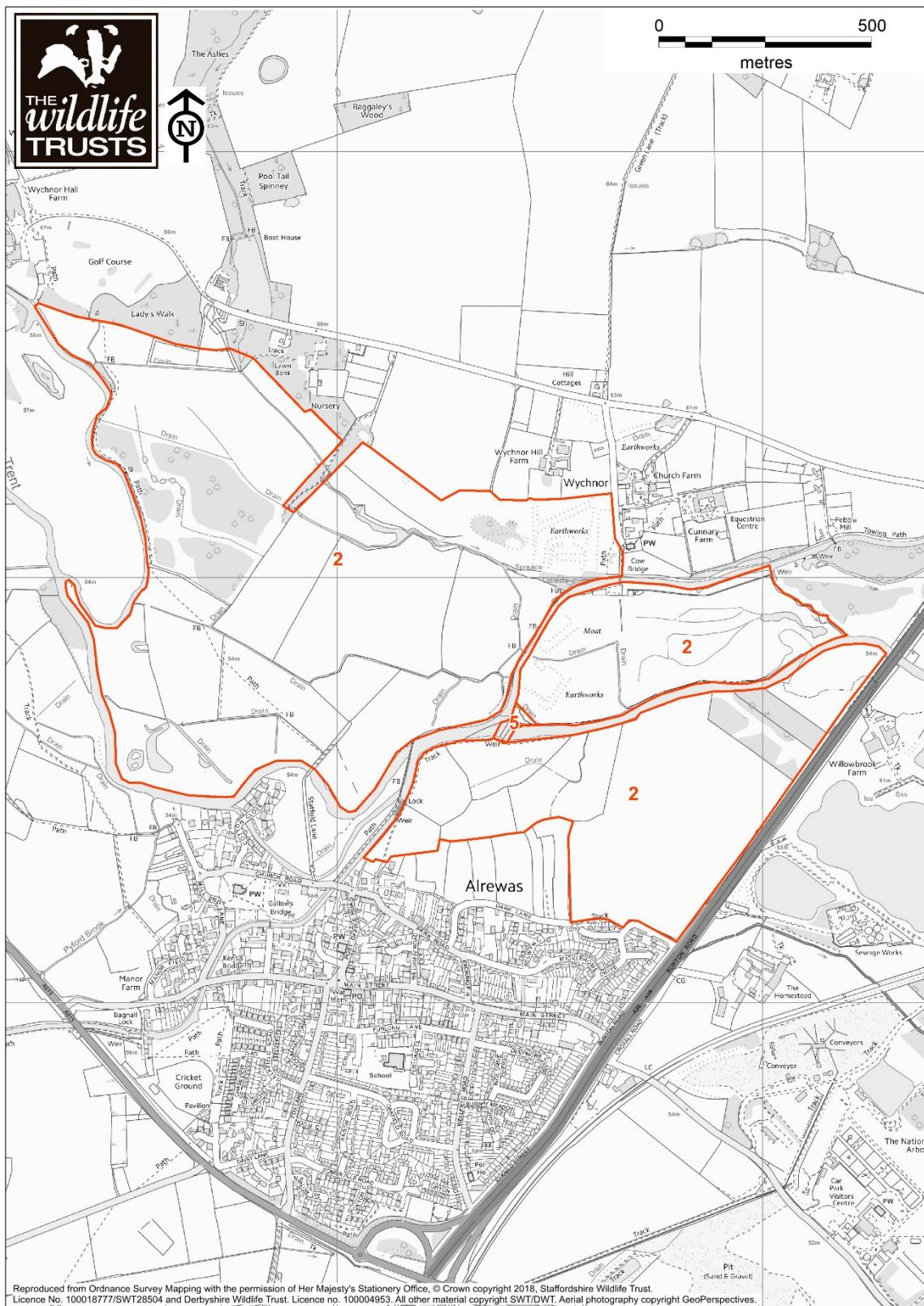
Costs

£10-50k for reprofiling the inside of the river meander at the NMA

£90-100k capital for capital works for re-profiling at Croxall Lakes, £30k for modelling, design, feasibility and supervision.

Total: £110-180K

Wychnor



Map 11. Specific project recommendations for Wychnor, map numbers refer to written recommendations outlined in the following sections.

Overview

Wychnor is a large, approximately 175 hectare site on the River Trent located just to the north of Alrewas, this site differs from many others from the 2006-2007 audit in that there is no previous history of mineral extraction and the habitats represent some incredibly good examples of species-rich lowland meadows, floodplain grazing marsh and historic water meadows. The site also acts as a hotspot for a number of different bird species such as Lapwing, Snipe, Redshank, Wigeon, Teal and Shelduck. A large proportion of the site was entered into a Higher Level Stewardship scheme in 2007, which has now lapsed after 10 years, it would be good to make contact with the landowner to discuss putting the site into Higher or Mid-Tier Countryside Stewardship and this is something that could be approached as an opportunity as part of this project.



Wychnor Meadows floodplain edge

Prior to the 2006-2007 audit it was confirmed by Staffordshire County Council's Historic Environment Team that large parts of the Wychnor site have numerous well-preserved water meadow features such as brick sluices on adjacent watercourses, carriers and channels. Part of the site still functions as a washland

designed to encourage flood waters onto areas of pasture. Several other archaeological features still remain including medieval fish ponds, a moat and an abandoned village. An extensive re-wetting program was carried out after the 2006-2007 audit to raise the water levels on site and restore some of the areas of water meadow and wet grassland, including some of the historic features. SWT were involved in walkover surveys to discuss restoration of the river island in 2016 and were approached to potentially take on ownership and management of the site.

Surveys of the large species-rich fields in the centre of the site were carried out in 2008 and designated as a Local Wildlife Site. The site itself has been used as a source site for green hay strewing and was used as a donor site for the large river island directly to the east in 2016.

Recommendations from 2006-2007 still relevant

1. Recommendations from 2006-2007 were carried out successfully.

New opportunities and recommendations

2. Make contact with the landowner(s) with regards to putting the site into an appropriate Higher or Mid-Tier Countryside Stewardship scheme both to protect existing areas of good biodiversity and to improve areas of the site with lower biodiversity.
3. Explore the possibility of using the site as a target for enhancements through Lichfield District Council's (LDC) biodiversity offsetting through their local plan, this could potentially fund and deliver a number of outputs for the site including restoration of further sections of species-rich wet grassland.
4. Ensure that the fish pass on the large weir on the Trent is working as it should, monitor fish movement.
5. Link habitats together, with further habitat improvements to reinforce a key, robust and resilient site capable of storing flood waters, as well as being a hotspot to enable species movement throughout the project area. Utilising a source of biodiversity to benefit the entire landscape.

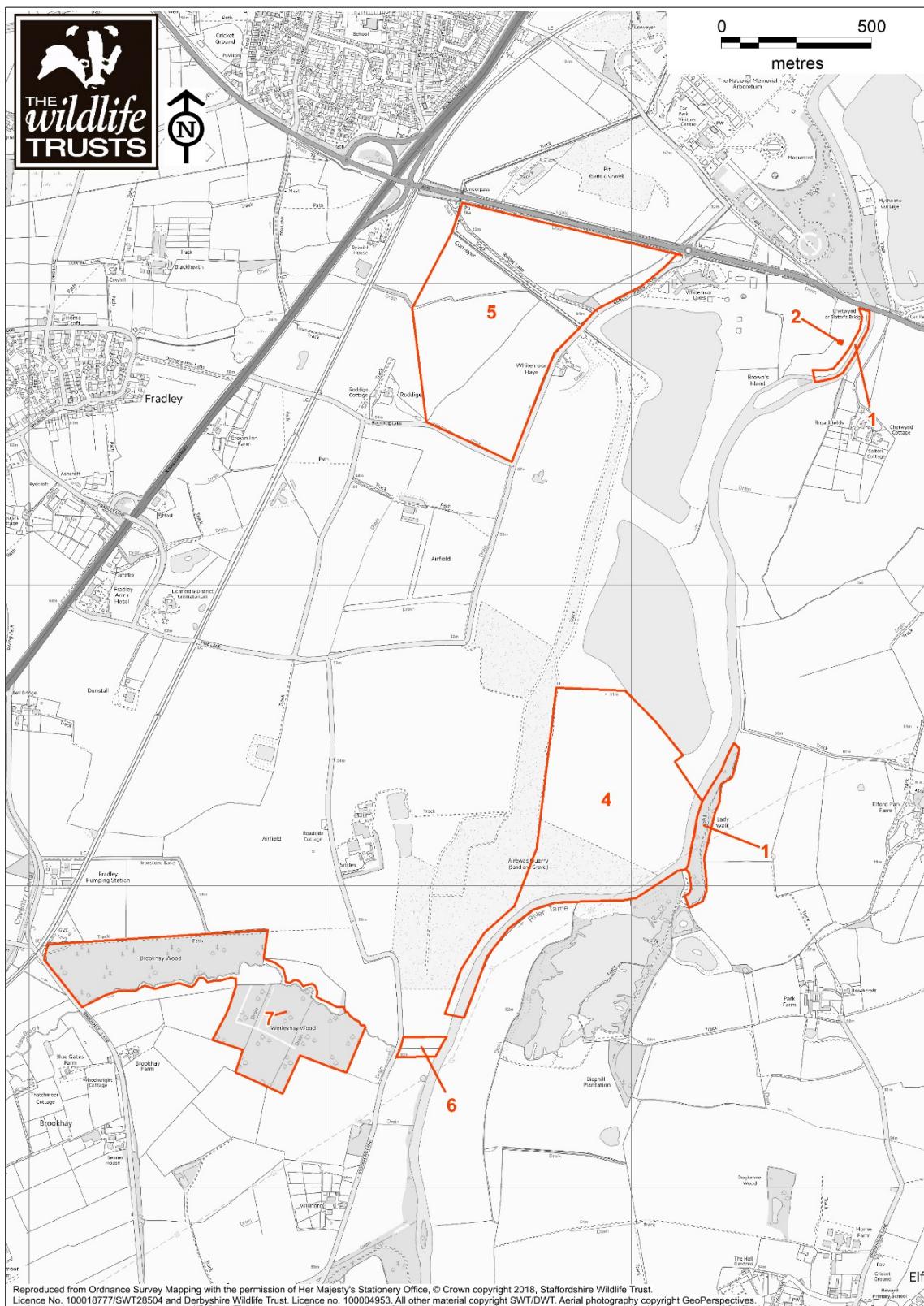
Key species' opportunities

- Breeding waders
- Wintering wildfowl
- Barn Owl
- European Otter
- Brown Hare

Costs

Total: £1k-10k - likely to be small-scale costs for landowner liaison, advice and support to landowners for completing a CS application. Possibility that the site will be used as a donor site or as mitigation from LDC plans which could increase costings.

Whitemoor Haye



Map 12. Specific project recommendations for Whitemoor Haye, map numbers refer to written recommendations outlined in the following sections.

Overview

A large 282 hectare site located south of the NMA and east of the A38. The site was described as a predominantly arable area in 2007 and this is still the case in 2018, however two large lakes now dominate the eastern section of the site on an area of former sand and gravel extraction. This was referred to in the original 2006-2007 audit for the restoration plans of the site, which has now been fully carried out.

The next phase of quarrying is about to begin, which will take in much of the western section of the site and has already started in the northwestern section of the site which formerly had plans to undergo arable reversion in the original audit.

It was noted that the original restoration plans were poor for biodiversity and highlighted that several meetings took place during 2006 to discuss revisions of the plan to include more biodiversity features at the southern end of the site. These included works such as river braiding and creating a complex of floodplain grazing marsh, reed swamp and open water, however this section of the site is yet to be restored. Several of the recommendations in the 2006-2007 audit are no longer feasible now that a large proportion of the restoration on the eastern section has already been carried out. The large river braiding and wetland restoration plans proposed in the original audit were only partly carried out and do not appear to have been carried out exactly to the specifications detailed on the plans. The northernmost section of wetland restoration is now occupied by the southern-end of one of the larger lakes and the second section appears to be one larger shallow pool with an island as opposed to the series of scrapes and shallows proposed by SWT.

The arable land still supports the species noted in the original audit with records of Corn Bunting, Reed Bunting, Linnet, Tree Sparrow, Skylark, Grey Partridge and Brown Hare, however mineral extraction has now begun in this area. Suitable areas of habitat should be replicated through restoration plans and suitable habitats should be retained whilst quarrying takes place.

Recommendations from 2006-2007 still relevant

1. The landowner was interested in re-profiling the River Tame at the northern end of the site adjacent to the outdoor centre, this was mainly due to safety purposes, however it would also have biodiversity benefits. Communication with the landowner would need to be refreshed.
2. Investigate the possibility of converting the World War II (WWII) Pill Box as a secure bat roost site.
3. Retention of bare ground and exposed sediments when removing bunds from quarrying work.

New opportunities and recommendations

4. Discuss quarry restoration plans with the County Ecologist to influence inclusion of more aspirational elements aside from arable reversion. Possibly re-visit the river braiding along the Tame in the southern section of the site, either making use of existing live trees to create river islands and exposed shingles and sediments or excavating of one side of the river bank and sorting fine sediments from gravels and introducing gravels back into the river. Planting of freshly cut willow to begin natural processes and island formation. Detailed plans for braiding in this section were produced and could be utilised if this was revisited as an option.
5. As the quarrying has now commenced in the western section of the site the restoration of this area could be adapted subject to discussions with the County Ecologist and mineral company to revert from arable to wet grassland with ditch management and scrape creation. The field is inundated during the winter and early spring, and was identified in 2006 as being a focal point for Lapwing and Reed Bunting with records of both species present since 2006.
6. Wiggle the existing straight section of the Mare Brook at the southern-end of the site between Stockford Lane and the Tame to create backwaters, a wider area of wetland, and possibly with the inclusion of woody debris, to create further areas of habitat.
7. Expand the site to incorporate Brookhay Wood LWS and Wetleyhay Wood LWS to the west of Stockford Lane, plant a section of broadleaf trees similar to the composition in the existing woodlands to link the two ancient

woodlands. European Otter habitat and buffer fencing (chestnut palings) 15 m from the brook edge and straw bales. This should help to offset the proposed new quad bike training area as well as delivering more habitat area and protecting the existing habitat.

Key species' opportunities

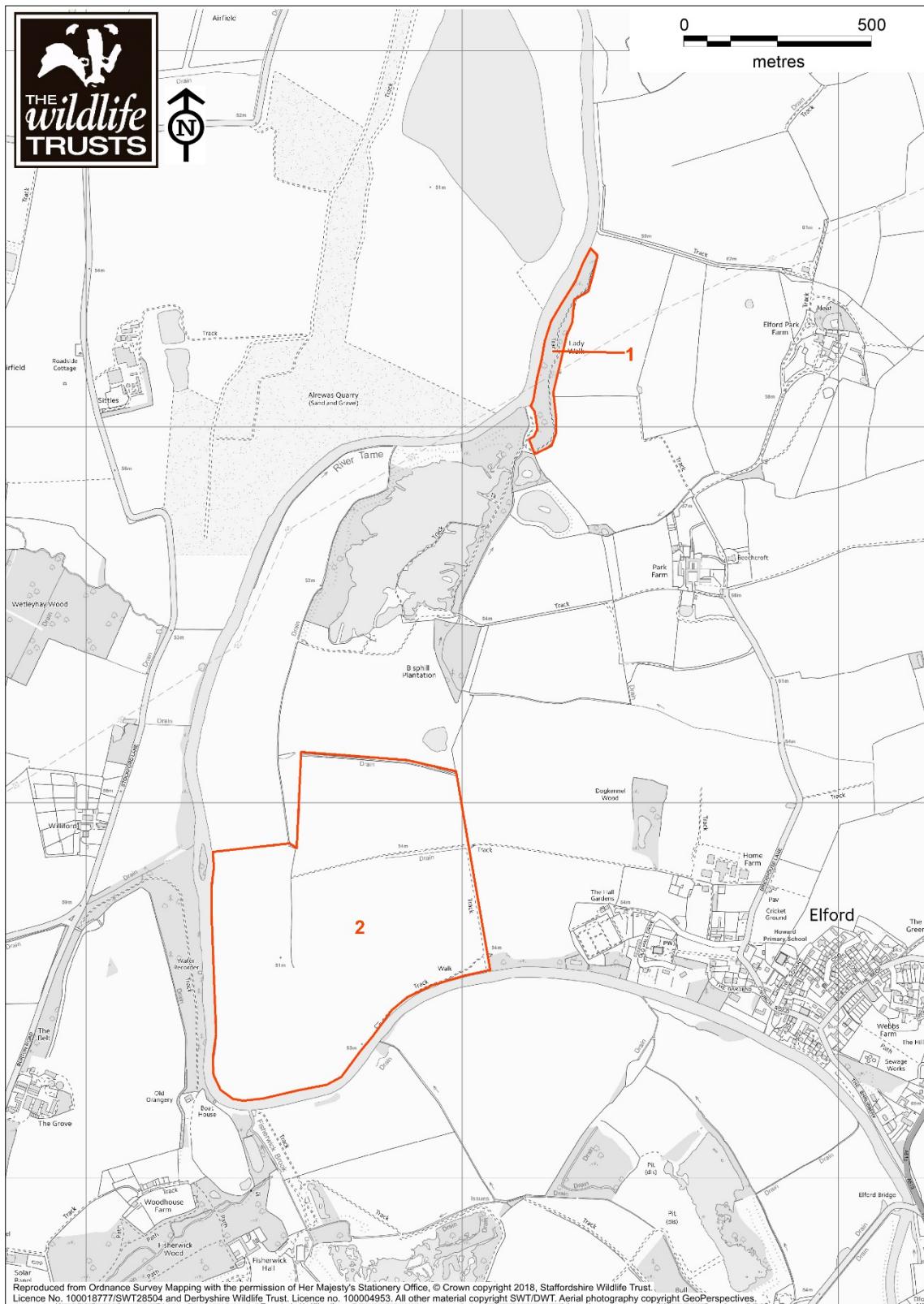
- European Otter
- Brown Hare
- Grey Partridge
- Skylark
- Reed Bunting
- Corn Bunting
- Tree sparrow
- Little Ringed Plover
- Breeding waders

Costs

£5k-10k for brook wiggling on Mare Brook, woodland planting, backwater creation and otter fencing. Much of other costs could be incorporated into the restoration plan of the quarry and therefore would incur no cost to the project itself aside from some liaison and restoration recommendation advice. £1k-5k

Total: £5k-15k

Elford (North)



Map 13. Specific project recommendations for Elford (north), map numbers refer to written recommendations outlined in the following sections.

Overview

An area of former quarry, approximately 130 hectares in size which was fully restored prior to the 2006-2007 audit, with a semi-natural area to the north and areas of arable land to the south of the site. The site is mostly unchanged since the original audit. The semi-natural area to the north of the site contains several large lagoons which were profiled to provide spits, shallows, reedbed habitats, with wet woodlands and wet grasslands on their periphery. It was noted in 2007 that the arable land to the south is regularly inundated, there are several large intensively managed ditches which are funneling water away from the site.

Recommendations from 2006-2007 still relevant

1. Carry out a Local Wildlife Site survey of the broadleaved woodland at the northern end of the site to establish current condition. This may also extend into the area of restored habitat further south, as this is now more established.

New opportunities and recommendations

2. It was noted in the 2006-2007 audit that the landowners were amenable to working with the Central Rivers Initiative. A possibility to re-establish communication and conversation with landowners to buffer ditches, carry out Rural SuDS (RSuDS) schemes or even re-visit ideas in the original audit of arable reversion back to wetland habitat. This is a large landowner in this section of the TTV project area so engagement and communication to build a relationship and deliver different projects throughout this particular section will be beneficial.
3. Check maps of historic river islands and backwaters and potentially look to re-establish where possible. This would form part of a further study throughout this southern section of the whole TTV project area, which seeks to review and identify opportunities for historic river island restoration and where there are opportunities for woodland and pond creation to build connectivity in an otherwise arable landscape devoid of many other ecological features.

Key species' opportunities

- Wintering wildfowl

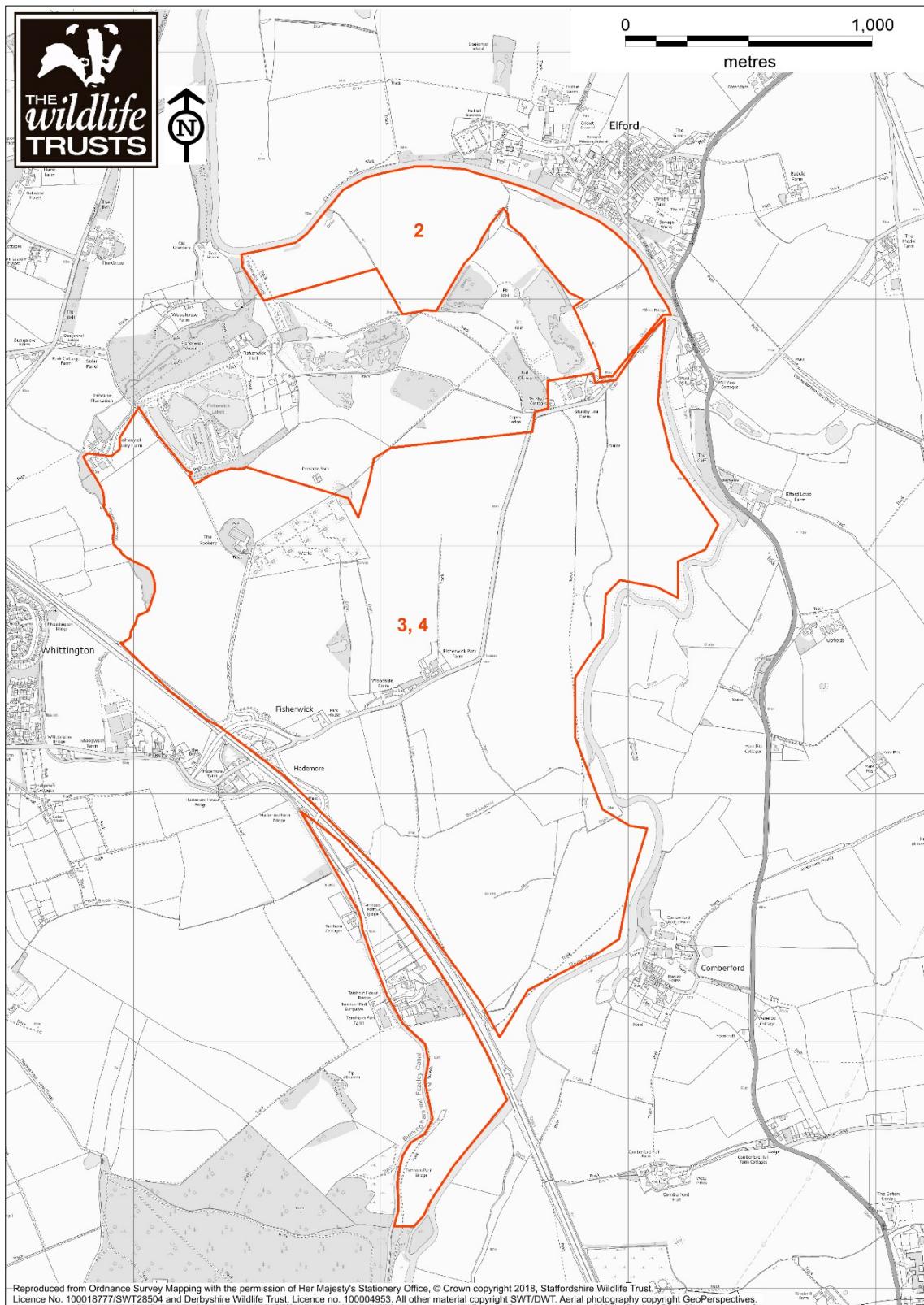
Costs

£1k for LWS survey

Possibly some staff costs associated with engaging and advising the landowner but these will only be low costs.

Total: £1k-5k

Elford (South), Fisherwick and the Darnford Brook



Map 14. Specific project recommendations for Elford (south), Fisherwick and the Darnford Brook, map numbers refer to written recommendations outlined in the following sections.

Overview

A large restored former quarry approximately 320 hectares in size containing a diverse mixture of habitats and several Local Wildlife Sites. The site was restored following recommendations from the 2006-2007 audit where SWT liaised with JPE (the quarry operators), Staffordshire County Council, Staffordshire Biodiversity Action Plan group, EA and 'Friends Of' groups to inform a revision of the mineral plan. This included environmental statements, numerous environmental surveys and was finalised with the submission of a planning application. The results of the restoration were successful, and the site now has a good mixture of habitats, some of which achieve LWS status (Fisherwick Wood, stream and adjacent quarry workings) providing valuable semi-natural habitat to the site such as shallow pool margins, ephemeral pools and ponds, islands, peninsulas, bare ground and grassland habitats.

The site was noted as being important for White-clawed Freshwater Crayfish and European Otter, particularly in the Darnford and Fisherwick Brooks, with surveys of White-clawed Freshwater Crayfish suggesting that there were up to 15 individuals per square metre. This is however no longer the case, and it is likely that the population has been wiped out at this site due to the rapid influx of the invasive Signal Crayfish and the associated crayfish plague. European Otter however, are still present.

Recommendations from 2006-2007 still relevant

1. All of the recommendations from 2006-2007 were accomplished, with a large area of the project site designated as LWS following survey.

New opportunities and recommendations

2. Seek to communicate and build relationships with landowner(s) which manage a large proportion of this area to discuss taking areas of arable land out of production, possibly discuss RSuDS, or other applicable statutory grant schemes to provide habitat and contribute to water quality or WFD issues. Removal of topsoil and other material from areas of floodplain to

- provide further shallow water habitat and create areas of flood storage during peak flows.
3. Key area to devise a sensitive and appropriate plan of woodland planting to connect critical key sites (Hopwas Hays in the south to larger areas of woodland further north) to further strengthen the woodland LWS present in this area of the project. Address the 'gap' or lack of woodland between this site through Comberford and further on to Hopwas Hays further south. This should also benefit the movement of other key species such as European Otter and Grass Snake.
 4. Creation of further small farm pools and ponds linking to Comberford further south, to provide a network of refuge sites enabling an easier passage particularly to amphibians. This could be closely linked with the canal and river, and avoid locating ponds in the floodplain but instead locate on the lower river terraces.

Key species' opportunities

- European Otter
- Breeding waders
- Skylark

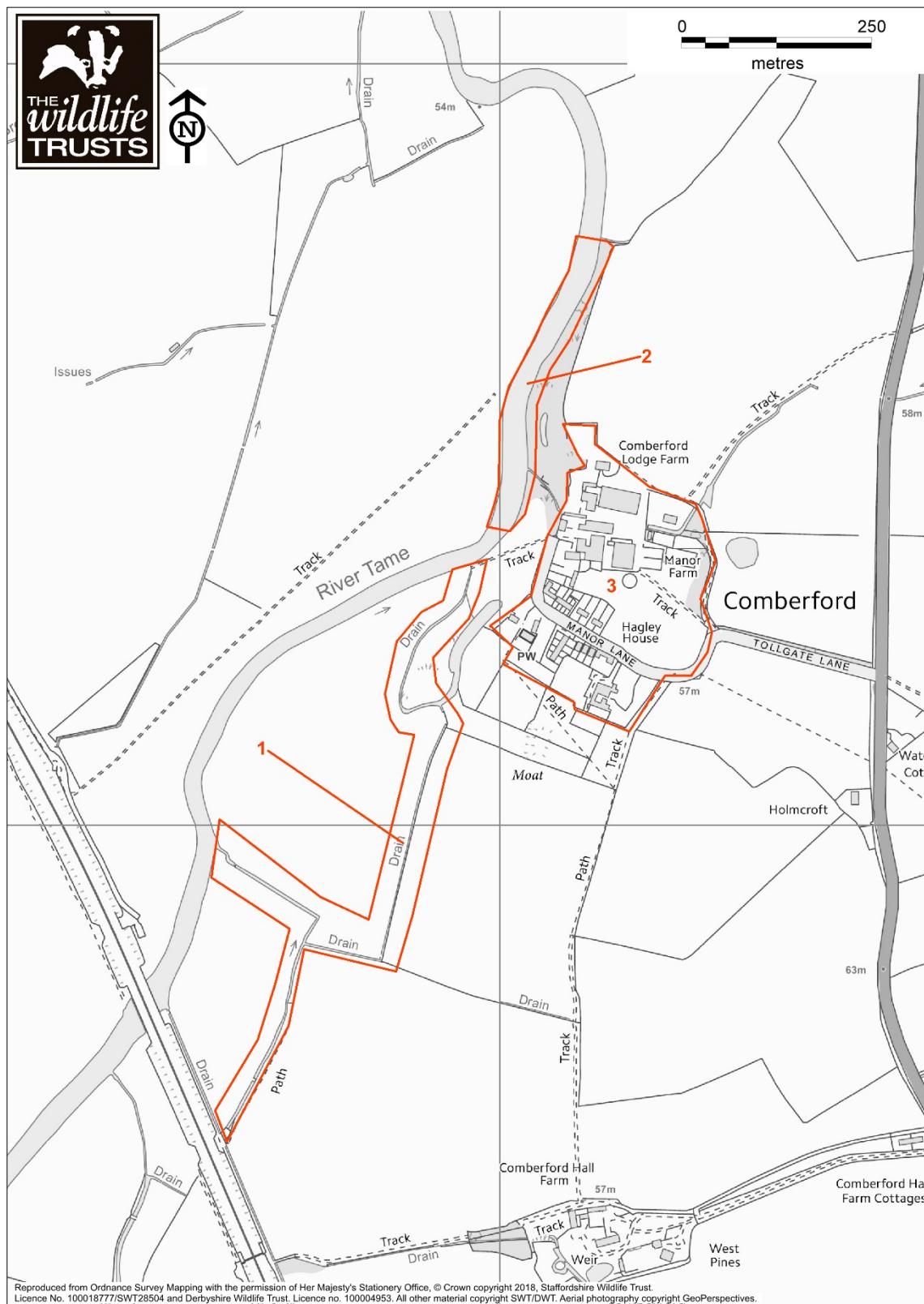
Costs

Possibly some staff costs associated with engaging and advising landowner(s) but these will only be low costs.

£5k for desk study on targeting areas where pond creation, river island restoration and sensitive woodland planting could be carried out throughout the southern section of the TTV project area (this covers a wider area than just this location but is included as a cost here as this is the key central focal point).

Total Costs: £5k-10k

Comberford



Map 15. Specific project recommendations for Comberford, map numbers refer to written recommendations outlined in the following sections.

Overview

A smaller site area than those in the north of the project area, at approximately 90 hectares, but still contains a reasonably good mix of semi-natural habitats. In the 2006-2007 audit this site was identified as being a biological hotspot within the project area. The core habitats remain relatively unchanged since the original audit surveys in 2006-2007, with damp pastures adjacent to the Tame still present providing a buffer from the intensive arable land. The oxbow lake is still present and remains a LWS although it has not been re-surveyed since the original 2006 survey. The area of wet woodland in the north of the site, directly adjacent to the Tame, is also still present, which at the time of the original audit was providing a source of Large Woody Debris into the river.

Several mineral extraction applications have been submitted since the 2007 report however these have all been declined through planning.

Recommendations from 2006-2007 still relevant

1. Excavate additional ponds along drain courses off the floodplain to provide suitable habitat for Great Crested Newt, Grass Snakes and dragonfly
2. Talk with landowner(s) and discuss the possibility of creating a river island using living willow branches from the adjacent woodland to the north of the site.

New opportunities and recommendations

3. The village of Comberford is unprotected with no flood defenses in place. An area of wetlands could be created on the floodplain to serve as a flood storage area to protect the village from major flood events. This could possibly be achieved through a Flood and Coastal Risk Management (FCRM) scheme. This is an aspirational project and would rely on communication with mineral extraction companies, surrounding landowners and identification of suitable funding streams.
4. Identify historic river islands to restore, and there is a possibility to create backwaters on the original channel of the Tame.

Key species' opportunities

- Great Crested Newt
- European Otter
- Kingfisher
- Grass Snake
- European Water Vole
- Aquatic invertebrates such as dragonfly larvae.
- European Eel
- Spined Loach

Costs

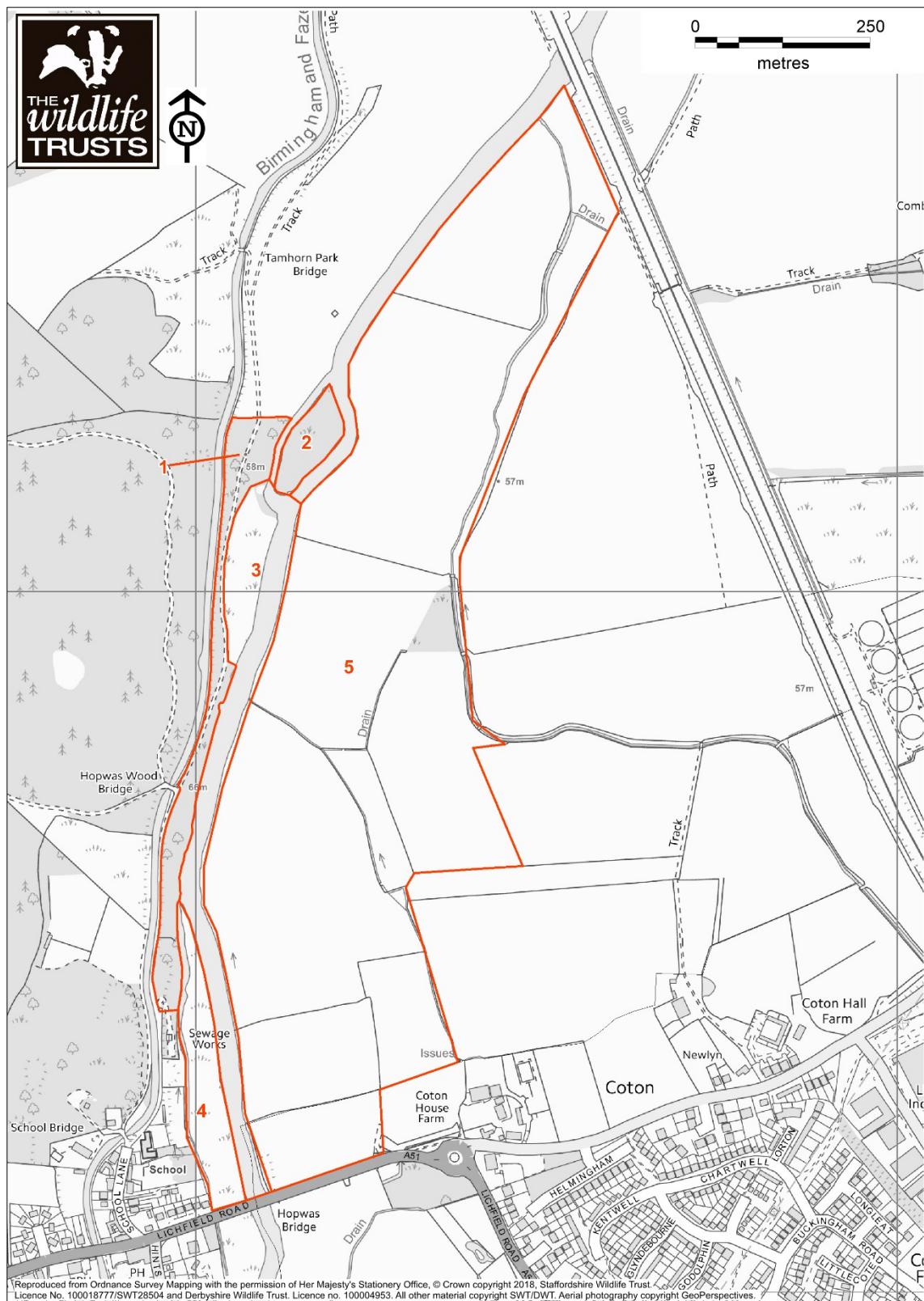
£1k-10k for excavation of online ponds on drain courses inclusive of supervision, necessary consents and capital works.

£2k per river island creation (capital), requiring digger, trees from a suitable nearby donor site. £2k for consents and supervision.

£30k for FCRM all in cost for practical works and consent.

Total: £1k-50k

Hopwas Hays Wood



Map 16. Specific project recommendations for Hopwas Hays Wood, map numbers refer to written recommendations outlined in the following sections.

Overview

The vast majority of this 260 hectare site falls outside of the TTTV boundary, however the section between the Birmingham and Fazeley Canal, the River Tame and the fields to the West of the River fall within the boundary. This is the least diverse section of the original 2006-2007 site, predominantly consisting of poor quality, intensively managed arable fields that are managed up to the margins of the watercourse. It would be beneficial to encourage the uptake of large buffer strips between the fields and the watercourse.

The land between the river and the canal does contain a linear strip of woodland which is of Local Wildlife Site quality, however this has not been resurveyed in a number of years. This section of the site is unchanged since the original audit.

Recommendations from 2006-2007 still relevant

1. Undertake an updated LWS survey for the woodland between the River Tame and the Birmingham and Fazeley Canal.
2. Protect the wooded river island.
3. Identify suitable locations to create further river islands using living willow branches secured to shallow sections of the River Tame.
4. Treat and remove Japanese Knotweed on site.
5. Promote the Countryside Stewardship Mid-Tier scheme to landowners with fields adjacent to the Tame with suitable options such as buffer strips along the watercourse. Alternatively, promote other practical enhancements which are desirable for the landowners, for example RSuDS.

New opportunities and recommendations

6. Seek to complete previous opportunities.

Key species' opportunities

- Reptiles (Grass Snake, Slow-worm, Adder, Common Lizard)
- Amphibians
- European Otter
- Invertebrates

Costs

£1k for resurvey of LWS

£2k per river island restoration and/or creation, possibly up to four islands = £8k

£5-10k for Japanese Knotweed treatment, phased over a three year period

Total: £10k-20k

An update of 2009 Staffordshire Washlands Assessment and Recommendations for Key Sites.

Introduction

The following section outlines details forming an update of the Staffordshire Washlands - Recommendations for Key Sites (2009) which was a summary document detailing activities undertaken by Staffordshire Wildlife Trust on behalf of the Staffordshire Washlands Partnership between January and March 2009. The Washlands Partnership covered all parts of Staffordshire but the priority area for activity between 2003 and 2009 was the Trent and its tributaries between Trent Vale near Stoke to Alrewas, as well as parts of the Sow and Penk catchments.

The main aim of the 2009 report was to:

- Liaise with Landowners, managers and/or tenants.
- Promote the delivery of enhancements which would contribute to Local and UK Biodiversity Action Plan targets.
- Promote enhancements to help deliver Flood Risk Management objectives.
- List measures required to help achieve Good Ecological Status within the WFD Programmes of Measures.

A total of 16 key sites were identified from the 2009 report throughout the whole catchment. An overview of each site was provided together with a set of potential opportunities based on liaison with relevant landowners, managers and interested parties. The main aim was to encourage partnership formation between various organisations and landowners to plan, fund, co-ordinate and undertake projects to deliver practical improvements to create resilient ecological networks.

The 16 sites were subject to a desk-based analysis in 2018 to assess the recommendations outlined and determine the current state of sites and progress made on the original recommendations.

Recommendations for key sites

Only sites which fall within the TTTV boundary were considered for review in 2018, as many of the sites were located outside the project boundary. Some of the sites were very large and only a small proportion of the site fell within the project boundary. For this review, the sites that have only a section of site within the project area, were considered.

Caveat regarding recommendations in mineral extraction sites:

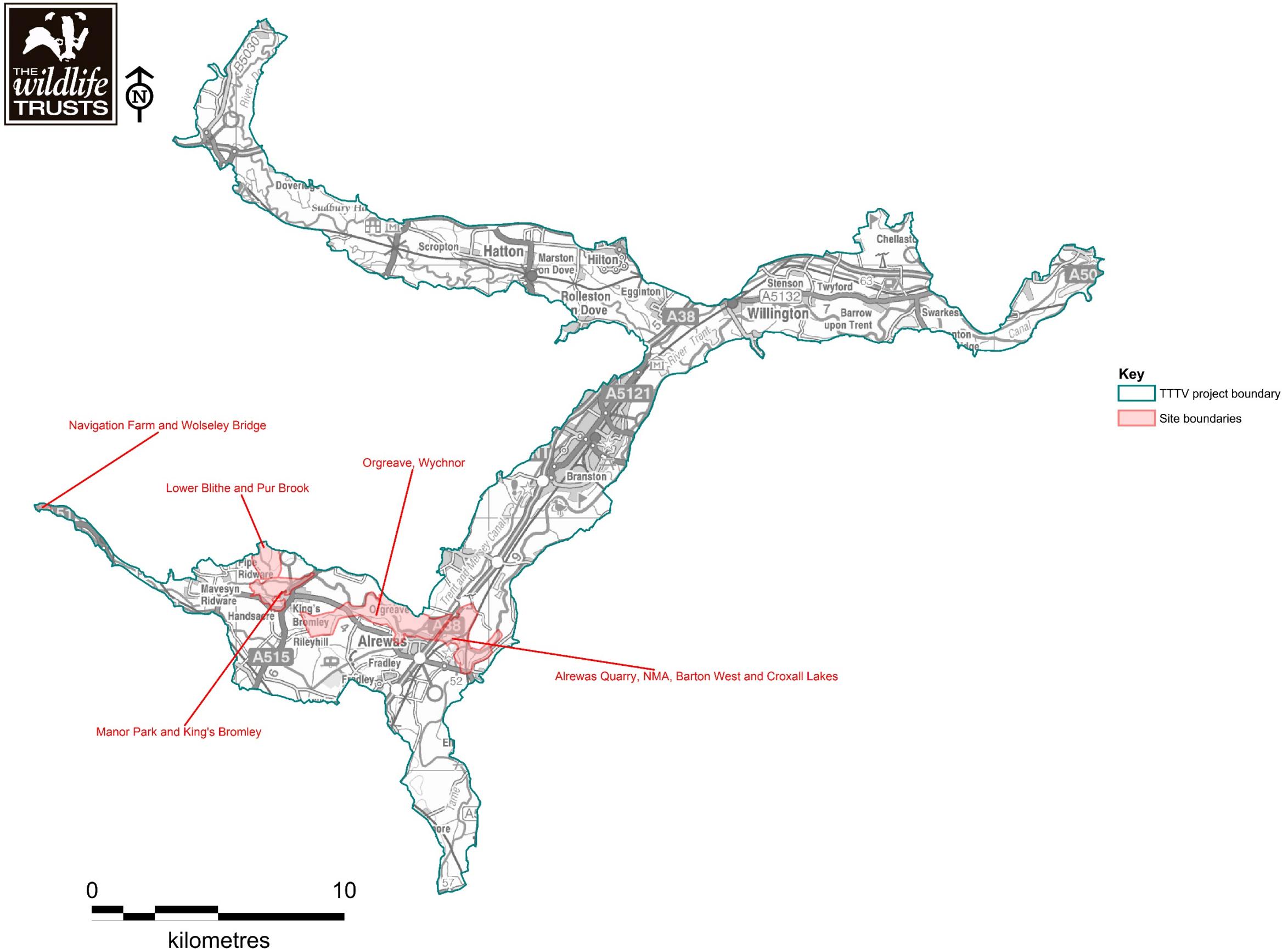
There are multiple sites which either partly or wholly include mineral extraction sites, recommendations made for these areas are purely aspirational with no obligation for the operator to fulfil any recommendations laid out. Costings do not include the submission of planning applications or the cost to the quarry operator such as drawing of new plans etc. therefore minor variations to existing plans may be quite expensive. Operators may choose to deliver recommendations as part of their Corporate Social Responsibility (CSR) which could be used as match funding to deliver further enhancements.

Of the original 16 sites, only 5 sites were present within the TTTV project area:

Table 9. Sites listed in the 2009 Staffordshire Washlands Assessment and Recommendations for Key Sites and their presence in the TTTV area.

Site Number	Site Name	In TTTV area?
1	Trentham Estate	No
2	Beech-Tittensor	No
3	Downs Banks & Wash Dale	No
4	Scotch Brook & Cotwalton Drumble	No
5	Crown Meadow & Southern Meadows - Stone, Aston Mill Barn, Aston Hall Farm & Flute Meadows	No
6	Gayton Brook Catchment	No
7	Navigation Farm and Wolseley Bridge	In part
8	Moreton - Bourne Brook	no
9	Blithfield Reservoir (North) and Tad Brook	No
10	Lower Blithe & Pur Brook	In Part
11	Manor Park & King's Bromley	Yes
12	Upper Swarbourne	No
13	Lucepool, Yoxall	No
14	Orgreave, Wychnor	Yes
15	Alrewas Quarry, NMA, Barton West and Croxall Lakes	Yes
16	The Lawns, Cannock Chase	No

There are some overlaps of sites between the Biodiversity Audit of the Tame and Trent River Valleys in Staffordshire (2007) as detailed in the previous section, namely these include sites 14 (Orgreave, Wychnor) and 15 (Alrewas Quarry, NMA, Barton West and Croxall Lakes) from the table above.



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Map 17. Sites listed in the 2009 Staffordshire Washlands Assessment and Recommendations for Key Sites in Staffordshire and their presence in the TTTV area

Review of 2009 16 Key Sites

Navigation Farm and Wolseley Bridge



Map 18. Specific project recommendations for Wolseley Bridge (Navigation Farm is outside of the TTV project area), map numbers refer to written recommendations outlined in the following sections.

Overview

Wolseley Bridge is the only section of the original 130 hectare site which is in the project area, as the Navigation farm section of the site lies outside the TTV project boundary to the west. Wolseley Bridge is the location of the SWT Headquarters (HQ) which also includes a garden centre and the grounds associated with both sites. SWT HQ contains a variety of habitats including large lakes, wet grassland, traditional orchards and parkland as well as the confluence of the Stafford Brook and the River Trent.

Recommendations made in 2009 report still relevant

1. Use a 1 km section of the River Trent at Wolseley Bridge as a national large river wood debris demonstration project. Further management accords with private landowners and an angling club need to be secured (as well as additional discussions with EA) in order to take the proposals to the next stage. Proposals include allowing the ongoing natural input of LWD such as whole trees, big branches or root plates. In addition to this, LWD would be introduced and “keyed in” at appropriate locations to form further stable accumulations of wood within the channel.

New opportunities and recommendations

2. Further enhancements to the section of wet grassland owned by SWT through the creation of swales, ‘wet fencing’ which will act as natural barriers for cattle grazing but would also prevent access to selective areas of the grassland by the general public and dogs. Furthermore, these enhancements will be new habitat, remaining wet for the majority of the year. Any excavated material can be deposited in Swan Lake to form shallower sections enabling the creation of further reedbed and marginal habitat.
3. Creation of further scrapes and shallow pools to the west of Swan Lake.

Key species' opportunities

- European Otter
- Fish such as Bullhead, European Eel, Stone Loach and Brook Lamprey
- Aquatic invertebrates

Costs

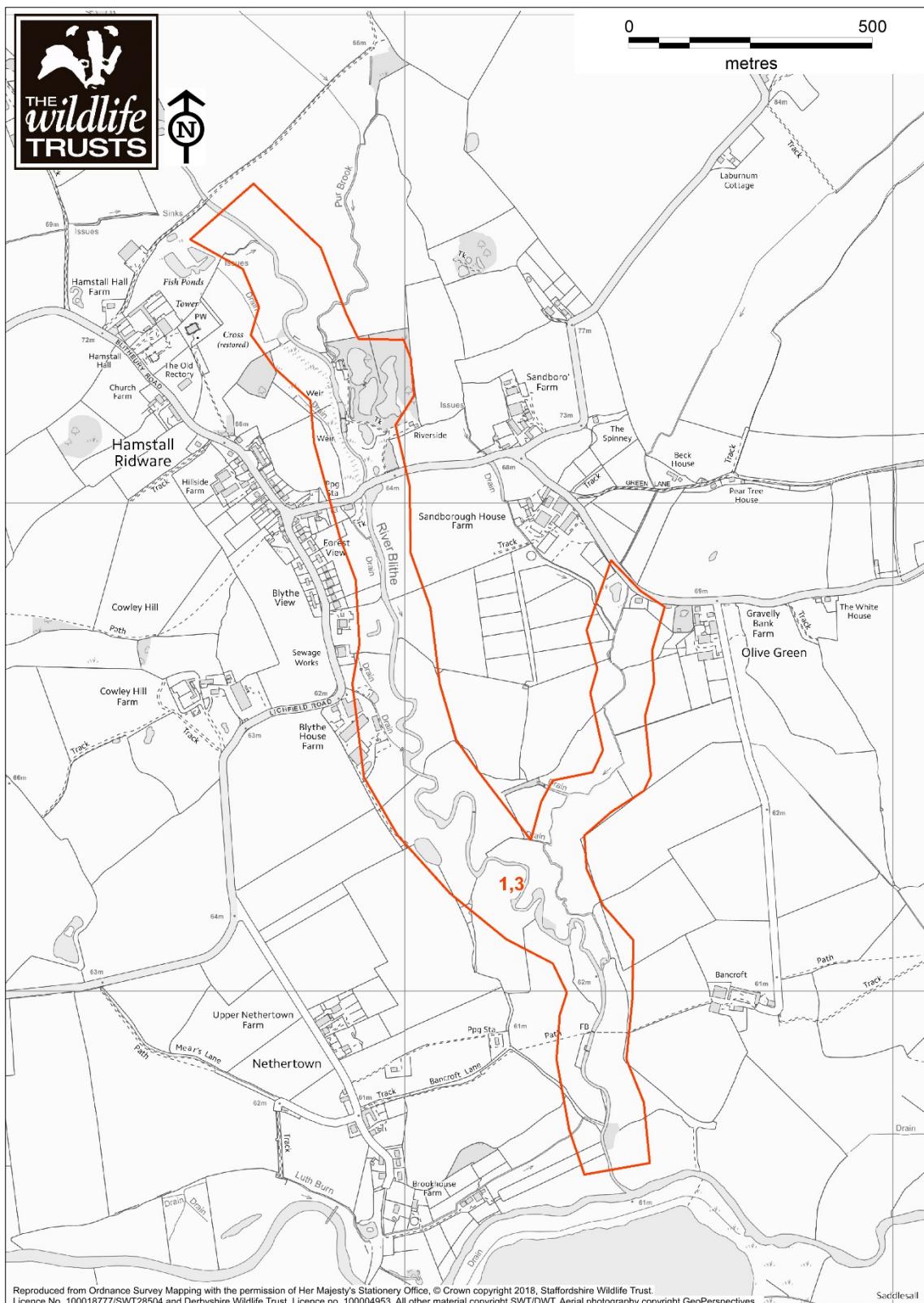
£2k capital works for installation of LWD; £1k for supervision, consent and feasibility.

£12k for capital works for creation of 'wet fence'; £3k for purchasing reed plugs, planning and supervision with some work to be done by volunteers

£2k capital works for scrape creation, £1k for supervision

Total: £21k plus volunteer time.

Lower Blithe and Pur Brook



Map 19. Specific project recommendations for Lower Blithe and Pur Brook, map numbers refer to written recommendations outlined in the following sections.

Overview

Of the very large 620 hectare site identified in 2009, only a small section at the very southern end of the site is within the project area and only the very southern end of the Pur Brook and the Lower Blithe are within the TTV project boundary at Hamstall Ridware. The Lower Blithe in this area possesses some very nice natural geo-morphological features, including lots of meanders and a mixture of wooded and non-wooded sections. In 2008 a report from JBA identified this section of the Blithe as a priority for establishing sites for NFM, this could be re-visited as a priority in 2018.

Recommendations made in 2009 report still relevant

1. Promote NFM through increased channel and floodplain roughness. Install LWD, retain and/or encourage the natural input of LWD, identify appropriate areas to plant suitable riparian trees, identify suitable areas for new fencing, buffer strips and areas of natural regeneration, arable reversion to grass and opportunities to re-wet areas to marshy grassland.
2. Himalayan Balsam control (this would need to be a wider area than just this stretch and would need to go upstream to the dam at Blithfield)

New opportunities and recommendations

3. Seek to protect and further enhance the good ecological and geomorphological features present by engaging and communicating with landowners regarding the possibility of entering into CS.

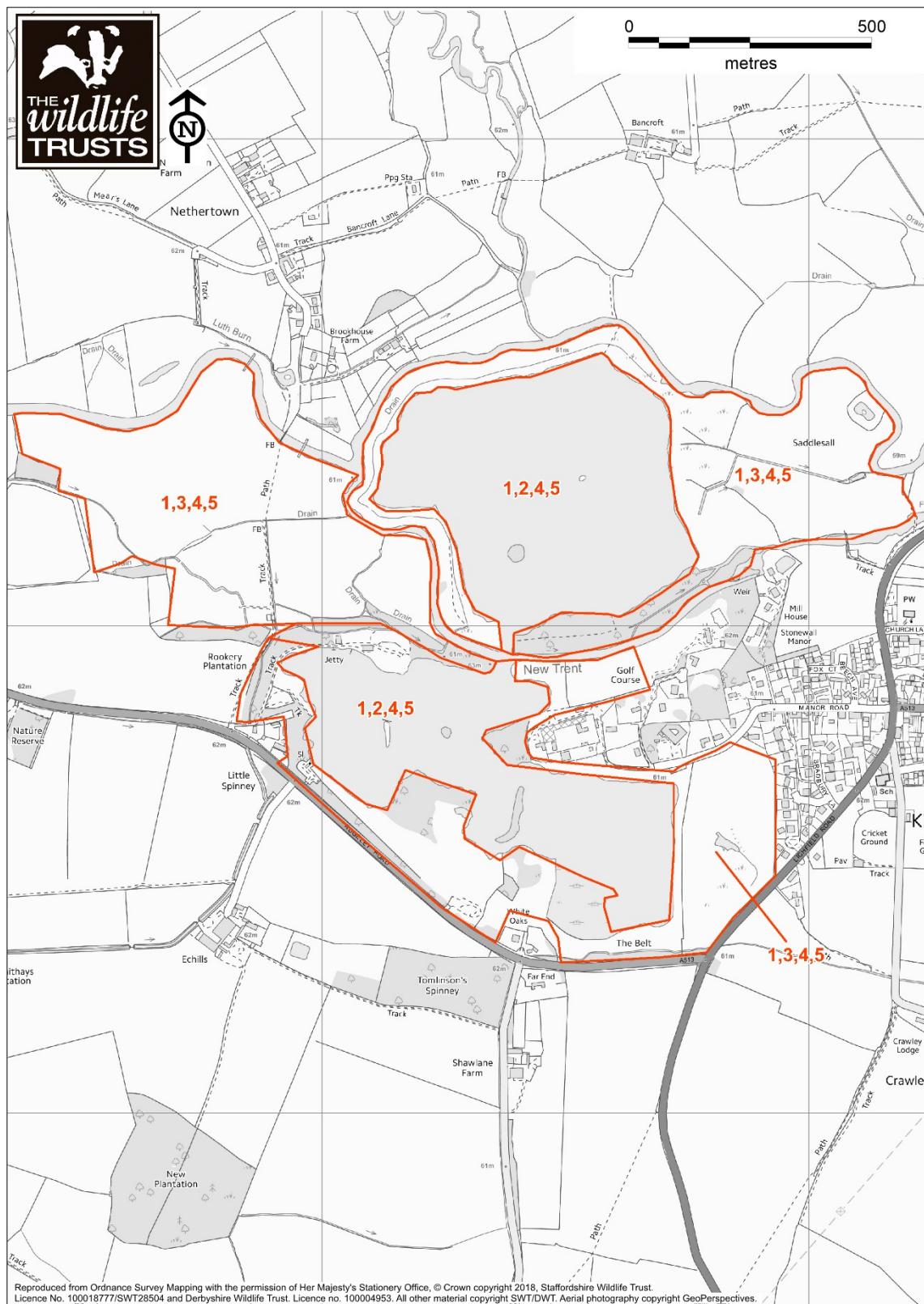
Key species' opportunities

- European Otter
- Brown Hare
- Aquatic invertebrates

Costs

Total: £1k-10k

Manor Park and King's Bromley



Map 20. Specific project recommendations for Manor Park and King's Bromley, map numbers refer to written recommendations outlined in the following sections.

Overview

Manor Park consists of two large lakes adjacent to the River Trent, which were created during the previous extraction of sand and gravel, they are extremely deep and straight edged due to being excavated using dredging barges. The River Trent at this location splits into two channels, the River Trent and the New Trent which run either side of the northernmost lake. The New Trent is 'on-line' with both lakes and runs directly down the middle of the two, with two large wide channels connecting the watercourse to the lakes themselves.

Recommendations made in 2009 report still relevant

1. Identify a suitable organisation to manage part or all of the site for nature conservation.
2. Invasive species treatment and removal.

New opportunities and recommendations

3. Seek to promote CS with Hanson and tenant farmers to get land on the periphery of the river and lakes in good ecological management with light grazing and buffer strips where applicable.
4. Creation of wetlands and/or wet grasslands on the periphery of the lakes and secure appropriate conservation management, this will not only serve to provide additional habitat but also to add 'edge' habitat and buffer the lakes.
5. High Speed 2 (HS2) Phase 2 passes within 2 km of this site and is therefore a suitable site to identify any appropriate mitigation schemes which could deliver practical conservation outcomes.

Key species' opportunities

- Breeding waders (particularly Lapwing, Redshank, Oystercatcher)
- Skylark, Tree Sparrow and Reed Bunting.
- Wintering birds (Snipe, Jack Snipe and Goldeneye).
- European Otter
- Bullhead
- Spined Loach

Costs

Total: £1k-10k however, depending on the results of HS2, mitigation and discussions with HS2 Ltd the costs may change to include more practical projects.

Orgreave, Wychnor

Overview

This site overlaps with another site which was also described during the 2006-2007 Tame and Trent Audit (Wychnor) and subsequently updated as part of the review of those sites in the previous section of this report. All specific recommendations made in the 2009 report were completed between 2009 and 2018. Subsequent review and updates of the sites recommendations were made as part of the review of the 2006-2007 audit and are described in **pages 60-63** previously, therefore are not repeated in this section.

Alrewas Quarry, NMA, Barton West and Croxall Lakes

Overview

This site overlaps with another site which was described during the 2006-2007 Tame and Trent Audit (Alrewas Quarry, National Memorial Arboretum and Croxall) and subsequently updated as part of the review of those sites in the previous section of this report. Specific recommendations listed in the 2009 report closely resembled those made during the 2006-2007 audit, any outstanding recommendations were noted in the review of this report previously. Subsequent new site recommendations were made as part of the review of the 2006-2007 audit and are described in **pages 56-59** previously so are not repeated in this section.

Wider Potential Project Opportunities.

Opportunities through HS2

Trentside Meadows

Overview

An area of land adjacent to Trentside Meadow LWS has been put forward by HS2 as a potential mitigation site for losses to a proportion of the LWS through the construction of HS2 Phase 2a accounting for roughly 32% of the site. Trentside Meadows LWS, covering an area of approximately 27.5 ha, is located between the A513 Rugeley Road and the River Trent, east of Pipe Ridware and is designated for floodplain meadow with species-rich grassland. From the HS2 surveys, several protected and BAP species were found on and around the Trentside Meadows LWS, including various bat species foraging along the River Trent, a Barn Owl pair, a potential European Water Vole and the site was also noted to be important for Harvest Mice. The adjacent mitigation site covering approximately 13 hectares currently supports a mixture of species-poor semi-improved grassland and amenity grassland bound by hedgerows. In addition to the area proposed by HS2, in order to complement the planned mitigation works, further habitat creation opportunities have been identified to the west of the mitigation site on either side of the River Trent. This area also supports poor sem-improved grassland alongside arable cropland, tall ruderal and scrub habitats as well as several pools. The aim of any extended area of mitigation would be to provide improved ecological connectivity between the Trentside Meadows LWS and the Bailey Bridge Wetland and Sitch Covert LWS.

Opportunities and recommendations

1. Resurvey Bailey Bridge Wetland and Sitch Covert LWS.
2. On the mitigation site an area of species-rich grassland habitat is to be created, 250 m to the west of the River Trent viaduct, located adjacent to Trentside Meadows LWS, to provide replacement habitat.
3. Provision of grassland and hedgerow habitat on the mitigation site will also support the identified key species.

4. To the west of the HS2 mitigation site, further wet grassland creation will increase the habitat resource, in particular looking at restoring water meadows in the north.
5. Restoration of the river island in the Trent is planned with volume calculations completed for excavation work.

Curborough Woodlands

Overview

This project area has been highlighted as an area where HS2 Phase 1 mitigation, for losses in ancient semi-natural woodland habitat, will be carried out. Whilst mitigation plans for HS2 Phase 1 mitigation are unlikely to change now, the site was included as part of the TTTV opportunity mapping to align habitat creation options. The HS2 mitigation strategy for this area is to compensate for losses to the Ravenshaw Wood, Black Slough and Slaish LWS and consists of woodland planting south of the proposed route and north of Woodend Lane, which connects remaining woodland parcels. The main habitats consist of arable fields some pasture land and semi-natural broadleaved woodland habitat; most of which are designated as LWS. This area being important for its ancient woodland habitats, should be the focus of additional woodland planting if possible as part of TTTV, as well as linking woodland with hedgerows.

Opportunities and recommendations

1. Broadleaved native woodland creation.
2. Increasing links between woodland habitats through planting hedgerows.
3. Improving habitats for farmland birds through arable margin creation.

Quarrying restoration plans

Uttoxeter Quarry

Overview

Uttoxeter sand and gravel extraction quarry is situated north of Uttoxeter and is managed by Aggregate Industries. The main extraction site is surrounded by pasture and the River Dove bounds its eastern edge. North of the proposed project area is the Uttoxeter Quarry LWS important for its species-rich meadows, wet woodland and flush habitat. The site has looked at river channel restoration along the River Dove and there may be the opportunity to revisit this work as well as revisiting restoration plans alongside the planned quarry extension to the north.

Opportunities and recommendations

1. Update survey data and resurvey Uttoxeter Quarry LWS.
2. Look at creating a post quarrying wetland restoration vision with Aggregate Industries and Staffordshire County Council.
3. Vision to include looking at the feasibility of widening the River Dove channel along one side to encourage natural riverine processes to rebuild the channel, with the aim of undertaking work towards the end of the life of the quarry, to avoid potential flooding impacts.
4. Commission flood modelling and analysis to assess impact of river widening on the quarry as well as a historic bridge.
5. Create species-rich wet grassland habitats and restore historic water meadows.
6. Create other wetland habitats around the Uttoxeter Quarry lakes.

Other opportunities

Burton Flood Risk Management Scheme

Overview

The Burton Flood Risk Management Scheme will improve 9 km of existing flood defenses alongside the River Trent protecting more than 4,000 homes and businesses in the centre of Burton upon Trent. The area of the scheme covers the area known as the Washlands, which includes the floodplain extent and its interface

with urban areas. As part of the FRMS there will be a visionary master plan developed to provide a tool with which to inform planning, engage with stakeholders and link with local strategies. The visionary masterplan will help inform the development of ecological landscape of the FRMS area. Broad-scale opportunities are mapped as part of the CRI opportunity mapping update, presented in the CRI opportunities section of this document. Specific project areas were identified from the updated 2006-2007 audit of the Tame and Trent river valleys in Staffordshire, these are listed below.



Opportunities and recommendations

1. From the broad opportunities identified as part of the CRI opportunity mapping, key habitats to be created included wet grassland and wetland, specific opportunities are listed.
2. CRI opportunity: south of Drakelow Nature Reserve on St. Modwens' landholding opportunities include river braiding, creation of reed wetland, wet grassland, wet woodland and to protect the existing ponds of high biodiversity value.
3. CRI opportunity: On Branson Golf Course, pull back inside bends and create fish refuge in tributaries.

4. CRI opportunity: Through the central area of the Washlands there are enhancement opportunities to meadows, woodland and the river, for example reprofiling the left bank and moving material to other side of the flood bank.
5. CRI opportunity: In farmland north of Wetmoor Hall Farm there is an opportunity to carry out arable reversion and create wet grassland to benefit Lapwings as well as river restoration to pull back inside bends of the river and install a fish pass on the weir.
6. CRI opportunity: Create a reedbed alongside the River Trent on land to the east of Clay Mills Severn Trent Sewage Treatment Works.
7. As part of the Woodland for Water opportunity mapping the northern part of the FRMS project boundary identifies opportunities for tree planting in the floodplain as well as riparian tree planting along the Trent and network of drains which lead into the trent (see **Map 2**).
8. The Burton i-Tree Project indicates that Burton upon Trent has a relatively low tree cover and recommends at least 30 hectares of new tree planting with the aim of increasing the diversity of native broadleaved tree species planted, as well as increasing the age diversity of the tree cover to address the young age of the tree population, in particular by making sure that older trees are protected.
9. See Clay Mills, Egginton and Wetmore project plans (**page 34**).
10. See Upper Mills Farm, Burton project plans (**page 37**).
11. See Branston and Drakelow project plans (**page 42**).
12. See Newbold Quarry project plans (**page 45**).
13. See Tucklesholme project plans (**page 48**).

Dovecliff Weir removal (downstream)

Overview

The Dovecliff Weir is the remaining significant barrier to fish passage along the River Dove and is intended to be removed by the EA during the lifetime of the TTV Living Floodplains delivery project, and therefore working with the EA on mitigating for the change in infrastructure is a project priority. The removal of the weir is likely to lower water levels as any backing up of the water is no longer restricted due to the barrier removal, additionally this may be a temporary increase the sediment input to the Dove downstream. The project area runs along the north side of the Dove with mainly semi-natural grassland habitat, there is also some quarrying to the east of the Trent and Mersey Canal. The project objective will tie into the restoration opportunities for wet grassland creation identified through the CRI opportunity mapping on the south side of the River Dove.



Opportunities and recommendations

1. Increase survey coverage.
2. Sediment trapping through addition of woody debris to the watercourse to capture increases in sediment as a result of weir removal.

3. In the southeast relinking palaeochannels which will help slow water flow and capture sediment as well as creating a natural riverine structure and encouraging natural processes.
4. River braiding to encourage silt capture and deposition.
5. Follow EA recommendations from walkover surveys for this section of the Dove to include options such as creating and fencing riparian strips protecting the river from runoff and poaching, increase tree cover along the river, replace stone piling reinforcements with trees, fence pasture land, create more fish refuges by creating backwaters.
6. Species-rich wet grassland creation as well a possible re-wetting of potential historical water meadow in the east.

Old River Dove, Marston-on-Dove SSSI

Overview

This project area is situated upstream of the Dovecliff Weir and north of Rolleston-on-Dove and covers pasture land surrounding a portion of the River Dove. The area supports a mixture of marshy grassland, species-poor semi-improved grassland and a few arable fields to the west, as well as a network of small watercourses and oxbow lakes, which are mostly wooded. The Old River Dove, Marston on Dove SSSI is notified for its tall mixed fen and swamp communities along a historic meander now cut off from the River Dove. The SSSI is also important for its range of eight dragonfly species which makes this one of the best sites for dragonflies in Derbyshire. Two other oxbow lakes have been designated as LWS to the north of the River Dove including Marston on Dove Church Oxbow and Marston Crossing Oxbow. Additionally, there are other designated sites within the project boundary including the River Dove LWS, Marston Junction Disused Railway, Egginton Disused Railway, Dovecliff Drain Pond, Burton Old Railway and Dovecliff Ponds 1 and 2. The area is also important for its historic water meadows particularly to the south of the River Dove.

Opportunities and recommendations

1. Re-linking palaeochannels where it does not affect the existing SSSI.

2. Creating species-rich wet grassland which can also hold flood water when the river is elevated.
3. Buffering the SSSI with transitional wet grassland habitats.
4. Buffering the River Dove and creating fenced riparian strips in line with EA recommendations from the walkover surveys along this section of the river Dove. The relinking of the palaeochannels will help to meet targets for increasing fish refuges along this section.
5. Creation of small dragonfly pools to increase open water habitat resource.
6. South of the River Dove there are opportunities for riparian tree planting alongside Mill Fleam in accordance with Woodland for Water recommendations.

Additional areas for further investigation

As part of the biodiversity opportunity mapping session held on the 28th February 2018, further potential projects within the TTV project area include:

- Toad Hole, Burton upon Trent wet woodland restoration.
- There are opportunities to link with Lichfield District Council to target biodiversity offsetting of various planning applications coming forward. The biodiversity offsetting will secure long-term management of up to 25 years on restoration sites. Potential sites include land around Fradley, Catton Hall, and Rugeley Power Station.

Conclusion

Broad-scale opportunity mapping

The broad-scale opportunity mapping gathered a range of different environmental datasets culminating in a map. This illustrated a range of general and more specific targets for key habitats and projects. Recommendations were made for woodland, wetland, grassland, watercourses and farmland birds, with the specific detail for opportunities held within the GIS layer. This resulted in 2,381 hectares of woodland opportunities across the project area, 441 hectares of wetland opportunities, 1,771

hectares of grassland opportunities, 800 hectares of farmland bird opportunities and 36 km of recommended watercourse improvements.

The opportunities that have been identified cover a wide range of options ranging from broader suggestions such as improving the network of hedgerows and connecting habitat between existing sites of interest, to more specific recommendations such as removing Dovecliff weir to create a passage for fish. Some of the key targets that were derived include water meadow restoration, which is a priority around Uttoxeter, west of Egginton, alongside the River Dove to the east of Willington and around Wychnor. Species-rich grassland restoration and creation is recommended alongside both the River Trent and the River Dove, with potential areas amounting to 782 hectares in total. Woodland opportunities are to focus on riparian buffering of watercourses, particularly north of the River Dove, with a few areas such as north of Curborough, specifically targeted for wet woodland creation. The numerous quarries in the area present a large-scale opportunity for the creation of wetlands, and the arable land south of Kings Bromley would be a key target area for improving hedgerow and arable margin connections for farmland birds. The majority of the recommendations are aspirational and provide an evidence base on how to meet biodiversity targets through a connected landscape.

More detailed targeting of projects was produced through the opportunity mapping drop-in session, which identified areas where the opportunities were more tangible. 13 potential projects were identified and these are explained in more detail in the wider potential project opportunities section, with the exception of three of the projects targeted in the Central Rivers area (Newbold and Tucklesholme Quarry, Whitemoor Haye Quarry and Barton Quarry and Catton Hall), which are explained in the updated 2006–2007 Biodiversity Audit of the Tame and Trent River Valleys section.

At this stage, the projects listed under the wider potential project opportunities have not had costings attributed to them. The next stage is to contact respective landowners to determine the feasibility of opportunities as well as ground truth the

areas to refine project plans. Some sites have potential funding opportunities attached to them, especially with regards to the biodiversity offsetting sites which may incentivise landowners' involvement.

Audits

A total of 17 sites covering 3,336 hectares were identified from existing audits and reviewed, generating approximately 80 project proposals. Project proposals range from small-scale interventions such as the control of Himalayan Balsam by volunteers, to large-scale projects for instance river re-profiling requiring multiple contractors, consultants and consents and lasting multiple days or weeks. Due to the range of scale in project proposals, there is also a range of costs from free, inexpensive proposals (Himalayan Balsam pulling with volunteers or tree planting to link ancient woodlands), to relatively expensive proposals such as river bank re-profiling at Croxall Lakes.

There is a total of approximately £500,000 worth of project recommendations as a result of previous audits, however this does not take into account works such as the submission of planning applications for mineral operators and developing new restoration plans, which would significantly increase the cost of any project proposals on mineral extraction sites. Having a suite of projects with different cost values is of benefit as this enables project managers to 'cherry pick' projects based on available budgets, for instance where one project may be too costly there may be another which is more appropriate, and can therefore still deliver biodiversity benefits.

The diversity of landowners throughout the project area provides a huge range of both challenges and opportunities. Communication, building relationships or even in some cases identifying landowners to approach, will be critical in ensuring that project proposals can be delivered successfully.

A potential future desk-based study has been proposed, to identify the most suitable locations where ponds and woodlands could be created to connect areas of existing good quality habitat. This will investigate several sites in more detail and will help to inform and develop future practical works in the project area.

Several sites identified in the review of audits could be looked at in more detail as ground-truthing has not been carried out for some time, and significant changes to habitat and land use may have occurred. Further to this, many LWSs have not been resurveyed in several years, and have been identified as being in need of updating through the review. Following this, resurveys may lead to management recommendations or possible discussions with entry into a current Environmental Stewardship Scheme to further improve habitats or aid in the recovery of degraded or degrading habitat, as highlighted through survey.

Funding

Several funding opportunities have been mentioned throughout the Natural Heritage Audit. The Living Floodplains HLF delivery project will have a budget for capital costs, with opportunities for linking with the EA to undertake restoration of the floodplain through the Burton Flood Risk Management Scheme and the removal of Dovecliff Weir. Additionally, biodiversity offsetting as a funding option, has been highlighted through discussions with Lichfield District Council, as well as offsetting the HS2 development. There are also good links with several of the quarry companies in the area which may be able to fund work detailed within the restoration plans. Woodland planting carried out with the support of the National Forest Company may present an opportunity for gaining funding through woodland grants. Furthermore, targeting some of the farmland bird opportunities could be done through securing Countryside Stewardship on landholdings.

Recommendations

In order to develop the opportunities identified as part of this audit further, a number of recommendations are considered. Initially, contacting key landowners will be a priority for the more detailed projects. The relationship with landowners is variable across the sites, ranging from some sites where contact has not been established to those where project plans have already been discussed with landowners particularly for many of the projects which were derived from previous audits. Further investigation is needed for the broad-scale opportunities, establishing land ownership, ground-truthing the land and discussing options with interested landowners as well as considering costings as more funding becomes available. A list of priorities has been developed:

- Discuss project plans with landowners and establish their commitment.
- Ensure baseline surveys are completed for all project sites.
- Update project plans following surveys of project areas and produce more detailed costed proposals.
- Carry out feasibility studies if required to draw upon EA LiDAR data, and undertake various tests such as soil sampling, test pits, water level monitoring and analysing bathometric data to inform rewetting projects.
- Carry out water quality monitoring if required.
- For projects which involve work within watercourses, apply for the relevant consents; working online in streams and tributaries with need consent from Staffordshire or Derbyshire County Council and working within a main river will need consents from the Environment Agency. These will need to be applied for before work is undertaken, and can take several months to receive the consent.
- Great Crested Newt surveys may need to be conducted where work will affect existing ponds.
- For grassland restoration work, baseline surveys of vegetation composition should be completed in order to establish the nature of the restoration

opportunity required such as how much the sward would need diversifying as well as providing a means of reviewing restoration works.

- Source sites will need to be identified for any habitat creation work utilising a seed source. Permissions will need to be sought from the landowner, firstly to carry out surveys of the vegetation and if the sward is species-rich, to collect the seed. Seed should be locally sourced and should be appropriate to the local area.
- Where land is in an existing Environmental Stewardship scheme a derogation request may be needed from Natural England where a variation is proposed to the management of the land, including habitat creation work.
- Any work on a SSSI will need a 'Notice of proposal to carry out an operation on an SSSI' obtained from Natural England.
- Review and update the broad-scale key habitat opportunities, obtaining detail through survey work, as well as establishing contact with landowners to develop further projects as funding permits.
- Source contractors where required, to undertake work set out in the specifications of the project plans.



The River Dove: Monks Bridge and aqueduct

Acknowledgements

Authors and contributors: Victoria Bunter (Staffordshire Wildlife Trust), David Cadman (Staffordshire Wildlife Trust), Oliver Foulds (Derbyshire Wildlife Trust), Angela Mayson (Derbyshire Wildlife Trust), Rory Middleton (Staffordshire Wildlife Trust).

Produced with support and input from: Tim Brooks (Environment Agency), Helen Dale (Staffordshire Wildlife Trust), Kate Dewey (Staffordshire Wildlife Trust), Tom French (Derbyshire County Council), Ali Glaisher (Staffordshire County Council), Will Groves (Environment Agency), Sue Lawley (Staffordshire County Council), Justine Lloyd, (Lichfield District Council), Anna Maxwell (Staffordshire Wildlife Trust), Louise Morris (TTTV Project Manager), Nick Mott (Staffordshire Wildlife Trust).

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This document should be cited as:

Bunter. V., Cadman. D & Middleton. R. (2018) **Transforming the Trent Valley Natural Heritage Audit Report**. Staffordshire Wildlife Trust, Stafford.

Glossary

Biodiversity Action Plan (BAP) – A plan that sets objectives and actions for the conservation of biodiversity, with measurable targets, following the UK Biodiversity Action Plan, published following the 1992 Rio de Janeiro Convention on Biological Diversity.

Biodiversity offsetting – A system used predominantly by planning authorities and developers to fully compensate for biodiversity impacts associated with economic development, through the planning process. Offsets should aim to achieve no net loss and preferably a net gain of biodiversity, and be managed or maintained in perpetuity.

Citizen science – The collection and analysis of data relating to the natural world by members of the general public, typically as part of a collaborative project with professional scientists.

Ecological networks – A way of thinking about landscapes and how we can create linkages between key wildlife areas to benefit habitats and species. Ecological networks are created by identifying opportunities to connect habitats through the provision of corridors, stepping stones and buffer zones.

Ecosystem Action Plan (EAP) – In Staffordshire, Habitat and Species Action Plans are replaced with 14 "Ecosystem Action Plans", the Staffordshire BAP aims to prioritise conservation management at a landscape level and contribute to local, regional and national conservation targets.

Ecosystem services – These are the benefits which the natural environment produces that are freely utilised by humans including carbon storage, flood mitigation, and food production.

Good overall status – An assessment of the biological quality of UK watercourses based on standards set in accordance with the Water Framework Directive and other EU water directives.

Habitat and Species Action Plan – Measurable targets for priority habitats and species which set out the priorities, which will contribute to meeting local and national BAP conservation targets.

Historical water meadow – The control of water in fields by a system of channels, sluices and ditches, enabling the management of water levels manually with the aim of encouraging early and lush growth of grass. These differ from floodplain meadows which flood naturally. Historical water meadows are an important part of our agricultural heritage for managing land in the floodplain.

Local Wildlife Sites – Areas that are locally important for the conservation of wildlife, identified and selected locally by partnerships of local authorities, nature conservation charities, statutory agencies, ecologists and local nature experts using robust scientifically-determined criteria and detailed ecological surveys. They are identified and selected for the significant habitats and species that they contain.

Natural capital – The naturally occurring assets and systems that sustain life on Earth, including minerals, soils, and nutrient cycles, water and hydrological cycles, cellular life (for example, plants, animals and bacteria), energy resources, and atmospheric and climatic processes.

Natural Flood Management (NFM) – Natural Flood Management is the alteration, restoration or use of landscape features, working with natural hydrological and morphological processes, in order to reduce flood risk.

Natural heritage – Natural heritage refers to the sum total of the elements of biodiversity, including flora and fauna, ecosystems and geological structures. Heritage is that which is inherited from past generations, maintained in the present, and bestowed to future generations.

Palaeochannel – A remnant of former river or stream channel which is inactive and filled with younger sediment.

Priority habitats (Habitats of Principal Importance) – Habitats of Principle Importance (HPI) included in the England Biodiversity List published by the Secretary of State under section 41 of the Natural Environment and Rural Communities Act (NERC) 2006.

Priority species (Species of Principal Importance) – These are defined as those listed in the NERC Act 2006. Schedule 41: Species of Principal Importance in England, and Staffordshire Biodiversity Action Plan (SBAP) Priority Species.

Protected species – These are defined as those listed on the Birds Directive, Habitats Directive, Badgers Act, and the Wildlife and Countryside Act 1981 excluding those on Schedule 5 (section 9.5) sale only.

Site of Special Scientific Interest (SSSI) – SSSI is a statutory designation placed on an area of land that is considered to be of special interest by virtue of its fauna, flora, geological or geomorphological features. Owners and occupiers of SSSIs are required to obtain consent from Natural England if they want to carry out, cause or permit to be carried out within the SSSI, any activity that may affect the interest of the site.

Special Area of Conservation (SAC) – A SAC is a site designated under the Habitats Directive.

Sustainable Drainage Systems (SuDS) – SuDs are a natural approach to managing drainage in and around properties and other developments.

Water Framework Directive (WFD) – European Union legislation – Water Framework Directive (2000/60/EC) – establishing a framework for European Community action in the field of water policy.

Woodlands for Water – Woodland planting to improve water quality and reduce flood and contribute towards objectives for the WFD.

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Appendices

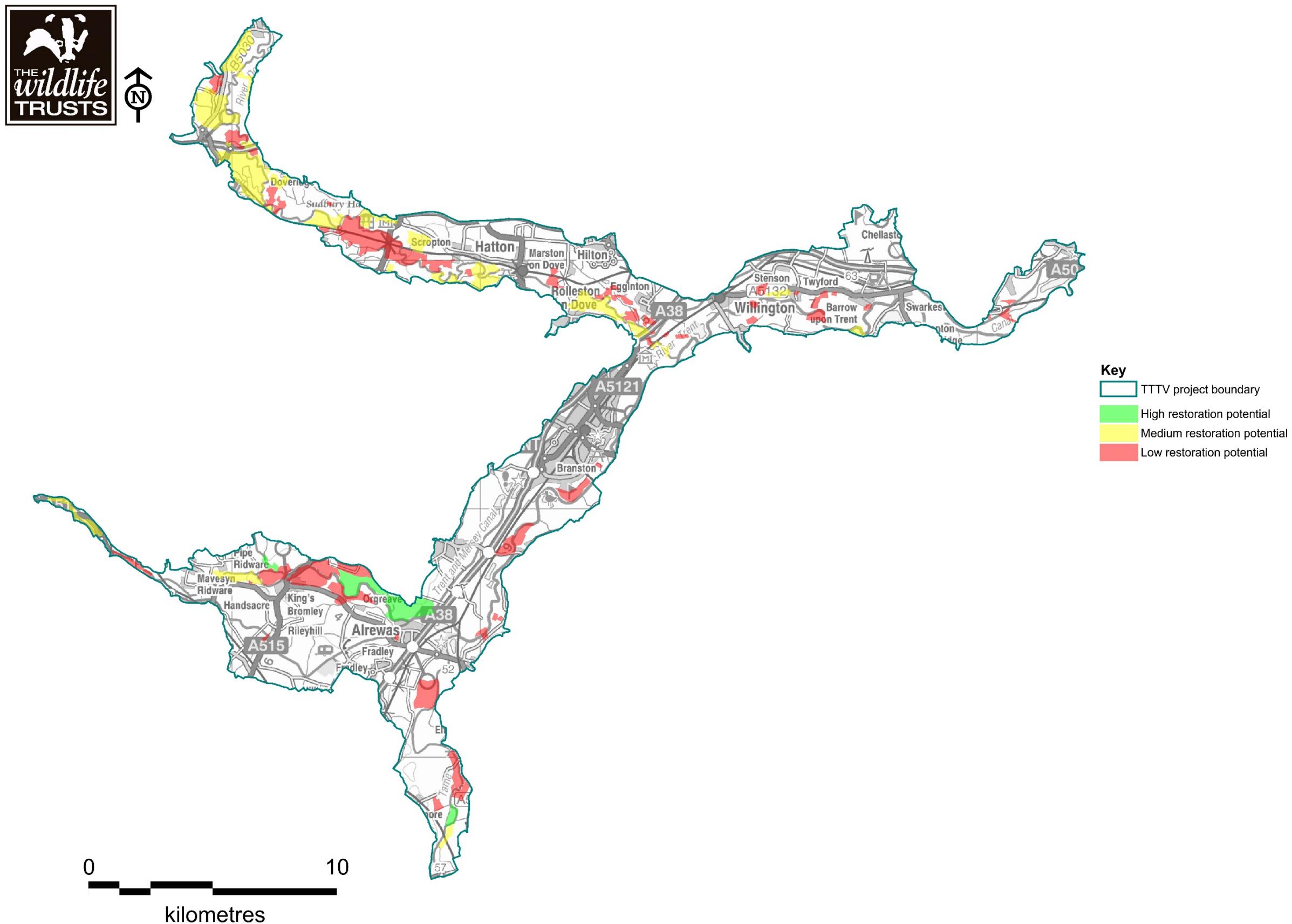
Appendix 1: TTV NHA GIS Datasets

Geographical Information Systems (GIS) datasets used in the compilation of the Natural Heritage Audit were:

1. Staffordshire Habitat Mapping (1996-2017) (© Staffordshire Wildlife Trust)
2. Derbyshire Habitat Mapping (© Derbyshire Wildlife Trust)
3. Staffordshire Local Wildlife Sites Inventory (1996-2017) (© Staffordshire Wildlife Trust)
4. Derbyshire Local Wildlife Sites Inventory (© Derbyshire Wildlife Trust)
5. Staffordshire Protected and Priority Species Information (© Staffordshire Ecological Record)
6. Central River Initiative Biodiversity Opportunity Mapping (2013) (© Central Rivers Initiative)
7. Environmental Stewardship Scheme (2016) (© Natural England)
8. Staffordshire Water Meadows (2008) (© Staffordshire County Council)
9. Staffordshire Mineral Sites (© Staffordshire County Council)
10. Staffordshire Palaeochannels (© Staffordshire County Council)
11. Lichfield District Council Housing & Employment Allocation Sites (2017) (© Lichfield District Council)
12. East Staffordshire Borough Council Housing & Employment Allocation Sites (2017) (© East Staffordshire Borough Council)
13. Flood Risk Data (2017) (© Environment Agency)
14. Land Use Data (2017) (© European Union, Copernicus Land Monitoring Service 2017, European Environment Agency (EEA))
15. The National Forest Tender Scheme (2017) (© The National Forest)
16. Tame & Trent Biodiversity Audit (2006-7) (© Staffordshire Wildlife Trust)
17. Staffordshire Washlands Assessment (2009) (© Staffordshire Wildlife Trust)

18. Sites of Special Scientific Interest (© Natural England)

Appendix 2: Historic Water Meadow restoration potential sites map.



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