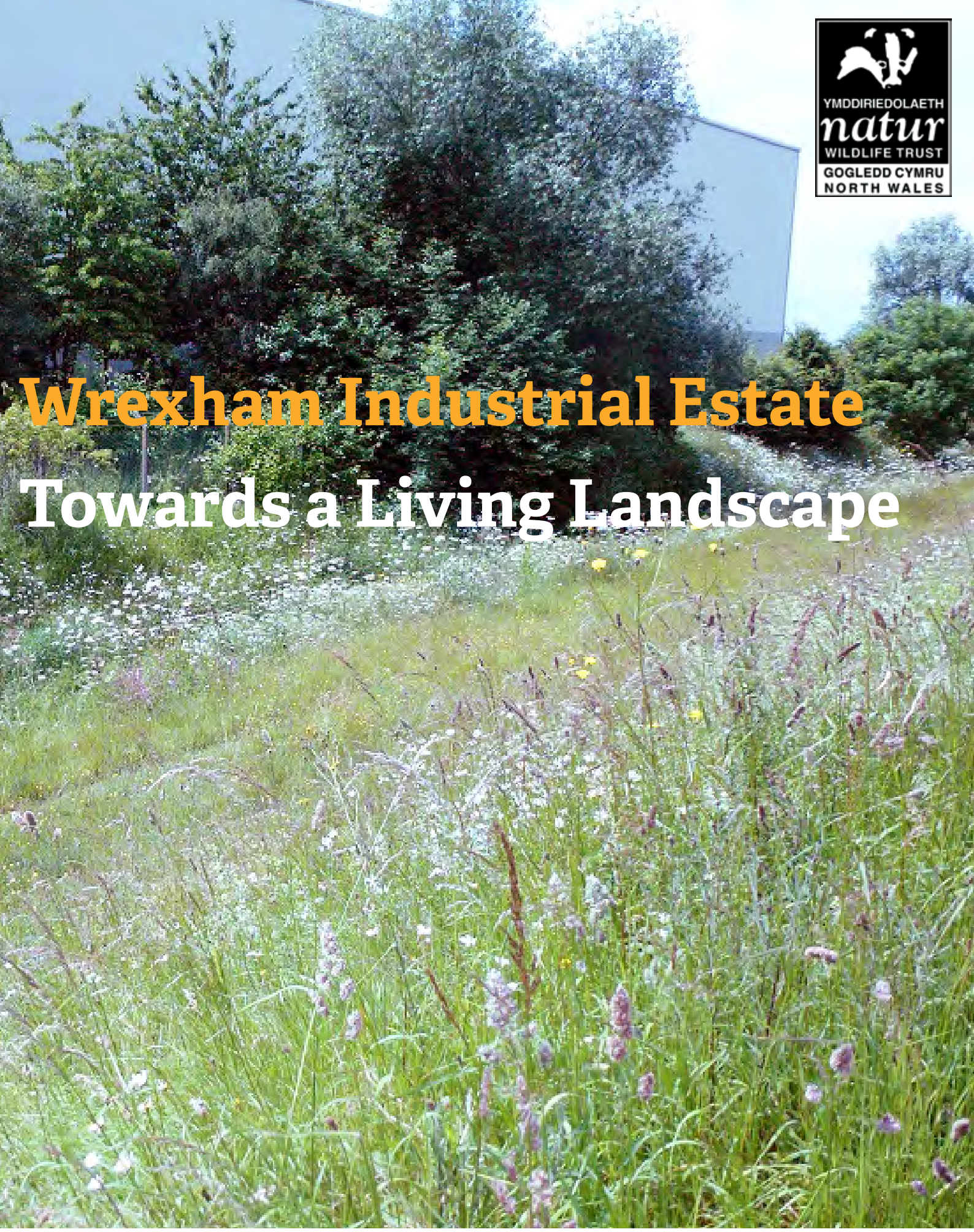


YMDDIRIEDOLAETH natur WILDLIFE TRUST GOGLEDD CYMRU NORTH WALES

Wrexham Industrial Estate

Towards a Living Landscape

Partneriaeth Bioamrywiaeth Cymru Wales Biodiversity Partnership

buglife Cymru

wrexham wrecsam

Butterfly Conservation Wales

Cyfoeth Naturiol Cymru Natural Resources Wales

SP MANWEB

Ariennir gan Lywodraeth Cymru Funded by Welsh Government

Protecting **Wildlife** for the Future

Contents

Front cover: Redwither Brook © Clare Williams (Butterfly Conservation)
This page: Narrow-bordered Five Spot Burnet Moth © Clare Williams (Butterfly Conservation)

Foreward

A natural place to build a better business

Nature on the doorstep is good for people, and it is also very good indeed for business. There is plenty of sound scientific evidence to show that access to nature brings lasting health benefits. A break of as little as three or four minutes in green surroundings is enough to reduce stress to a measurable degree. The pulse rate slows, tense muscles relax and people feel calmer. The economic benefits that accessible greenspace brings to business are rather less well known.

Most businesses have a dependence on biodiversity, either directly or indirectly. Natural systems provide many raw materials, renewable energy, waste processing and a host of other services. It is also becoming clear that there are other, less obvious commercial gains. Research shows that a view of natural greenery from the window can aid concentration, improve problem solving and reduce tension in the workplace. The sound of birdsong on arrival at work, some natural breathing space for breaks between meetings and the opportunity to take a little gentle exercise in the open air have all been shown to improve staff morale and general well-being. A business in attractive surroundings, with a calm atmosphere is a pleasure to work in and creates a very positive impression for commercial business partners when they visit. Working in a natural green environment has also been shown to increase job satisfaction, lower the levels of absenteeism and reduce staff turnover. For all these reasons the Living Landscape in and around the Wrexham Industrial Estate is an enormous natural asset that can be helped to grow in value over time. If managed well, it can bring lasting benefits for local residents, businesses and visitors as well as the wildlife itself.

There is plenty of international research to confirm these claims, but in fact most of us know it anyway. People with the greatest choice prefer to live in tree-lined streets and leafy neighbourhoods. We know that a walk in the park, an hour in the garden or a round of golf help us to feel better, and it is no coincidence that the senior executives in most organisations have the offices with the best views in the building.

In the pages that follow it will become clear just how rich a resource the Wrexham Industrial Estate's Living Landscape already is. The green spaces that weave their way between the buildings, the car parks and roads create a mosaic of wildlife habitats far richer than any equivalent area of land in the farming countryside. The survey and mapping of this

habitat network undertaken via this project has provided an authoritative record of the estate's natural resources, and the findings so far are impressive. The overall impression is one of rich natural diversity, but there are also some rare and uncommon species living here. This is a Living Landscape with an abundance of song birds, with a great variety of wildflowers and emerging woodland, and with important populations of butterflies, newts, hedgehogs and many of the other wild plants and animals that help to make close contact with nature so interesting and enjoyable for people.

The Living Landscape of the Wrexham Industrial Estate is already an attractive place in which to do business, but it could be even better. Clearly it is very important to protect the most sensitive pockets of habitat and there is plenty of scope for improving the existing habitats through skilled management. Over time these special areas will extend their influence and spread their wildlife throughout the network of green corridors and other less well-established green spaces. Importantly, in the future the built environment itself can make more of a contribution. Some improvements such as bird feeding stations and the planting of more flowers for pollinators would be simple. Others, such as green roofs, green walls, surface drainage wetland schemes and car park planting programmes would be more ambitious. There is also scope for businesses to make more creative use of the Living Landscape. There are opportunities for volunteering as a part of corporate team-building, for working with schools and other local organisations as a contribution to corporate social responsibility. Business could also use the landscape as creative breakout space and as a testing ground for new ideas.

Many of these positive improvements to the Wrexham Industrial Estate will also provide valuable benefits for the people who live in the area. This is a Living Landscape which combines attractive surroundings and extremely rich wildlife habitat with many practical facilities for people. There is extensive off-road car parking and the growing network of well signed footpaths and cycleways will make access increasingly easy and enjoyable. Increased levels of on-site information and interpretation will help those visiting the landscape to learn more about their surroundings and discover some of the hidden secrets of the natural landscape. Their observations will help to increase awareness and understanding of the Wrexham Industrial Estate's wildlife and through the involvement of school study projects, special interest groups and practical volunteering there will be a great many opportunities for local people to become actively involved with the developing landscape.

The North Wales Wildlife Trust sees members of the industrial estate's business community as some of its most important long-term partners. Active enjoyment of the Living Landscape for the people who work here is one of the Wildlife Trust's highest priorities, and in return there is an opportunity for businesses to contribute to nature conservation in a host of inspiring ways. The potential for positive partnerships is very powerful. As commerce, conservation and the community combine forces, this will become a model of best practice. It will help to attract new businesses, to justify further inward investment and to inspire and encourage more environmentalists to collaborate with business leaders. The Wrexham Industrial Estate's Living Landscape promises to become a natural leader in the field of sustainable development. Together we can set new standards for mixing work and wildlife at a time when creative conservation, job satisfaction and creativity in the workplace have never been more important.

CHRIS BAINES

1 Introduction

Polecat (*Mustela putorius*)

1.1 A Living Landscape

A Living Landscape is a recovery plan for nature championed by The Wildlife Trusts since 2006. It is a new way of thinking about how we manage land to do more for wildlife, people and the economy.

Nature conservation in the UK has traditionally focused on the preservation of specific sites. But outside these few places, natural habitats have been lost on an unprecedented scale and many species, both common and rare, are in long-term decline. As the demand for land for agriculture, housing and development has increased, so the room for wildlife and natural processes has decreased. This has resulted in small oases of wildlife-rich protected land, such as nature reserves, becoming surrounded by an otherwise inhospitable landscape for many plants and animals.

This has slowed but not stopped the decline in biodiversity as these areas alone cannot prevent continuing declines of many species of flora and fauna. Now, especially in the face of climate change, it is essential that we take a broader view of the environment, in which economic, social and natural processes are encouraged to operate sustainably to the benefit of people and wildlife. To rebuild nature and ensure that future generations succeed, a new more ambitious approach to wildlife conservation is needed.

The Wildlife Trusts are aiming to transform the environment we live in: restoring, recreating and reconnecting wildlife-rich spaces in rural and urban areas by working together with partner organisations, local communities, landowners, schools and businesses. Our aim is to create a landscape within which wildlife thrives and people prosper together in clean, healthy and sustainable environments.

We need to develop a more integrated landscape-scale approach to wildlife conservation and land management to benefit all our native species and habitats across networks of sites throughout entire landscapes. Areas we conserve need to be larger, greater in number, be better managed and better connected, both within and between sites, improving the ability of species to move through the landscape. Management to improve connectivity involves removal of barriers to dispersal as well as management to improve habitat availability within the landscape and this can include the whole range of land-use types from national parks and nature reserves to parks, gardens and road verges. An important component of this approach is that it integrates protected sites, nature reserves and all other areas of high biodiversity value and thereby both uses and strengthens their special roles in wildlife conservation.

A Living Landscape involves the creation of robust, resilient and connected landscapes on a large scale that are highly valued and accessible to people; full of wildlife and rich in opportunities for learning, health, well-being and economic development. We wish to reconnect fragmented habitats so that wildlife can move more freely and to reconnect local people with their natural environment, providing easy access to high quality, biodiverse greenspaces and improving their health and well-being as well as offering opportunities for learning and development. What is good for wildlife is also good for people, communities and businesses.

1.2 The Wrexham Industrial Estate

The Wrexham Industrial Estate is situated to the east of Wrexham town in North Wales. At around 550 ha in size it is the largest industrial estate in Wales and one of the largest in Europe. It is home to approximately 300 businesses and provides employment for around 7000 people.

The Wrexham Industrial Estate has its origins as a Royal Ordnance Factory established soon after the start of World War II in 1939 to produce cordite, an explosive propellant for shells. The factory complex was deliberately spread

out to minimise damage from any aerial attacks. After the war, the demand for cordite decreased significantly and the facility was closed in 1945. Many of the buildings and much of the infrastructure was left in place and the land abandoned. From the late 1940s businesses began to re-occupy the site, many using the disused Royal Ordnance Factory buildings. Some of the disused buildings were also converted for housing for key workers and this established the Pentre Maelor housing estate to the south west of the site, which is still present and occupied by a small local community. In due course, major companies such as British Celanese and Firestone established factories on the site and others were later encouraged by the Welsh Development Agency, which designated the site as the official Wrexham Industrial Estate in the late 1970s. Businesses have come and gone but today the Wrexham Industrial Estate remains a major centre for employment with companies such as JCB, Kellogg's, Calypso and Wockhardt having factories based there. The new Wrexham Prison is situated on the site formerly occupied by the Firestone tyre factory (which closed in the 1970s).

As the Wrexham Industrial Estate was formerly low-lying traditionally managed farmland, woodland and scrub, with many hedgerows, ponds and trees present, the site has always supported a range of habitats and species. The Wrexham Industrial Estate's history, including the occupation, abandonment and reoccupation of land has proven beneficial to many species. Plots of land left unmanaged for long periods of time, free of pesticides and fertilizers, developed into rough species-rich grassland and scrub, supporting mammals, amphibians, reptiles and birds. The demolition of disused buildings often provided bare and rubble-strewn ground which is important for early colonising species.

Today, the Wrexham Industrial Estate still contains an important network of habitats, including County Wildlife Sites, which support a diverse range of wildlife, including many species that are protected and/or Welsh Priority Species (NERC Section 42). Examples

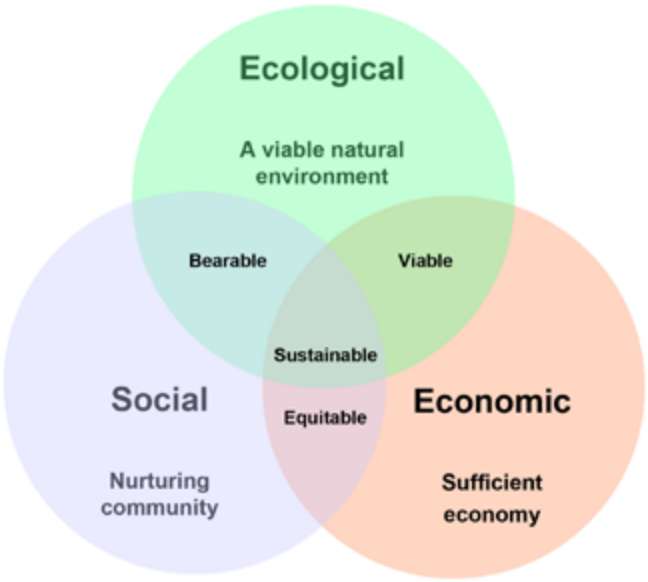


Fig 1. Three Pillars of Sustainable Development

of species that have been recorded within the Wrexham Industrial Estate include Water vole, Otter, bats, Grizzled Skipper and Dingy Skipper butterflies, Great Crested Newt, Barn owl and Kingfisher. Some of these important species, especially those that require very specific habitat conditions, are threatened on the Wrexham Industrial Estate due to habitat loss and fragmentation as a result of development, and deteriorating habitat suitability. As populations decline and become more isolated the chances of local extinction increase. Should a local population become extinct, good connectivity allows natural recolonisation to occur.

Due to the special attributes of the Wrexham Industrial Estate; its wildlife, businesses and people, it presents an excellent opportunity to try to properly integrate the Three Pillars of Sustainable Development (Social, Economic and Environmental elements of society) in a mutually beneficial way.

With good future planning the Wrexham Industrial Estate can continue to develop as a strategic employment centre fostering economic growth and prosperity in the region, being an attractive place to live, work and visit, whilst also benefitting wildlife and becoming an exemplar site for sustainability in Wales and beyond.

1.3 The value of the Living Landscape

There is a very long history of mixing nature and the built environment. From the fabled Gardens of Babylon and the monastery gardens of the Middle Ages, right up to modern times, enlightened people have seen the value of providing green spaces close to where people live and work. In the 19th Century Britain led the world in commerce, trade and industry and a key feature of the industrial revolution was the public parks and gardens that grew up alongside factories and homes in the fast expanding towns and cities. Business leaders and local politicians recognised the good sense of providing easy access to fresh air and gentle exercise in natural green surroundings. It was seen as an effective way of keeping workers and their families fit and healthy. Those urban parks and tree-lined avenues are still prized features of our urban heritage today.

A hundred years ago, Britain led another world-class green revolution with the planning of garden cities such as Letchworth, Welwyn, Bournville in Birmingham and Port Sunlight on the Wirral. Again, most of these models of green development were fostered by commerce and industry. It was the more imaginative businesses that recognised the way in which a leafy work environment could encourage company loyalty, creativity, productivity and profitability. That idea was revived in the 1970s and 80s in New Towns such as Warrington and Redditch, and it is thriving again today, with politicians of all parties working with industry to develop eco-towns and a new generation of garden cities in several areas of the country.

The greening of towns and cities is being adopted on a grand scale in many of the world's major cities. Beijing is planting a forest of tens of billions of trees to create the Great Green Wall of China as a way of filtering sand storms and purifying the capital's air. In Seoul, capital of South Korea, an eight lane urban motorway has been completely removed in order to restore ten miles of the buried river Cheonggyecheon. This remarkable decision has brought a ribbon of green parkland into the heart of the city, and provided a more ecological solution to the recurring problem of storm water flooding. Stuttgart, in Germany, is a particularly green city where the public transport system provides a striking network of wildlife corridors alongside bus and tram

High Line Park in New York City

Cheonggyecheon in Seoul, South Korea

routes. Malmo in Sweden and Portland in the USA are just two of the places where a blue/green land use strategy is helping to deliver more absorbent urban landscapes, clean up water pollution and reduce flood risk. In New York the greening of a redundant elevated railway viaduct to form the "Highline" linear park is credited with kick-starting the economic recovery of whole downtown neighbourhoods.

Green spaces between buildings can help to reduce the impact of flooding, clean and cool the air and bring people and nature closer together. Planners now refer to this strategic approach to the Living Landscape as functional green infrastructure. For most people it is simply recognised as providing a more attractive environment where wildlife, physical comfort and the changing seasons can be enjoyed on a daily basis. This undoubtedly has great popular appeal and it can lead to a whole range of commercial benefits. Research has shown that homes in green streets are frequently valued 15% to 20% more highly than those in less well treed neighbourhoods. On green and leafy commercial developments, tenancies may be sustained for longer and businesses tend to benefit from greater levels of staff retention, reduced absenteeism and more successful recruitment of key personnel. An attractive green setting also creates a good impression for customers, clients and visitors.

1.4 Improving the Living Landscape

The Living Landscape of the Wrexham Industrial Estate has grown up largely unaided as nature has established a wild network of green spaces amongst the existing buildings. The relative absence of agrochemical pollution and human disturbance has created a rich landscape that is already full of wildlife. The detailed habitat surveys and the landscape appraisals that form the basis of much of this document provide an exceptional knowledge-base from which to improve the landscape even further.

As a first priority it is essential to protect the very richest pockets of wildlife habitat, and to manage them in ways that will conserve and enhance them. They are important assets and some of them are irreplaceable. The species-rich ponds and small patches of wildflower

meadow, the oldest of the hedgerows and the long-established water courses all have vital roles to play. They can provide models for the new and improved habitats that will be established across the wider landscape. They will also serve as small reservoirs of the species of wild plants and animals that will be encouraged to extend their range across the whole of the Wrexham Industrial Estate and its greenspace network.

There is ample scope for traditional nature conservation work here, with space for new planting to strengthen the ecological corridor system, for improvement to the various ponds and streams by managing the waterside vegetation and by introducing more wildflowers into areas of established grassland. The buildings themselves offer additional opportunities for habitat improvement. Low key and low cost schemes to erect nesting boxes and bat roosts can make a considerable difference and there is also scope for more ambitious projects. It should be possible to establish green walls and green roofs on some of the existing buildings, and to incorporate such ecological features when new buildings are being designed. These green elements will undoubtedly benefit the wildlife, but with care they can also improve the energy efficiency of the buildings, help to harvest rainwater and make the structures more attractive.

In the immediate vicinity of buildings each associated landscape can be designed and managed to add further ecological value to the whole Wrexham Industrial Estate. A surface car park need not be a bleak sheet of tarmacadam. Instead it can be treated as a useful and attractive addition to the habitat network. New trees can provide welcome shade in the summer and shelter in the winter, whilst the surface rainwater can be drained into open ditches as additional habitat for wetland plants and animals. Where there is room for more decorative planting adjacent to work places, then these office and factory landscapes can function as habitat for butterflies and other wildlife, and also offer scope for regular bird feeding. Equally importantly they can also serve as important breathing spaces where workers, visitors and the local community can enjoy Wrexham's wildlife at close quarters.

The new prison with its 2,000 residents, its training and education programmes and its workshops, nursery facilities etc. offers a unique opportunity to add particular value to the Living Landscape of the Wrexham Industrial Estate. The prison landscape itself can provide a relatively undisturbed environment for wildlife, and there should be scope for the prison service to manufacture items such as nesting boxes, benches, footbridges, signboards and a whole range of other products that can help to enhance access, enjoyment and understanding in the surrounding Living Landscape. There may be scope for working with prisoners to catalogue wildlife records, to grow trees, shrubs and wildflowers from locally harvested seeds, and to assist in communicating the features of the landscape and its wildlife to the wider community. There is also considerable evidence of the therapeutic role that contact with nature can play in such relatively stressed communities.

1.5 The Living Landscape as an asset for everyone

As the network of footpaths and bridleways becomes better signposted and managed, the Wrexham Industrial Estate is likely to become an increasingly popular destination for local people to enjoy. There is great potential for the estate to become a valuable environmental education facility for local schools and colleges, and it will also become a focus for practical conservation work by volunteers, for work experience and for community service.

The development of a long-term partnership between the North Wales Wildlife Trust, the local authority, Natural Resources Wales and the local business community will also present all of them with opportunities to make creative and productive use of the Living Landscape. Resident businesses will have a facility on the doorstep which can help to provide staff training, which can appeal to

employees families and friends, and which can make Wrexham an increasingly attractive and successful working environment. The Wildlife Trust will enjoy an increasingly fruitful relationship with a large number of successful local enterprises and organisations, and the local authority will benefit from an enhanced reputation for fostering such an innovative demonstration of sustainable development.

As Wrexham's reputation for industrial innovation in such natural green surroundings achieves wider publicity, then it is reasonable to expect that this will attract more inward investment. The Living Landscape is a concept that is bound to appeal to companies that depend on their commercial success, attracting and retaining high calibre professional staff. There are many successful science parks and enterprise estates around the country where the quality of the environment is a major selling point. However there are very few that give such a positive emphasis to the value of the natural world, and which can offer such easy access to high quality wildlife habitat. In an era when stress in the workplace is being so clearly linked with health, well-being and productivity, the Living Landscape of the Wrexham Industrial Estate should be actively marketed as a flagship example of the natural working environment of the future.

Migrant Hawker (*Aeshna mixta*)
© Sue Loose

1.6 The Living Landscape Development Project

The North Wales Wildlife Trust secured funding from the Welsh Government's Resilient Ecosystem Fund (REF) to begin to develop a Living Landscape scheme for the Wrexham Industrial Estate. As described above, the long-term aim of this scheme would be to successfully integrate the needs of the economy, environment and society in a genuinely mutually beneficial way, making the area attractive to businesses as well as providing benefits to wildlife and people.

The North Wales Wildlife Trust worked with a number of partners on this project: Buglife, Butterfly Conservation Wales, Wrexham County Borough Council and Professor Chris Baines.

This Living Landscape Development Project undertook three main activities:

1. Data collation, habitat surveys and mapping

2. Engagement with businesses and other stakeholders

3. Development of an ethos, vision and long-term strategy proposal for the Wrexham Industrial Estate

In order to protect, restore and join-up habitats, it was important to determine what is often described as the 'Green Infrastructure' present on the Wrexham Industrial Estate, i.e. the types, locations and status of habitats on the Wrexham Industrial Estate. The importance of

each habitat was considered along with which species they might support, how areas may be used by wildlife, habitat connectivity as well as actual and potential threats to habitats and species. In addition to this, the project also assessed the 'Amenity Infrastructure' present on the Wrexham Industrial Estate, i.e., public and permissive footpaths, walking routes (via WCBC Urban Walks booklet), recreational areas, benches and green spaces. Species data was provided primarily by Cofnod (the Local Record Centre for North Wales) and habitat (extended Phase 1) surveys were undertaken for the entire site. Targeted surveys for certain rarer species were also carried out. The information collected was then used to produce a number of maps of the Wrexham Industrial Estate.

Businesses present on the Wrexham Industrial Estate were approached to discuss the project and gain buy-in and support for its objectives. In addition to this, the project explored potential opportunities for improving the business landholdings for biodiversity and people. Following site visits, outline land-management prescriptions were produced for individual landholdings. The above activities enabled the project to:

- Identify key sites throughout the estate which are important habitats and/or support some of our rarer wildlife

- Identify the current condition of these areas and management required to maintain/improve/extend areas. Prioritise for protection/subsequent targeted management

- Identify where gaps exist in the habitat network and how connectivity can be improved for wildlife and for people

- Explore opportunities for public access to areas

- Marry up interested businesses with the habitat networks to allow priorities for management to be targeted

- Create draft proposals for a connected network of habitats across the estate that is capable of protecting habitats and species, accessible for people and allows development to proceed

- Put forward proposals for the maintenance, enhancement and creation requirements identified within this wildlife network

- Use the information gathered to put together an initial set of proposals as to how the site can be improved for wildlife, people and business for discussion, approval and future refinement

In addition to this, where immediate opportunities arose, some work identified through this project to create and improve habitats for wildlife has already been undertaken using funding from SP Manweb and further work is planned to be carried out in the coming years. The information outlined above can be found in Section 2 of this report.

Wrexham and the Wrexham Industrial Estate

2 Mapping Biodiversity on the Wrexham Industrial Estate

Grizzled Skipper © Andy Ingham

2.1 Species

Birds
The following species have been recorded within the Wrexham Industrial Estate, and are a conservation priority in Wales (NERC Section 42):

Linnet
Cuckoo
Kestrel
Black-headed Gull
Herring Gull
Skylark
Spotted Flycatcher
Reed Bunting
Curlew
Lapwing
House Sparrow
Tree Sparrow
Starling
Song Thrush
Dunnock
Bullfinch
Yellowhammer
Yellow Wagtail
Grasshopper Warbler
Barn owl (Wildlife and Countryside Act 1981)
Hobby (Wildlife and Countryside Act 1981)

Mammals
Badger (*Meles meles*) - there are numerous records for badger across the Wrexham Industrial Estate. Hedges and woodlands may contain setts, and areas of rough grassland and scrub are important foraging areas. Badgers are protected by the Protection of Badgers Act 1992.

Polecat (*Mustela putorius*) - there are a few records from across the Wrexham Industrial Estate. The polecat is a conservation priority in Wales (NERC Section 42), and is listed on Schedule 6 of the Wildlife and Countryside Act, 1981. The polecat was trapped to extinction in many areas of Britain in the 19th century, however the species has once again recolonised many areas following the cessation of trapping. Evidence suggests that polecats make particular use of woodland edges and hedgerows, hunting rabbits and rodents.

Bats - Whiskered bat (*Myotis mystacinus*) and a *Pipistrellus* species have been recorded from various buildings on the Wrexham Industrial Estate. The significant areas of plantation woodland and pockets of broadleaved woodland across the Wrexham Industrial Estate, may be important foraging areas for bats. Cavities in old trees may be used by roosting bats. All bat species are their roosts are legally protected under the Wildlife and Countryside Act, 1981.

Hedgehog (*Erinaceus europaeus*) - a report by the British Trust for Ornithology revealed that the hedgehog population in Britain has declined by a quarter over the last ten years. The hedgehog benefits from partial protection under the Wildlife & Countryside Act (1981), and the species is now a conservation priority in Wales (NERC Section 42).

Water vole (*Arvicola amphibius*) - there are undocumented observations of this species along Redwither Brook. The habitat here is entirely suitable, with an abundant supply of food plants and riverbanks for excavating burrows. The water vole is a conservation priority in Wales (NERC Section 42) and is protected in the UK under the Wildlife and Countryside Act, 1981.

Flora - a significant database of plant records from the Wrexham Industrial Estate exists, but rare species occurring on the Wrexham Industrial Estate include Dittander (*Lepidium latifolium*) and Dyer's Greenweed (*Genista tinctoria*). Black Poplar (*Populus nigra*) is a local biodiversity action plan species, and is commonly planted with other scattered amenity trees on the Wrexham Industrial Estate.

Invertebrates
Apart from butterflies and moths, minimal invertebrate species recording has taken place on the Wrexham Industrial Estate, and this needs to be improved through public engagement and training provision for local volunteer groups. A wide range of conservation priority Lepidoptera (NERC Section 42) have been recorded on the Wrexham Industrial Estate, including:

White-letter Hairstreak
Wall Brown
Small Heath
Latticed Heath
Cinnabar
Small Phoenix
Oak Hook-tip
Shaded Broad-bar
Small Emerald
Figure of Eight

The Grizzled and Dingy Skipper butterflies occur in isolated locations on the Wrexham Industrial Estate, and are a conservation priority in Wales. Both species are found in warm habitats that provide shelter and sparse vegetation, such as woodland edges and rides, unimproved grassland, and brownfield sites.

Amphibians and Reptiles

Great Crested Newt (*Triturus cristatus*) - occurs throughout the Wrexham Industrial Estate and the surrounding area. A number of managed mitigation areas are currently in place to safeguard this species. Great Crested Newts, their breeding sites and resting places are legally protected under the Wildlife and Countryside Act, 1981. It is also listed as a species of principle importance on Section 42 of the Natural Environment and Rural Communities Act 2006, as well as the Wrexham Biodiversity Action Plan (LBAP).

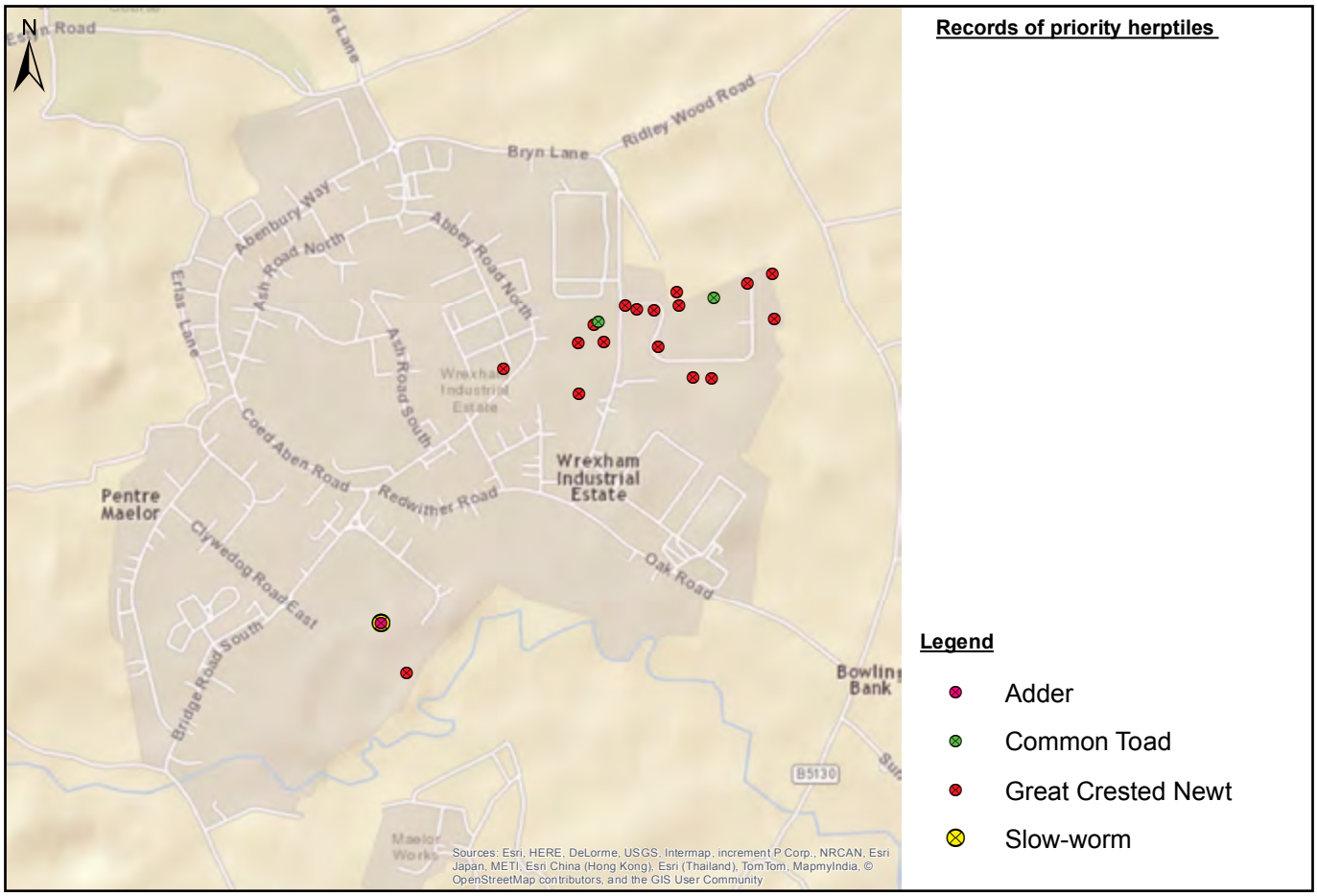
Common Toad (*Bufo bufo*) - occurs throughout the Wrexham Industrial Estate and the surrounding area (NERC Section 42 priority species).

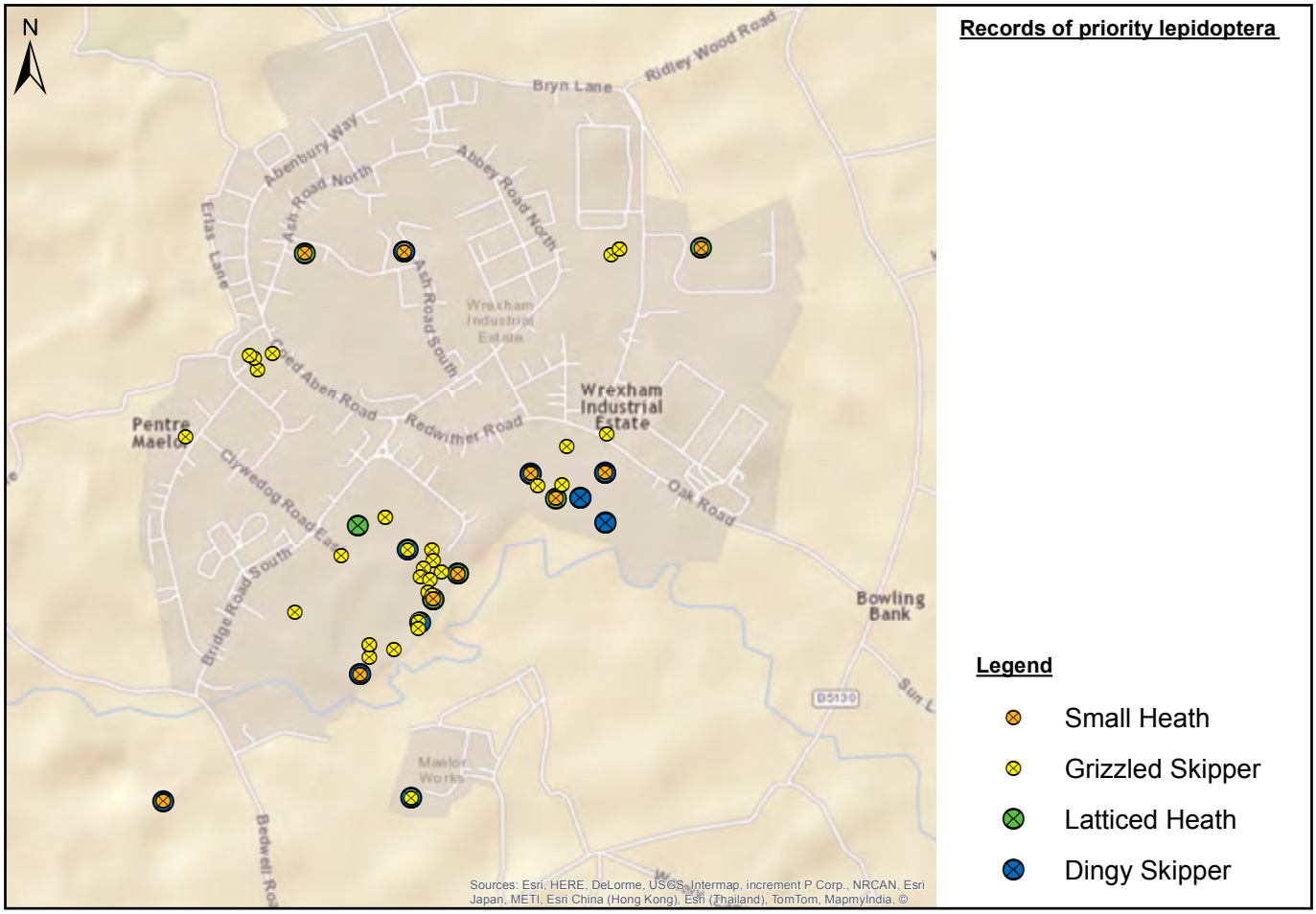
Slow-worm (*Anguis fragilis*) - infrequent records from the south of the Wrexham Industrial Estate (NERC Section 42 priority species).

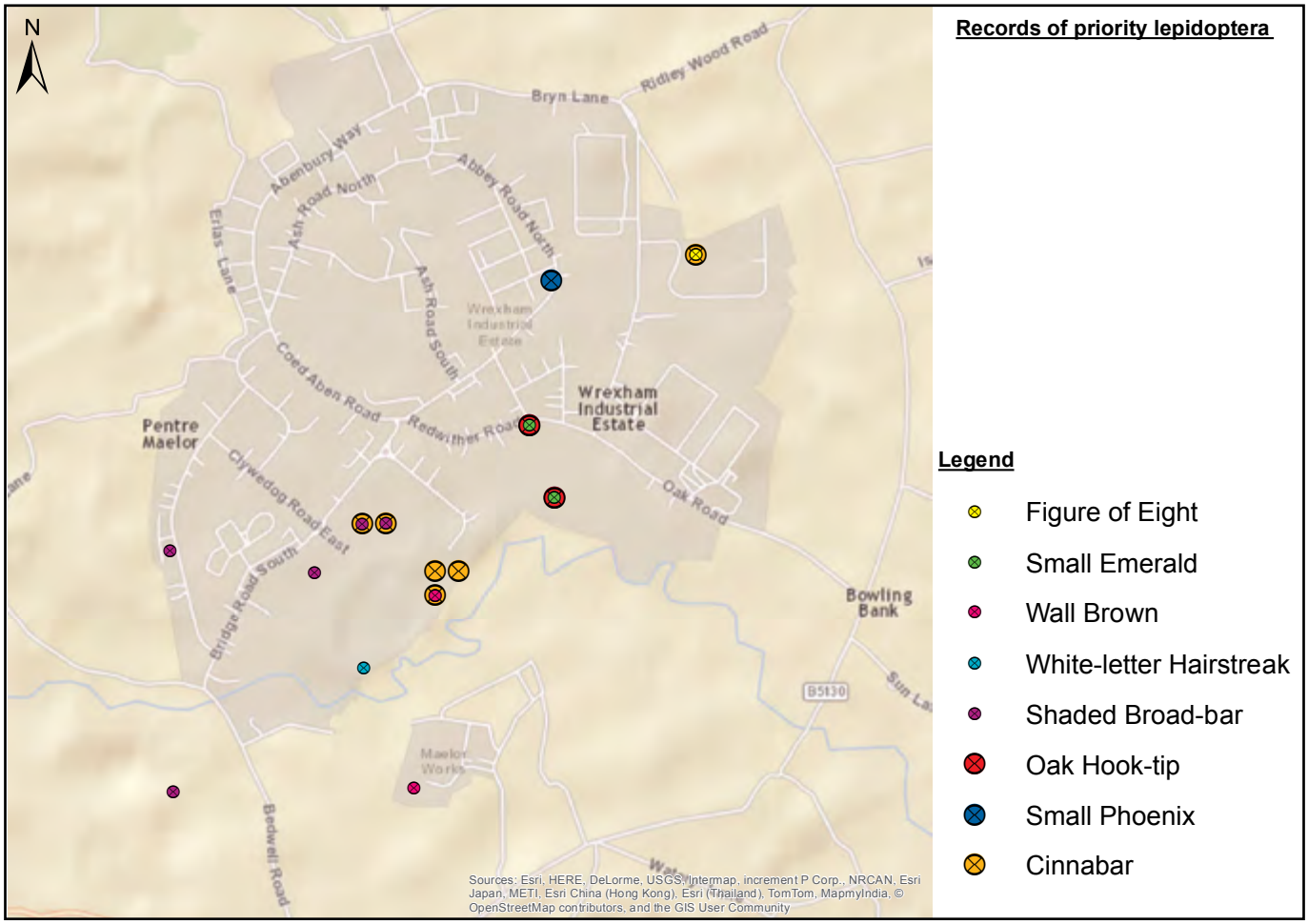
Adder (*Vipera berus*) - infrequent records from the south of the Wrexham Industrial Estate (NERC Section 42 priority species).

Invasive non-native species

A number of invasive non-native species occur in isolated locations on the estate; including Japanese knotweed, Giant hogweed and Himalayan balsam.




N
Records of priority lepidoptera
Bryn Lane
Ridley Wood Road
Abenbury Way
Ash Road North
Abbey Road North
Erias Lane
Ash Road South
Wrexham Industrial Estate
Coed Aben Road
Redwither Road
Pentre Maelor
Wrexham Industrial Estate
Clywedog Road East
Oak Road
Bridge Road South
Bowling Bank
B5130
Maelor Works
Bedwell Road
Sources: Esri, HERE, DeLorme, USGS, Intermap, increment P Corp., NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), TomTom, MapmyIndia, ©
Legend
Small Heath
Grizzled Skipper
Latticed Heath
Dingy Skipper


N
Records of priority lepidoptera
Bryn Lane
Ridley Wood Road
Abenbury Way
Ash Road North
Abbey Road North
Erias Lane
Ash Road South
Wrexham Industrial Estate
Coed Aben Road
Redwither Road
Pentre Maelor
Wrexham Industrial Estate
Clywedog Road East
Oak Road
Bridge Road South
Bowling Bank
B5130
Maelor Works
Bedwell Road
Sources: Esri, HERE, DeLorme, USGS, Intermap, increment P Corp., NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), TomTom, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community
Legend
Figure of Eight
Small Emerald
Wall Brown
White-letter Hairstreak
Shaded Broad-bar
Oak Hook-tip
Small Phoenix
Cinnabar

2.2 Habitats

Grassland
Most grassland within the Wrexham Industrial Estate is classed as semi-improved neutral grassland, but there are significant areas of improved and amenity grassland which is managed intensively. Roadside verges and vacant development plots usually contain areas of rough, species-rich grassland, which function as important wildlife corridors between adjacent habitats. These areas provide hunting grounds for Kestrel and Barn owl, and provide an important nectar resource for pollinating insects. Occasionally, these rough grasslands contain ant hills, which are an important food resource for Green woodpecker. The surrounding agricultural land is mostly improved grassland for pastoral farming.

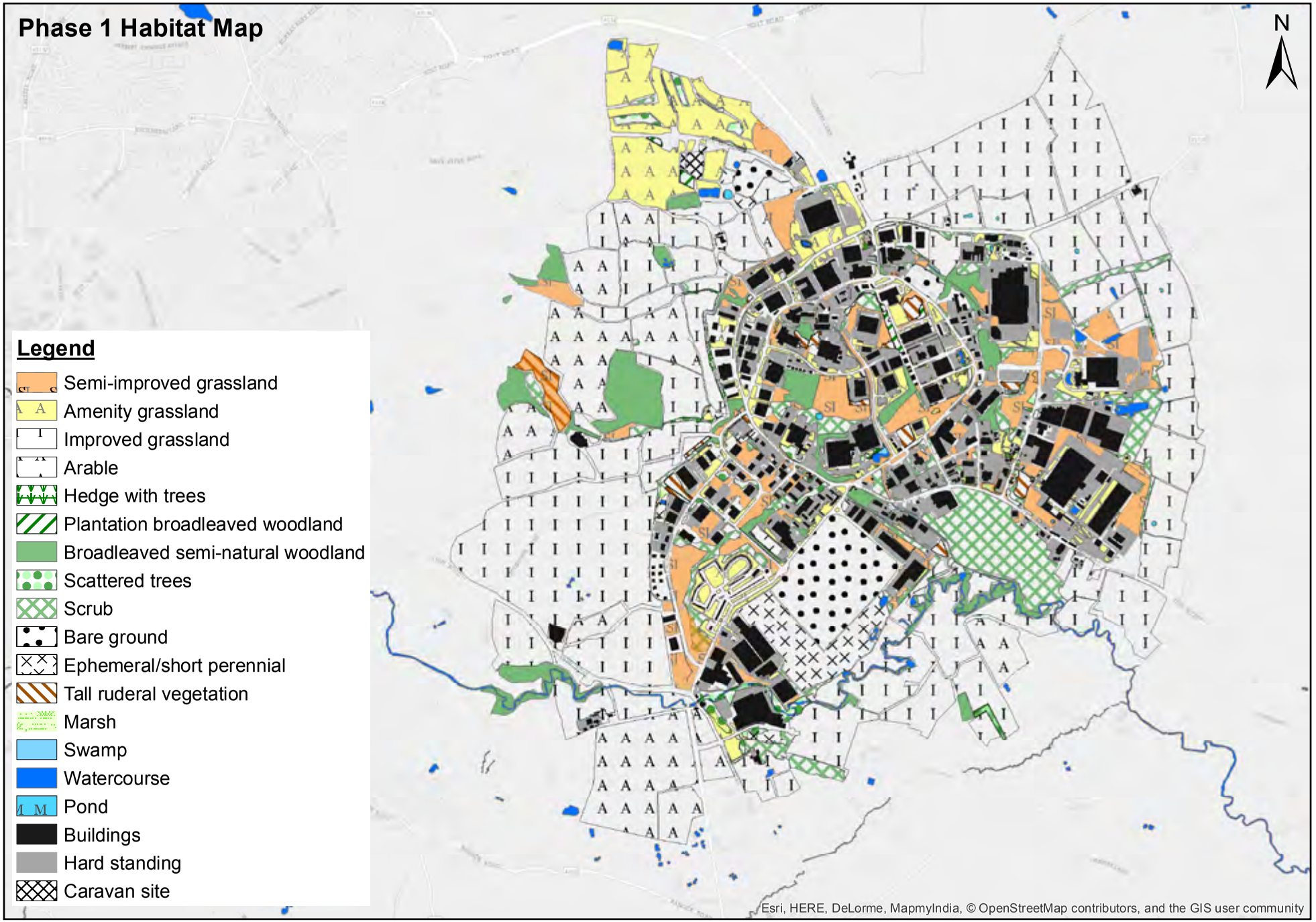
Woodland and scrub
There are some small, isolated blocks of semi-natural broadleaved woodland on the Wrexham Industrial Estate and in the 1.5km surround. Due to the area's impeded drainage, ditches are common on the edges and sometimes through the middle of these blocks of woodland. Dominant species are Alder (*Alnus glutinosa*), Field Maple (*Acer campestre*), Pedunculate Oak (*Quercus robur*) Silver Birch (*Betula pendula*) and Ash (*Fraxinus excelsior*). There are some important pockets of wet woodland dominated by Alder and Crack willow, and these areas may support Otter. Large areas of dense scrub exist across the estate, and in some areas, such as the 'Oaks wildlife site', scrub is encroaching onto valuable grassland due to lack of management. Some areas of amenity grassland have been planted with specimen trees of various origin, and some landholdings contain areas of mixed plantation woodland, which may or may not be managed. The surrounding farmland contains small fragments of semi-natural broadleaved woodland and wood pasture, usually including mature oak trees. Wet woodland, wood pasture and lowland mixed deciduous woodland are all recognised as NERC Section 42 habitats.

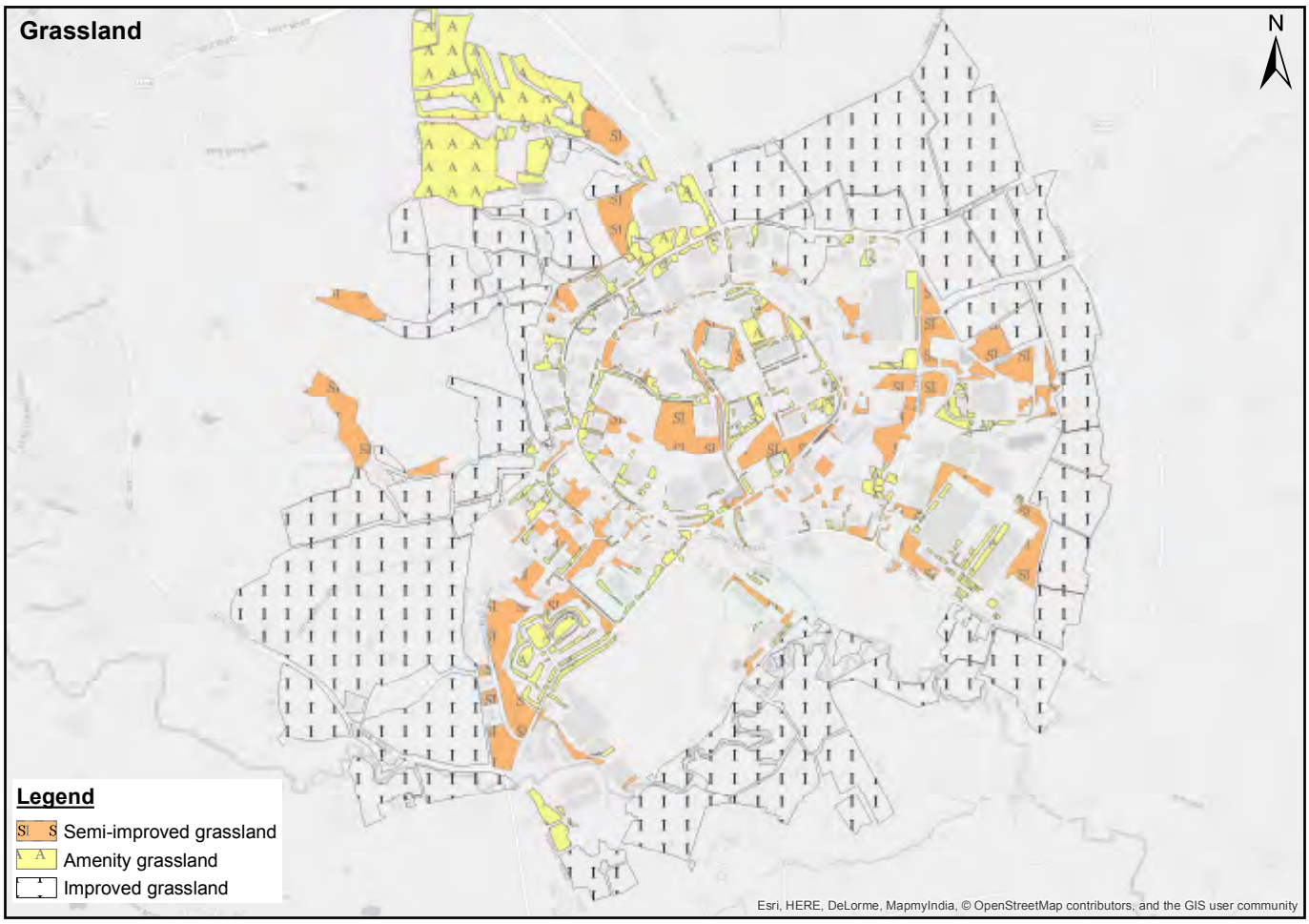
Freshwater
The Wrexham Industrial Estate and the surrounding farmland has an important provision of ponds, some of which support populations of Great Crested Newt (*Triturus cristatus*). Redwither Brook is a tributary of the River Clywedog and incorporates areas of swamp dominanted by Common Duckweed (*Lemna minor*), Great Reedmace (*Typha latifoli*) and Fools Watercress (*Apium nodiflorum*). Dominant marginal vegetation along Redwither Brook includes Common Hogweed (*Heracleum sphondylium*), Meadowsweet (*Filipendula ulmaria*), and Cow Parsley (*Anthriscus sylvestris*). Wet ditches are common on the periphery of landholdings and along woodland edges, and function as important wildlife corridors. Most wet ditches are inundated with algae and are unsuitable for Great Crested Newt. Ponds and linear aquatic habitats are recognised as an LBAP habitat and NERC Section 42 habitat of principal importance in Wales.

Ephemeral/short perennial
These are areas of early successional vegetation which occur on previously developed land. Demolition and ground disturbance by machinery creates the conditions necessary for colonisation by plants such as Creeping Cinquefoil (*Potentilla reptans*) and Bird's-foot-trefoil (*Lotus corniculatus*), important larval foodplants. These areas usually contain a range of microclimates and niches, supporting diverse and often specialist invertebrate communities. This habitat equates to a very small proportion of the habitats on the estate, and is also one of the most threatened due to its location on areas that are earmarked for development. Open mosaic habitat on previously developed land is recognised as a NERC Section 42 habitat.

Other habitats
Other significant habitats on the Wrexham Industrial Estate include areas of tall ruderal vegetation dominated by Tufted hair-grass (*Deschampsia cespitosa*), Rosebay Willowherb (*Chamerion angustifolium*) and Teasel (*Dipsacus fullonum*). Areas of bare ground are common on brownfield sites and these warm microhabitats benefit basking invertebrates.

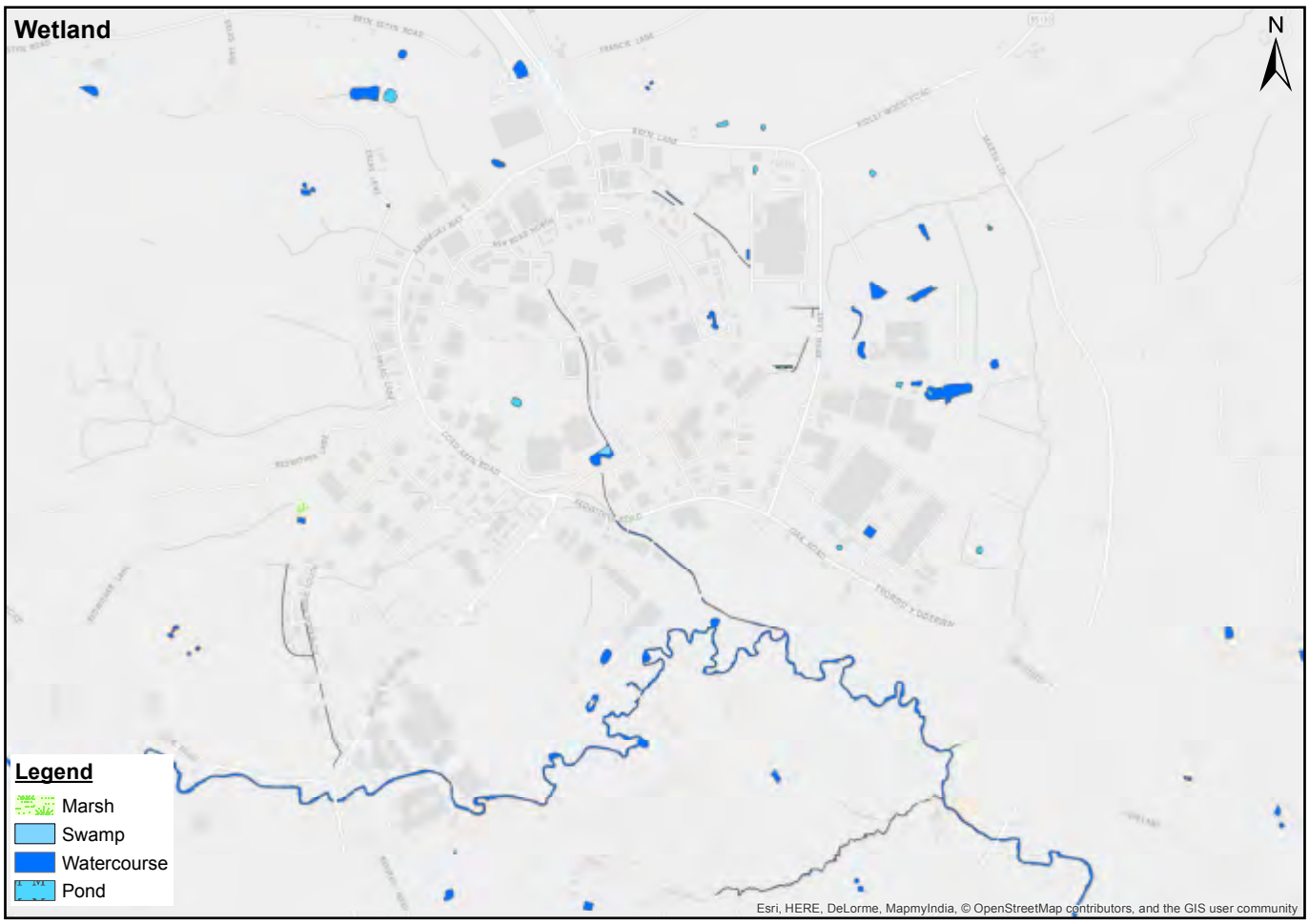
Phase 1 Habitat Map




Grassland
N
Legend
Semi-improved grassland
Amenity grassland
Improved grassland
Esri, HERE, DeLorme, MapmyIndia, © OpenStreetMap contributors, and the GIS user community


Woodland, hedges and scrub
N
Legend
Hedge with trees
Plantation broadleaved woodland
Scattered trees
Scrub
Broadleaved semi-natural woodland
Esri, HERE, DeLorme, MapmyIndia, © OpenStreetMap contributors, and the GIS user community


Disturbed ground
N
Legend
Bare ground
Ephemeral/short perennial
Arable
Tall ruderal vegetation
Esri, HERE, DeLorme, MapmyIndia, © OpenStreetMap contributors, and the GIS user community


Wetland
N
Legend
Marsh
Swamp
Watercourse
Pond
Esri, HERE, DeLorme, MapmyIndia, © OpenStreetMap contributors, and the GIS user community

2.3 Designated sites and habitats

There are no statutory sites with formal protection on the Wrexham Industrial Estate, however there are a number of non-statutory sites which are recognised for their importance in conserving biological diversity and their value to local heritage and recreation. Some of these sites have multiple designations. Through desk based research, the following site designations have been found:

Wildlife Sites
There are four designated Wildlife Sites on the Wrexham Industrial Estate. These sites are recognised by Wrexham County Borough Council as being important for biodiversity and support populations of rare and protected species, such as Great Crested Newt and Grizzled Skipper butterfly. They are known as 'The Oaks', 'Erlas Black Wood', 'Big Wood' and 'Bryn Lane Nature Reserve'.

Mitigation Sites
These are areas which have been allocated during the planning/development process, due to the potential disturbance of protected species and habitats. There are managed mitigation sites on Bryn Lane and Marlborough Road, and new ones are due to come into management, such as the new prison site.

'Woods for People'
This is publicly accessible plantation woodland that has been identified by the Woodland Trust and the Foresty Commission as playing an important role in urban/community forestry. A young broadleaf plantation exists on an east-facing slope, along the public footpath at the south of the Wrexham Industrial Estate.

Ancient Semi-Natural Woodlands (ASNW)
This is woodland which has existed since 1600, and is usually much older. ASNW is a priority for conservation in the UK; it is irreplaceable and is more biodiverse than more recent plantations. Small fragments of ASNW exist in and around the Wrexham Industrial Estate.

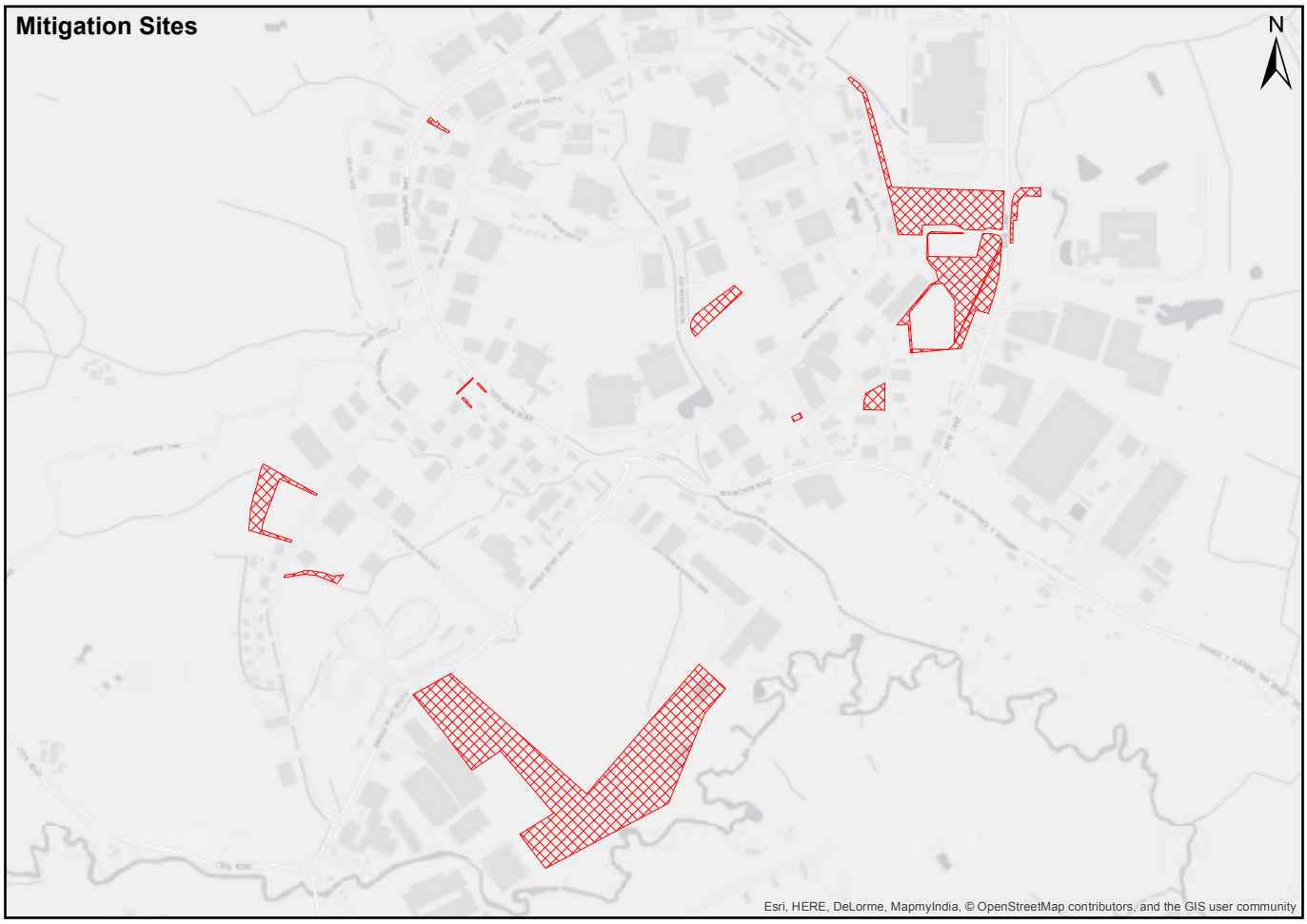
Restored Ancient Woodland Sites (RAWS)
These are predominantly broadleaved woodlands, which are believed to have been continually wooded for over 400 years. At some point in the past, non-native conifer species will have been removed, and the woodland may still be under active management. 'Erlas Black Wood' is a RAWS site in the centre of the Wrexham Industrial Estate.

NERC Section 42 Habitats
There are a number of habitats on or surrounding the Wrexham Industrial Estate, which are recognised for their rarity in Wales under Section 42 of the NERC Act (2006). These include wood pasture & parkland, wet woodland, lowland mixed deciduous woodland, hedgerows, arable field margins, lowland calcareous grassland, rivers, ponds, and open mosaic habitats on previously developed land.

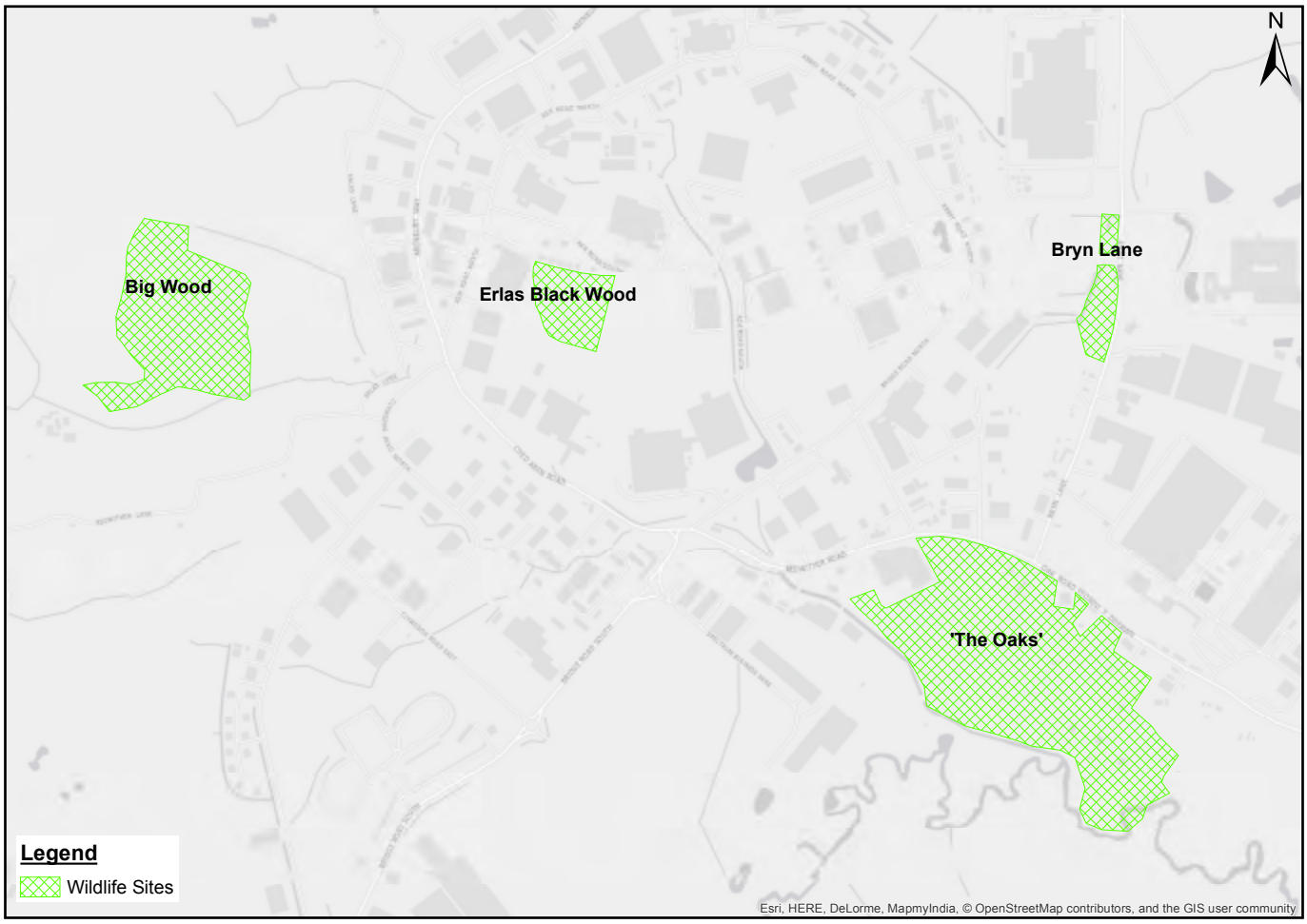
Wrexham Local Biodiversity Action Plan Habitats

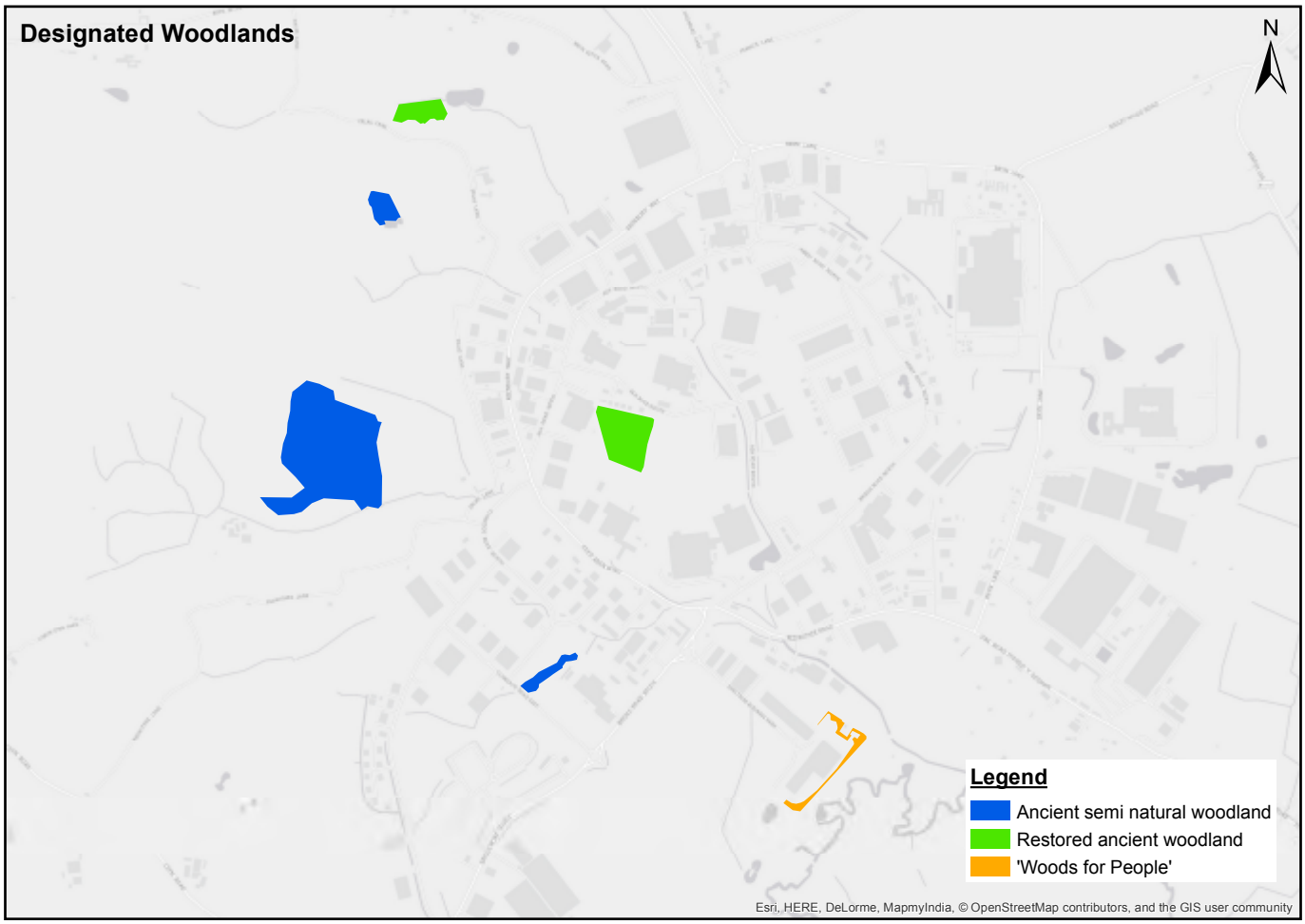
- Derelict and Industrial Land
- Garden
- Linear aquatic habitats (rivers, streams)
- Ponds
- Upland Moorland
- Woodland
- Lowland raised bog
- Lowland wood-pasture and parkland
- Wet Woodland

Great Crested Newt



Wildlife mitigation area on Marlborough Road


N
Big Wood
Erlas Black Wood
Bryn Lane
'The Oaks'
Legend
Wildlife Sites
Esri, HERE, DeLorme, MapmyIndia, © OpenStreetMap contributors, and the GIS user community


Designated Woodlands
N
Legend
Ancient semi natural woodland
Restored ancient woodland
'Woods for People'
Esri, HERE, DeLorme, MapmyIndia, © OpenStreetMap contributors, and the GIS user community

3 Enhancing the Wrexham Industrial Estate for Wildlife, People and Business

3.1 Enhancing the estate for wildlife

The Wrexham Industrial Estate is unique in that it contains a wide range of important habitats within a relatively small area. The challenge is knowing what needs to be protected and where, and how these habitats can be connected to form a sustainable wildlife network. Isolated blocks of woodland and patches of semi-improved grassland are important refuges and foraging areas for birds, mammals and invertebrates. However, these fragmented habitats do not allow populations to disperse and ultimately colonise new areas. Through the phase 1 habitat survey and through consultation with project partners, we have assessed the condition of existing habitats and prioritised areas for conservation management. We have also identified key areas where wildlife connectivity should be improved. Through simple and effective conservation interventions such as hedge planting and sensitive grassland management, wildlife will be able to move more freely through the estate.

3.1.1 Protecting habitats

The existing wildlife sites and ecological mitigation sites on the Wrexham Industrial Estate, all require ongoing maintenance and enhancement, as their original biodiversity value is being lost through neglect and a lack of coordinated action. It is imperative that these sites are managed and monitored for the range of species they support.

Many private landholdings on the Wrexham Industrial Estate contain important habitats and support threatened species. If planned properly, some habitats on the Wrexham Industrial Estate can be recreated to compensate for losses due to development. Other habitats however, are irreplaceable, and should be exluded from development. The following key sites have been identified as requiring protection and conservation land management.

Redwither Brook is a key wildlife corridor running through the centre of the Wrexham Industrial Estate. It connects wildlife sites and pastoral land in the south of the Wrexham Industrial Estate, with large areas of species-rich grassland and pockets of woodland in the north. Redwither brook may well support Otter, Water vole and reptiles. Bank-side vegetation such as Bramble provides an important foraging resource for many pollinators, including the Small Heath butterfly, and in dense areas supports breeding Whitethroat.

The former Firestone site at the south of the Wrexham Industrial Estate is an important area for Great Crested Newt, Grizzled and Dingy Skipper butterflies, Badger, Barn Owl and many other breeding birds. The new ecological mitigation area as part of the current prison development, will function as an important stepping-stone for species between 'The Oaks' Wildlife Site to the east, and woodland, ponds and streams to the west. It is anticipated that this new ecological mitigation area will maintain and protect important ephemeral habitat, ponds, scrubland and grassland.

'The Oaks' Wildlife Site

'The Oaks' Wildlife Site (approx 22 hectares) supports a wide range of species such as Polecat, Barn Owl, Grizzled Skipper butterfly, and some rare plant species such as Dyer's Greenweed. This Wildlife Site is in need of urgent management and long term protection. Large areas of species-rich grassland and ephemeral areas are being lost to encroaching scrub. The unregulated access of off-road vehicles is also disturbing nesting birds and damaging these important habitats. Key

areas should be brought under long term conservation management, and maintained for their floral diversity and invertebrate communities. The area also contains a significant number of fruit trees, some of which are likely to be of important local origin.

Priority Grizzled Skipper habitat along Clywedog Road North
© Clare Williams (Butterfly Conservation)

A number of landholdings on Clywedog Road North and South contain significant areas of open mosaic habitat, which should be maintained and expanded for the benefit of Grizzled Skipper butterfly and other priority invertebrates. Roadside verges and amenity grassland in this area could be managed more sensitively, incorporating areas of bare ground, short-sward grassland and wildflower meadow.

The ecological mitigation areas along Bryn Lane are a stronghold for Great Crested Newt and Common Toad, which are both conservation priority species in Wales. Bryn Lane itself is a hazard to these populations and innovative connectivity solutions should be adopted here. Replacing existing kerbs next to road gullies with 'wildlife kerbs' would provide a safe route around road gullies for amphibians on the move. Improvements to terrestrial habitat in between these mitigation areas and breeding ponds in the centre and west of the Wrexham Industrial Estate, would encourage dispersal and recolonisation. Grassland and roadside verges in these connecting areas should be managed as hay meadows and/or strips of arable weeds, to improve the nectar resource for pollinating insects as well as providing safe corridors for amphibians.

Erlas Black Wood (approx 2.6 hectares), other small fragments of ancient woodland in and around the Wrexham Industrial Estate, and veteran trees, should all be completely excluded from development. This is an extremely important habitat, which only covers about 2 per cent of the land area of the UK. Management of these sites sometimes involves the removal of planted conifers, selective thinning to encourage the regeneration of ground flora, replanting, and restoring the woodland edge.

There is a small block of wet woodland behind the Hauck/Rowan Foods premises on Ash Road South. This habitat is a conservation priority in Wales and requires protection and management. The area contains regenerating Alder and Guelder Rose, and may support Otter and some species of bat.

Erlas Black Wood - Wildlife Site and Restored Ancient Woodland

3.1.2 Improving habitats

All the Wrexham Industrial Estate landholders can make a substantial contribution to wildlife conservation and this Living Landscapes project. Whether it's managing a roadside verge for wildflowers, or creating a glade or ride in a woodland, every little helps towards improving the natural environment in and around the estate. Due to a positive response from some landholders, we have been able to implement some initial conservation works on the estate. These small interventions demonstrate what can be achieved alongside the operations and land management constraints on the Wrexham Industrial Estate. These have been presented as mini case studies over the following few pages.

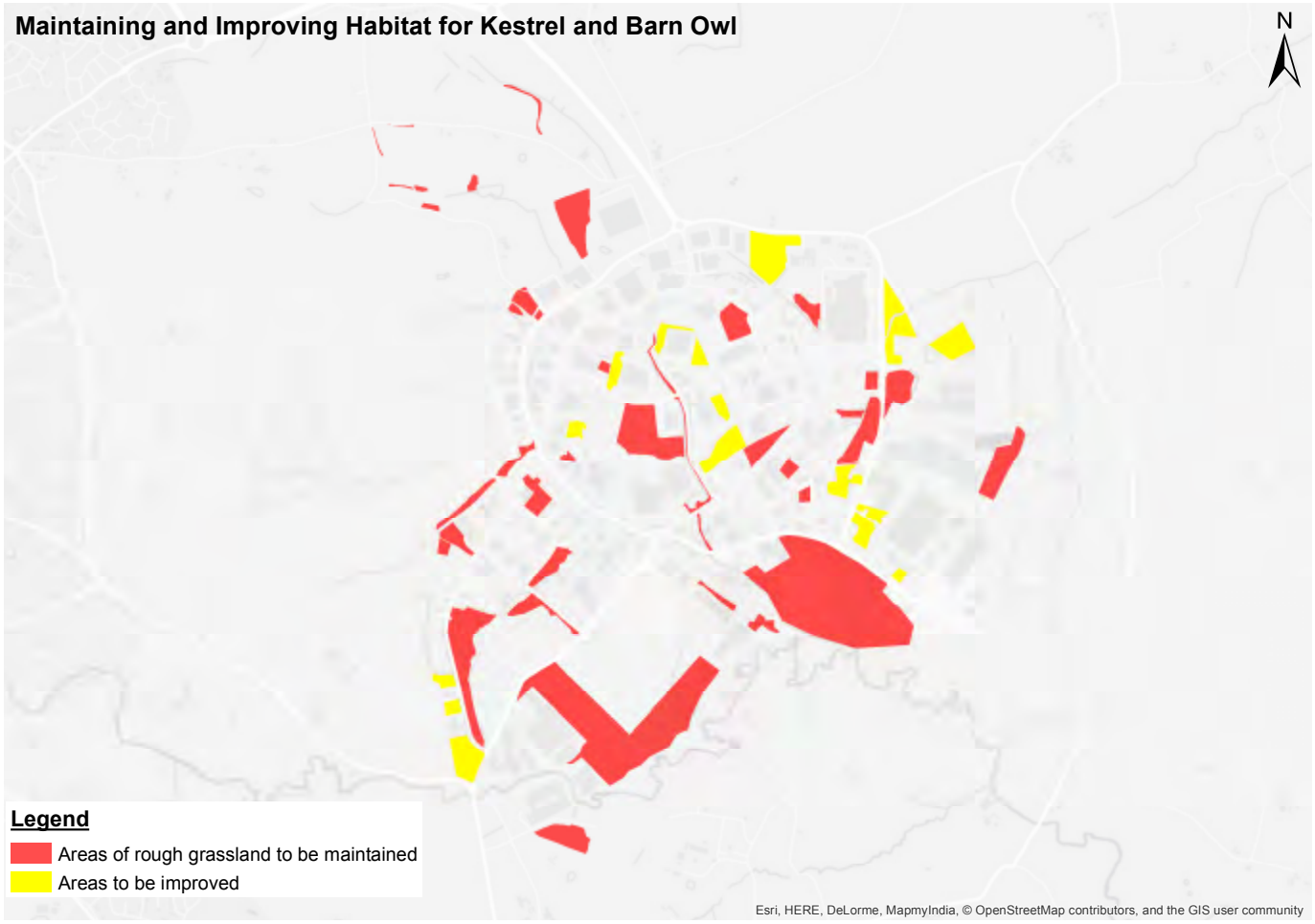
Scrub management
Scrubland is an important habitat which supports birds, mammals and invertebrates. Scrub management should be on a rotational basis, so that different successional stages remain on a site. Species such as Bramble, Hawthorn, Blackthorn and Crack willow, should not be allowed to encroach onto areas of species-rich grassland and important early successional habitats, and stumps may need to be treated with herbicide. Scrub should always be removed in the winter months to minimise disturbance to species using it, and ideally, smaller shrubs should be lifted out of the ground to expose the underlying bare earth, which provides an important micro-habitat for invertebrates. Brash can either be burnt off-site or used to make habitat piles which provides shelter and over-wintering habitat for invertebrates, amphibians, reptiles and small mammals.

Woodland management
The Wrexham Industrial Estate contains a number of woodland types including ancient semi-natural woodland, mixed plantation woodland, wet woodland and wood pasture. All types of woodland require active management to encourage new growth and to maintain their biodiversity value. Thinning, pollarding and coppicing are all techniques which open the woodland canopy, allowing light to reach the woodland understorey. Rotational coppicing of Alder can create temporary glades in wet woodland, which benefits many rare and specialised invertebrates. These operations should not be undertaken without first consulting a registered forestry contractor.

Woodland edge habitat is extremely valuable to birds and insects as this is where most foraging occurs. These areas can be enhanced by planting a mixed native species hedge around the woodland periphery, and leaving a five to ten metre wide strip of grassland in between the hedge and the woodland. This provides adequate habitat for hunting dragonflies and amphibians, as well as ground feeding birds and mammals. The buffering effect of a tall, broad hedge, reduces the chances of windblow and increases the overall temperature and humidity of the woodland, therefore creating the ideal conditions for woodland flora and fungi to thrive. The strip of grassland should be cut every autumn and arisings should be removed from the site.

The provision of standing, fallen and buried deadwood can greatly improve woodland biodiversity. Fallen deadwood should be retained as much as possible, as it provides hibernacular sites for amphibians and invertebrates; ring barking is an effective method of creating standing deadwood, which provides foraging and nesting opportunities for birds. However, standing deadwood can be a hazard and should only be retained in areas of woodland where there are no health and safety issues.

Grassland management
The UK has suffered a 97% loss of wildflower-rich grassland since the 1930s, and this has played a major part in dramatic declines to our native insect pollinators. Sympathetic management of grassland by mowing or grazing is essential for maintaining a varied structure and species diversity. Without management, grassland becomes rank, loses its diversity, and will eventually turn into scrubland.



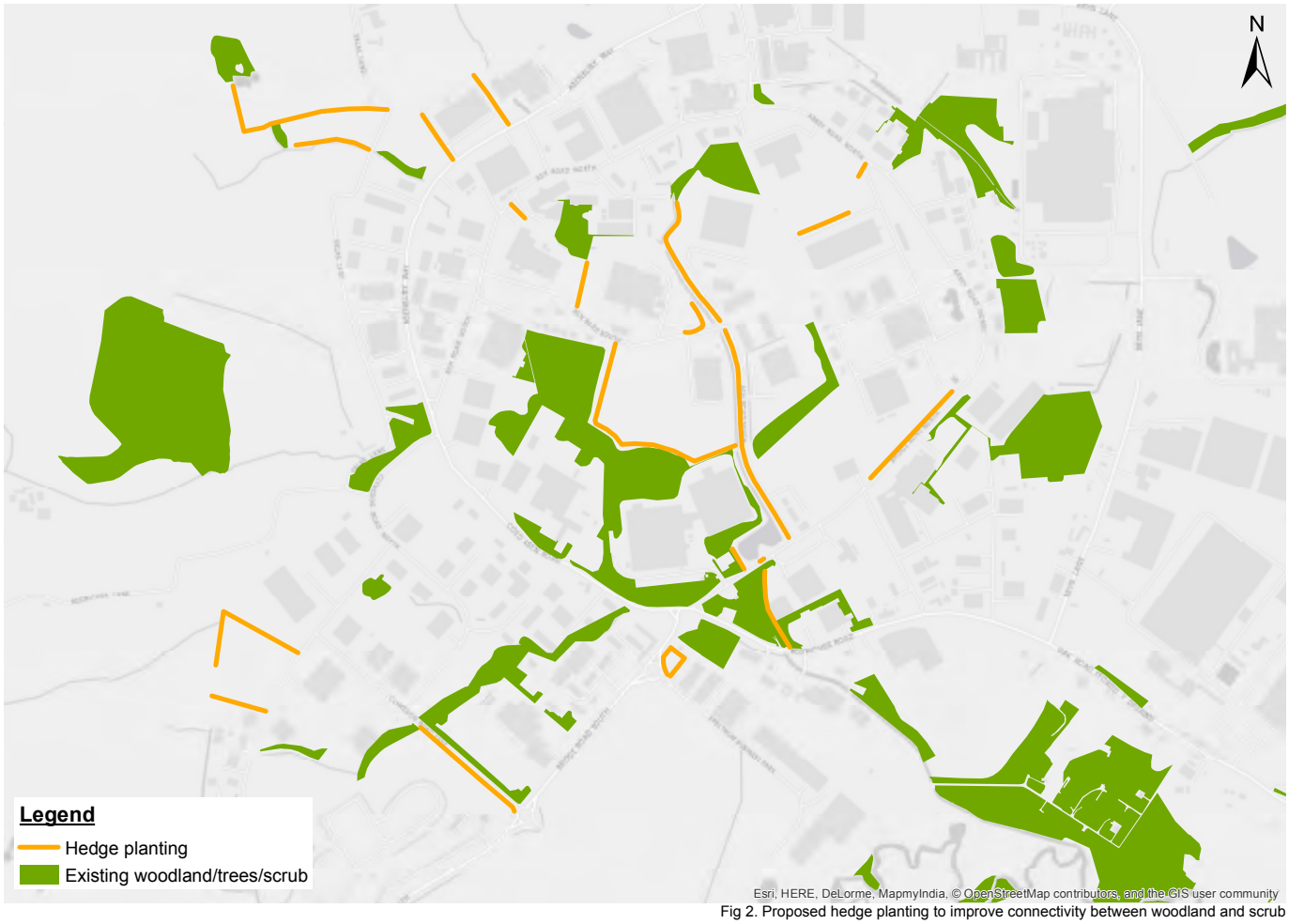


Fig 2. Proposed hedge planting to improve connectivity between woodland and scrub

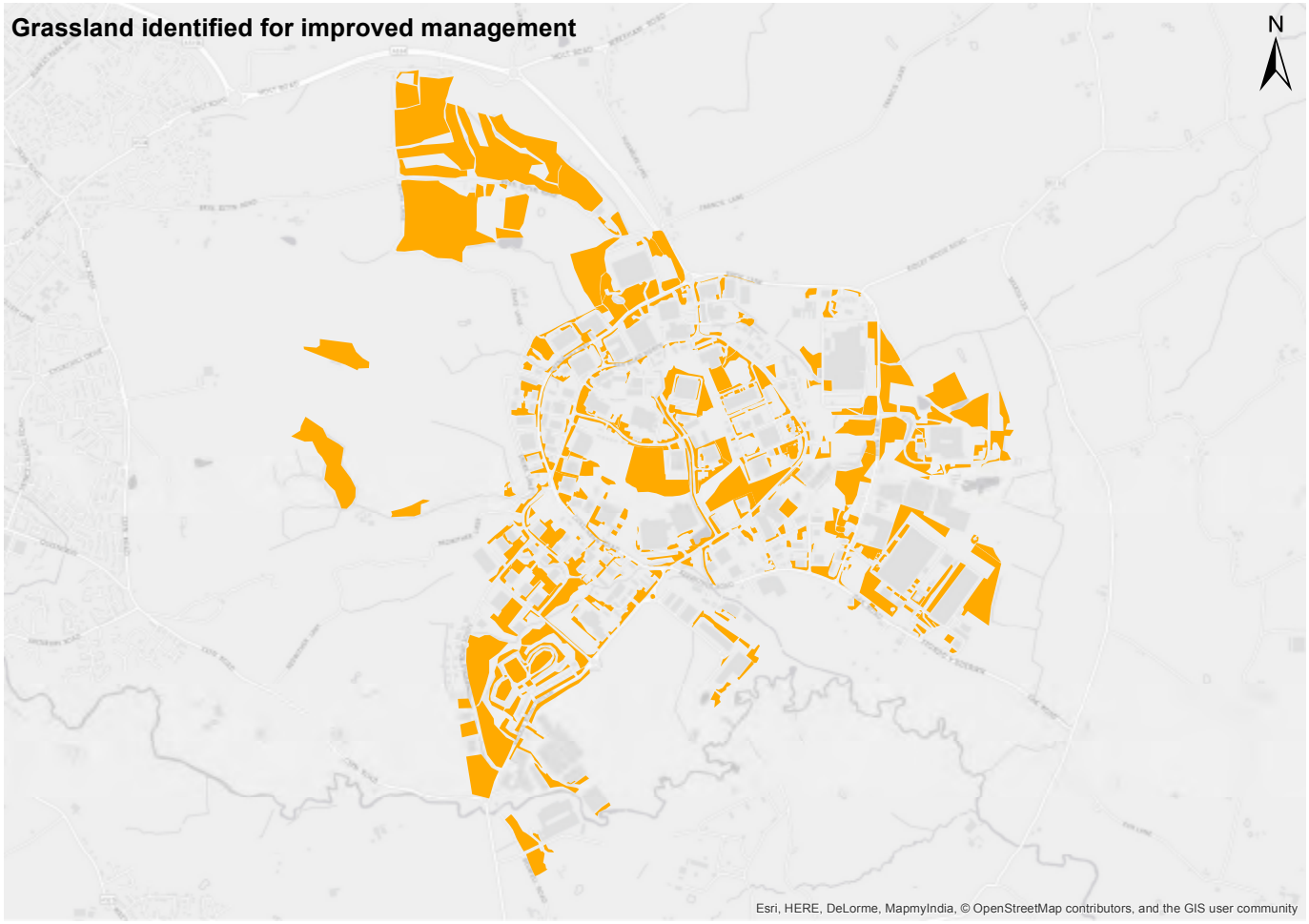
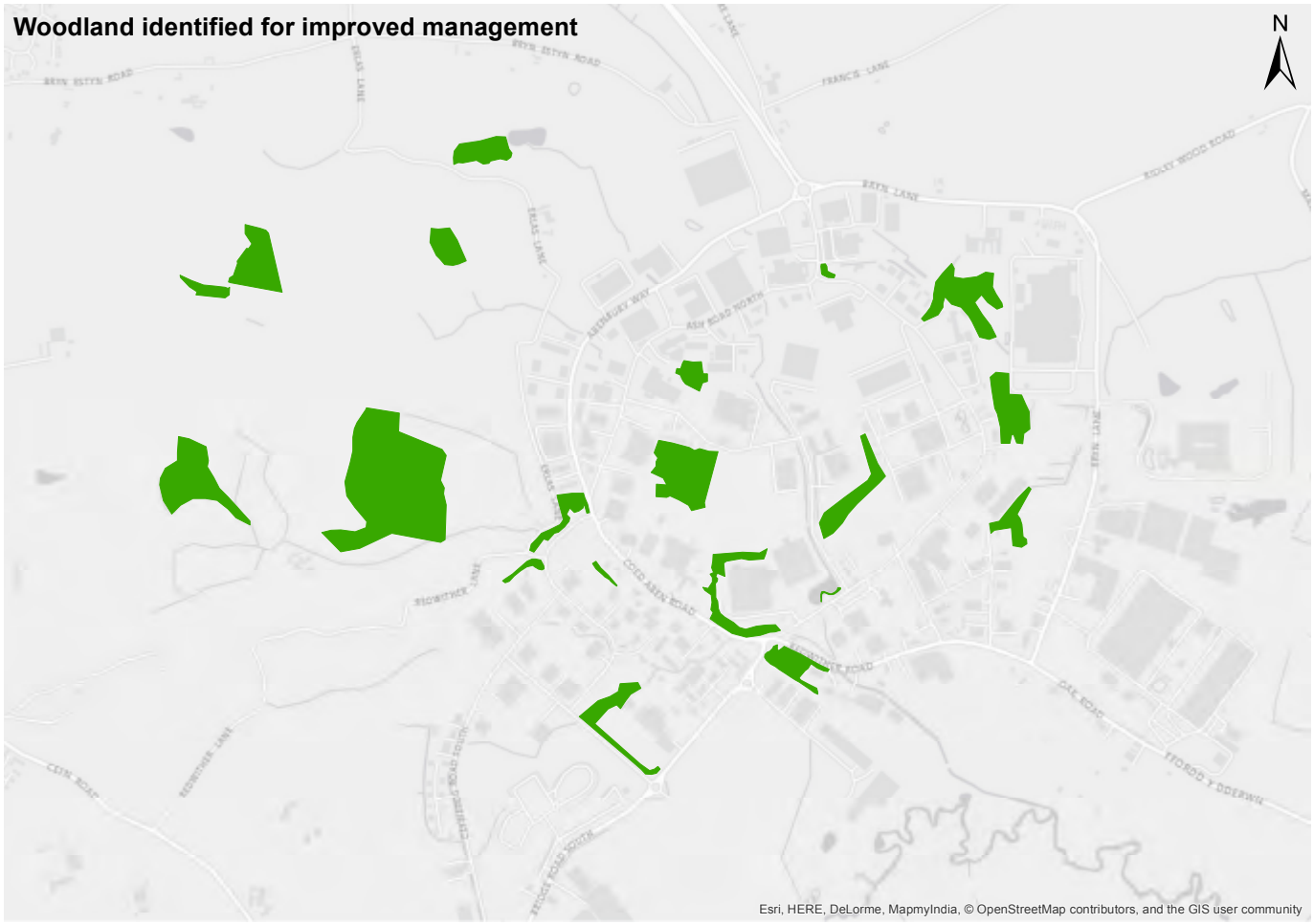


Fig 3. Areas of grassland identified for improved conservation management



There are large areas of amenity grassland and roadside verges throughout the Wrexham Industrial Estate (see Figure 3), and their biodiversity value can be enhanced by cutting on a rotational basis, so that some areas are left uncut each year and other wildflower-rich areas are allowed to set seed. Cutting should be undertaken no earlier than mid September, and ideally some areas should be cut later in October, leaving a rough sward of about 8 - 10cm along site margins and near woodland and scrub. Most wildflower species thrive in soils of low fertility, so all arisings should be removed from the site or piled in a designated area as habitat piles. This management regime allows invertebrates to complete their life cycles by providing an important nectar resource and overwintering sites, as well as being important foraging areas for birds, mammals and amphibians.

Around highly visible site entrances and frontages, an attractive mix of native annual/ perennial wildflower seed could be sown, but particular management regimes need to be followed in order for species to establish. Only a certain proportion of the verge should be cut each year and competing docks, thistles and dominant grasses should be controlled. In the winter, the area may need to be rotovated, harrowed and/or rolled to create a fine seed bed. Sowing should take place in autumn or spring and the seed mix should be well shaken and incorporated with damp sand (this ensures good/even coverage); it is then dispersed across the area at a density of about 3 - 5g. It is vital that after sowing, the area is lightly rolled to ensure good seed contact with soil, but the seeds should not be buried. Subsequent cutting and removal of arisings should take place in the autumn, once plants have set seed.

Where ditches occur, vegetation should be removed to prevent nutrient enrichment of verges. Any invasive alien species should be reported and controlled, and litter should be removed prior to cutting. If any ant hills are discovered, these should be protected and avoided during cutting operations.

Biological records from across the Wrexham Industrial Estate have informed our siting and selection of bird nest boxes and bat boxes. In strategic locations, where the habitat is suitable, we have installed A-frame Barn owl boxes on mature isolated trees. We have also installed woodpecker nest boxes, open-fronted & hole entrance bird boxes and Schwegler bat boxes in various locations across the Wrexham Industrial Estate.

Pond management

The UK lost 50% of its ponds in the 20th century, and 80% of those remaining are considered to be in a poor state. As the Wrexham Industrial Estate has a relatively low pond density, the specific management of existing ponds for Great Crested Newts is quite important (see the following sub-section 3.1.4, and the Great Crested Newt Conservation Handbook for more information). Where shallow ponds and pond edges have become inundated with trees or Bulrush, it may be necessary to remove these by hand, to try and maintain the pond close to its original state. It is also worth keeping an eye out for invasive alien species which may colonise bare pond edges; such as New Zealand pigmyweed and Floating pennywort. Any pond management should be undertaken between the months of November and January, and a licence may be required from the Welsh Assembly Government, due to the possible disturbance of Great Crested Newt.

Improving habitats for birds of prey

Kestrel and Barn owl are two raptors which breed on the Wrexham Industrial Estate. They depend on rough tussocky grassland with a good population of small mammal prey,

particularly Short-tailed field vole. Ideally, extensive areas of grassland should be cut on a three year rotation, to allow the build-up of a good litter-layer (at least 7cm deep) at the base of the sward, as this provides the cover field voles need. Hedge and tree planting along site boundaries and along roadside verges, encourages raptors to fly high over roads, therefore minimising collision with road traffic. Barn owls will move along linear features such as hedgerows as they provide safe connectivity between larger hunting areas. Nesting sites can be provided by installing artifical nest boxes in areas of suitable habitat. Boxes can be installed inside farm buildings or on a mature isolated tree, provided the entrance faces east and the entrance is easily accessible. An A-frame Barn owl box should be erected at a height of approximately 4.5 - 7 metres, and a Kestrel nest box should be erected at a height of about 3 - 4 metres.

3.1.3 Creation of new habitats

Hedge and tree planting
Hedgerows are one of the most important resources for wildlife in the countryside and the urban landscape. They provide food, shelter and nesting habitat, and function as important wildlife corridors, linking habitats together. Native species such as willows and Blackthorn provide an important pollen/nectar resource for pollinating insects such as queen bumblebees and solitary bees that emerge early in the year.

The best hedgerows for wildlife are those which closely mimick woodland edge habitat; tall, dense, species-rich, and broad at the base. Hedgerows can also buffer existing woodland edges by acting as a windbreak, and therefore maintaining humidity and creating ideal conditions for woodland flora to thrive. Along roadsides, incorporating fast-growing native trees such as Black Poplar, encourages Barn owl and Kestrel to fly high over roads, minimising collision with vehicles. Light trimming of hedgerows in the first few years after planting can be beneficial, as it encourages dense, bushy growth. To maximise the ecological value of a hedgerow, a strip of grassland at least 2m wide (ideally on both sides of the hedgerow) should only be cut every three or four years. This will encourage the development of rough, tussocky grassland, which is important for invertebrates and hunting birds of prey. Figure 2 shows our initial proposals for hedge planting, which will improve connectivity between existing woodland and scrubland.

Pond creation
Historically, old farm ponds were filled in to expand arable farming, and this had a detrimental effect on our freshwater biodiversity. Luckily, across the Wrexham Industrial Estate, a number of mitigation ponds have been created to safeguard threatened species such as Great Crested newt and Common Toad. Amphibians cover significant distances when hunting and migrating, so the surrounding habitat must contain suitable connectivity and hibernacular features for them to thrive (see next sub-section 3.1.4).

The wildlife value of newly created ponds can be seen almost immediately, but to maximise their ecological benefits a number of steps should be followed. It is best to create a 'pond complex' which includes both permanent and seasonal ponds of various sizes and depths, rather than a single one. Seasonal or temporary ponds surrounding a main pond are really important, as they support a rich community of plant and animal species, particularly amphibians and invertebrates. It is best not to add anything to a newly created pond, allowing plants and animals to colonise naturally.

Usually, the water level of a pond drops by about half a metre during the summer; this exposes a 'drawn-down' zone which is flooded in the winter and dry in the summer. This changing habitat plays an important role in the ecology of a pond, as most pond animal species often inhabit water that is only 1 - 10cm deep. When designing a pond, this 'draw-down' zone should be broad and undulating, and ideally should have a gradient of less than 1:5. Site selection is the most important consideration before creating a pond, as well as:

- the site should contain an unpolluted water source (choose an area of rough grassland or woodland edge)
- avoid areas near arable farming where fertilisers or pesticides could run off
- avoid areas that are likely to receive run-off from roads, spoil heaps and hard standing
- avoid siting a pond near streams and ditches - these inflows can bring silt and polluted water

Scarification

Early successional habitats are declining across the Wrexham Industrial Estate and these areas support some of our rarest invertebrates.
In strategic locations, the creation of bare ground scrapes or the introduction of crushed aggregates can attempt to replicate this habitat, providing important habitat niches and encouraging the establishment of beneficial flora such as Wild strawberry and Bird's-foot-trefoil. Early successional habitats and bare ground provide an important resource within the overall brownfield mosaic and can function as 'stepping stones' to improve connectivity for invertebrates within sites and between sites.
In priority areas, scarification can maintain habitat suitability by providing new areas for breeding and egg laying. On low nutrient substrates with minimal vegetation, suitable scrapes can be created with hand tools, but where nutrient levels are higher, it is easier to use a mini-digger to invert the top-soil and to expose the lower nutrient sub-soil. Edges of scrapes should be left as gentle rounded angles to diversify aspect and microclimate.
It is preferable to create a number of smaller scrapes across a site rather than a single larger one, ideally staggered over a number of years to encourage a site-wide mosaic of successional stages.
Natural colonisation vs. seeding should be decided on a site by site basis, but the aim is for larval foodplants to recolonise. The Grizzled Skipper butterfly lays single eggs on these foodplants, which tend to grow in warm situations near bare ground and short vegetation. The larvae spin together the edges of leaves to build a series of tents, which protect them as they grow. They overwinter as pupae, which are formed within cocoons of leaves and silk amongst low vegetation.
If seeding or plug planting is required, the following species should be included; Agrimony, Creeping cinquefoil and Wild strawberry (*Fragaria vesca).*

'Bee banks' can be created with a core of stripped turf and soil, and capped with sharp sand. These can be linear or horseshoe shaped and ideally south/south-west facing.
If any small 'cliff-like' features exist, they can be vertically scraped to create new nesting habitat for solitary bees and wasps. These features provide topographical variations with

Topsoil stripping with mini-digger

An area of scrub adjacent to a car park was identified as a good demonstration site for creating and maintaining an open mosaic habitat. A patchwork of bare, disturbed ground, scrub and short sward vegetation can support a rich diversity of invertebrates, including the Dingy Skipper butterfly which has been recorded nearby. A small patch was opened up by clearing some scrub and cutting back some overhanging trees; the topsoil was stripped to create areas of bare ground and to prevent regrowth of vigorous plants, allowing colonisation of larval foodplants (which will be plug planted at a later date).

differences in micro-climate and moisture, which benefits a range of invertebrates.

3.1.4 Maintaining and enhancing connectivity

For species to thrive, they need to be able to move between populations unhindered, and this can be a real problem in an urban landscape such as the Wrexham Industrial Estate, which supports protected and conservation priority species. Built development can sometimes act as a barrier, preventing this movement and sometimes isolating populations. This leads to poor gene flow, causing inbreeding and reducing a species' ability to survive and adapt to environmental pressures. Many of the species which occur on the estate have quite specialised habitat requirements; such as Great Crested Newt and Grizzled Skipper butterfly. These species have a declining population in Wales, but through coordinated action and the provision of well connected green infrastructure, development on the Wrexham Industrial Estate can proceed with little impact on threatened species.

Improving connectivity for invertebrates
Brownfield sites are a declining resource in Wales and are recognised as a conservation priority habitat (NERC Section 42). Due to the large proportion of brownfield sites on the Wrexham Industrial Estate, and their dynamic nature (sites are being lost and created on a cyclical basis), conserving these habitats and maintaining connectivity between them is a real challenge, which requires commitment to obtaining invertebrate data and using it to inform the management of priority areas and working to create new habitats between them.

The Grizzled Skipper butterfly is a rare and threatened butterfly in Wales, and the Wrexham Industrial Estate represents one of only five robust populations that remain in Wales. The Grizzled Skipper butterfly occurs in at least five distinct areas on the estate; the former Firestone site, 'The Oaks' Wildlife Site and

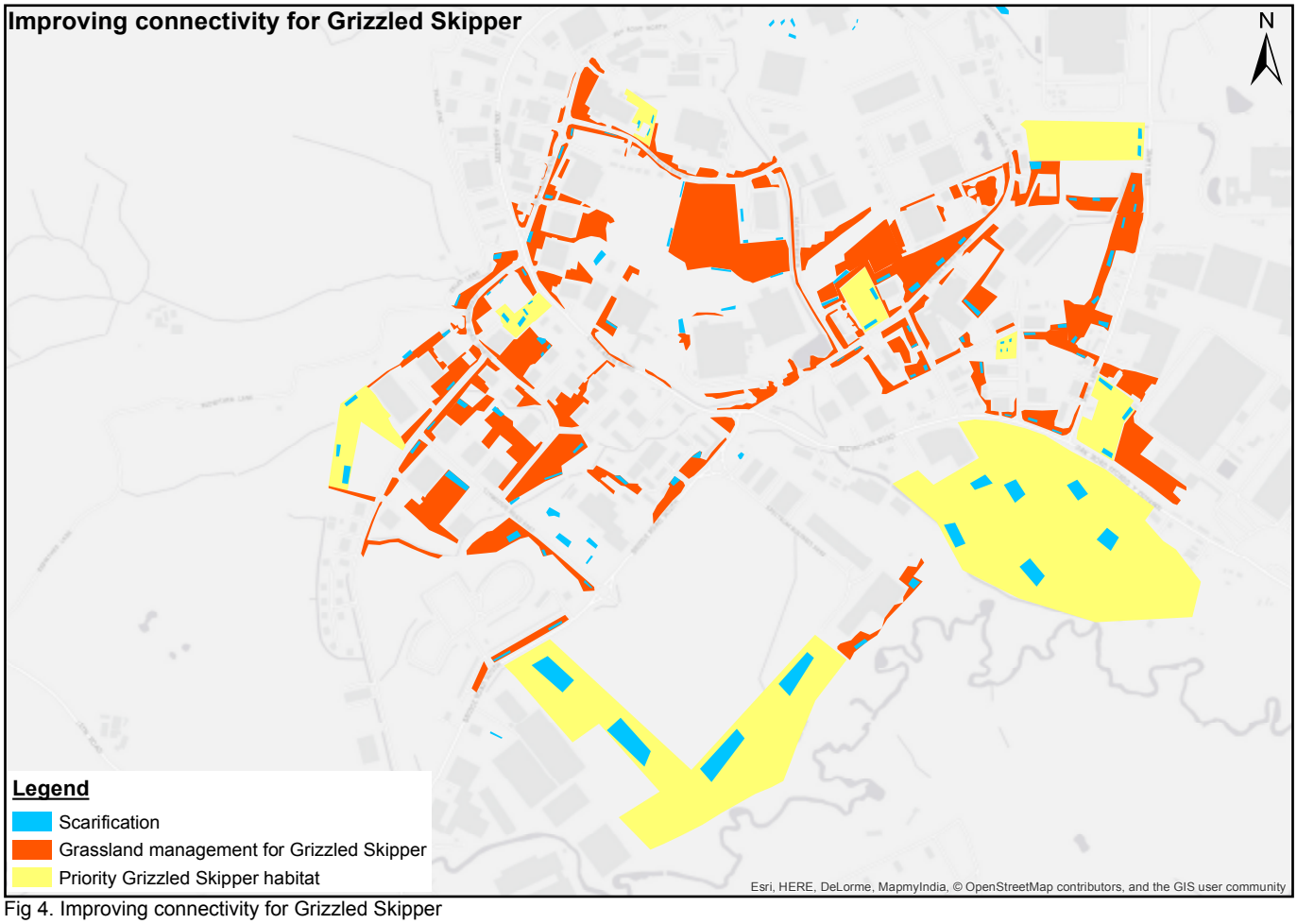


Fig 4. Improving connectivity for Grizzled Skipper

adjacent brownfield sites; the Bryn Lane ecological mitigation area; a brownfield site on Bridge Road North, and another brownfield area behind Riello UPS. Species surveys have provided enough information for us to prioritise these areas for protection and restoration. Figure 4 shows priority areas for Grizzled Skipper and where connectivity can be improved. By linking-up priority habitat in this way, populations of Grizzled Skipper butterfly and Dingy Skipper butterfly, as well as many other threatened invertebrates, will be able to colonise new areas and will be safeguarded from isolation and possible extinction.

The identified priority areas for Grizzled Skipper butterfly require immediate management to maintain their long-term habitat suitability. The aim is to maintain a mosaic of short herb-rich grassland with patches of bare ground for breeding; taller vegetation for shelter and roosting, and scrub for mate location and as foodplant habitat. This habitat resource is declining on the Wrexham Industrial Estate, but can be restored and created through simple interventions. Grass cutting should follow a long rotation so that areas of uncut grass are always retained, and wildflower-rich areas are allowed to set seed. It is beneficial to manage scrub on a rotational basis; arisings should be removed from the site or piled in a designated area to create hibernacular. Rotational creation of scrapes and improving the quantity of larval foodplants provides habitat for the butterfly's full life cycle. Scrapes should be plug planted with appropriate larval foodplants, as natural colonisation by these species is not guaranteed. Bare ground habitat is used by many invertebrate species and can be created by importing crushed limestone or other low nutrient substrates. Butterfly banks provide a range of micro-habitats and are colonised by many different plants and invertebrates. Throughout the connecting grassland, all of these key habitat features can be created to help improve the conservation status of Grizzled Skipper butterfly on the Wrexham Industrial Estate.

Grizzled Skipper © Tony Pope

Creeping cinquefoil colonising bare ground © R~P~M (http://creativecommons.org/licenses/by-nc-nd/4.0/)

Improving connectivity for amphibians

The Great Crested Newt Species Action Plan for Wrexham, estimates that 500 breeding ponds exist in Wales, and that 200 of these are within Wrexham County Borough. Therefore, the exceptional population which occurs in and around the Wrexham Industrial Estate makes an important contribution to the European population.

NRW's Population Review of Wrexham Industrial Estate, reviewed Great Crested Newt survey data undertaken by AMEC for the Wrexham Industrial Estate Road Improvement Scheme as well as other historical data. This data analysis indicated an overall population decline for Great Crested Newt on the estate, and that pond senescence was considered to be one of the main threats to Great Crested Newts in a high pond density landscape such as the Wrexham Industrial Estate. This illustrates the importance of habitat management and the continued creation of new freshwater and terrestrial habitats to safeguard the population.

Three 'hot-spots' for Great Crested Newt are known within the Wrexham Industrial Estate:

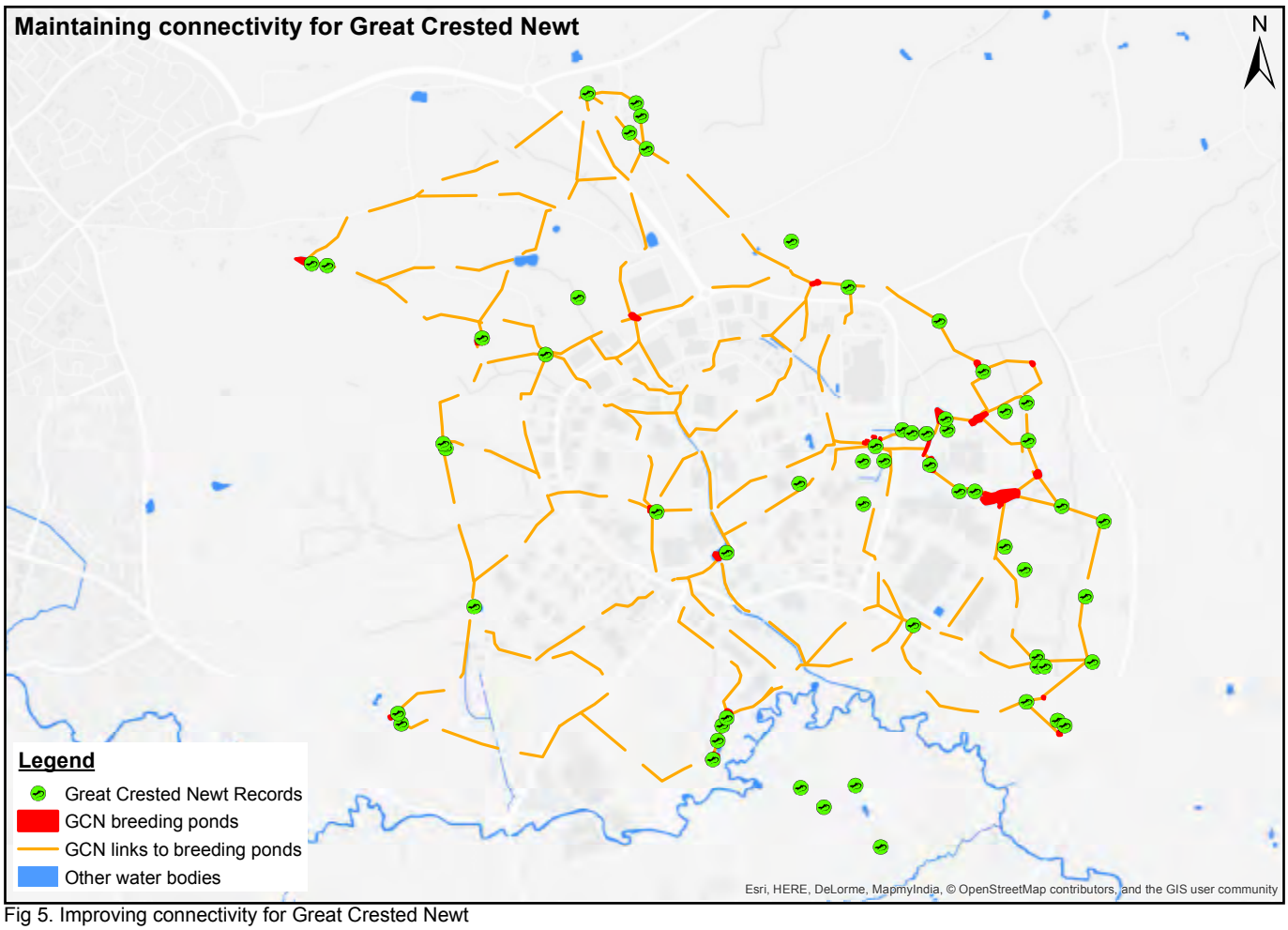


Fig 5. Improving connectivity for Great Crested Newt

- Firestone site (South)
- Mitigation sites along Bryn Lane/around Norbert Dentressangle (East)
- Erlas Black Wood (Central)

These hotspots are surrounded by roads, factories and hard standing, and are at risk from further development. Figure 5 shows the location of confirmed Great Crested Newt breeding ponds and the likely links between these ponds, these are priority areas for amphibian habitat improvement. The River Clywedog is likely to form a semi-permeable natural barrier to newt migration, and so habitat improvement works should be focused on areas to the north of the Firestone site, as well as patches of suitable habitat between Erlas Black Wood and the Bryn Lane mitigation areas.

Great Crested Newts require clear, open water for displaying and foraging; marginal vegetation for egg laying, and rough grassland for foraging and refuge. To improve the foraging and hibernation resource, and to improve connectivity between these amphibian hotspots, the following habitat improvements are proposed along these priority links:

- protection of areas of existing scrub
- hedge restoration and new planting
- three-year cutting regime of rough grassland
- creation of wildflower meadows and verges

There is a need for pond creation along the links between Erlas Black Wood and Bryn Lane. Ponds should be irregular in shape, with a varying topography. A range of depths should be created, between 0.50 to 1.50m deep; incorporating a shelf around 25% of the pond margin, giving a depth of around 20cm. Slopes should have a gradient of about 1:4. Spoil should be deposited in areas around the pond and ideally planted with appropriate marginal vegetation such as grasses, sedges and rushes. About 50% of the pond surface should be maintained as open water and plant losses should be replaced during the next available season. Hibernaculars should be created within 20m of a pond and should follow the

guidelines as presented in the Great Crested Newt Conservation Handbook (Froglife). Other water bodies with no confirmed amphibian presence may require further survey effort and habitat improvement works to improve the chances of colonisation in the future.

Roads are a significant hazard to migrating amphibians and this is especially true along Bryn Lane. There are a number of avoidance measures which can be implemented along Bryn Lane and elsewhere to minimise the risk of amphibians being squashed or being trapped in gully pots. This includes replacing the kerbs adjacent to gullies with 'Wildlife Kerbs', where the inclusion of a "bypass pocket" helps amphibians to avoid the gully. Amphibian Climate Tunnels can be incorporated into roads, where migration routes exist. Road signs are also effective, if they are installed in both directions and well before the breeding season commences.

ACO 'Wildlife Kerb' © wildlifefencing.co.uk

Roadside verges

The Wrexham Industrial Estate has a wealth of grassland verges which function as important wildlife corridors between key habitats. Their value to biodiversity can be greatly improved through sensitive management and allowing native wildflowers to set seed. Even improved grassland verges can be enhanced by sowing wildflower seed and following a specific management regime (please see previous sub-chapter 3.1.2 for guidance on grassland management). Native wildflowers provide an important source of nectar for pollinating insects such as bumblebees, and give a spectacular show of colour in otherwise sterile landscapes. If grassland verges are allowed to grow throughout the summer months, wildlife is given a chance to disperse and recolonise new areas. Managing verges for the benefit of wildlife is fairly straightforward and usually more cost effective than the intensive cutting regimes that are currently employed across most of the Wrexham Industrial Estate. Verges can be enhanced even further by creating patches of bare ground or creating 'butterfly banks'.

Roadside verges in Swansea managed for arable weeds
© City and County of Swansea Parks Department

Green infrastructure on the Wrexham Industrial Estate (grassland, woodland, scrub and ephemeral habitats)

3.2 Enhancing the estate for people and business

The wealth of species and habitats occurring on the Wrexham Industrial Estate make it an attractive place to live and work. Its natural and cultural heritage is appealing to outside visitors and investors and should be promoted far and wide. The scale of ecosystem services provided by the Wrexham Industrial Estate's green infrastructure is quite remarkable, contributing to flood alleviation, carbon sequestration, and even crime reduction. As a society, we are spending more time indoors and the medical profession is beginning to recognise the importance of nature in supporting our health and well-being. Safeguarding habitats and improving their accessibility, will ensure that future generations are able to learn about this unique resource and reap the many benefits it provides.

Amenity

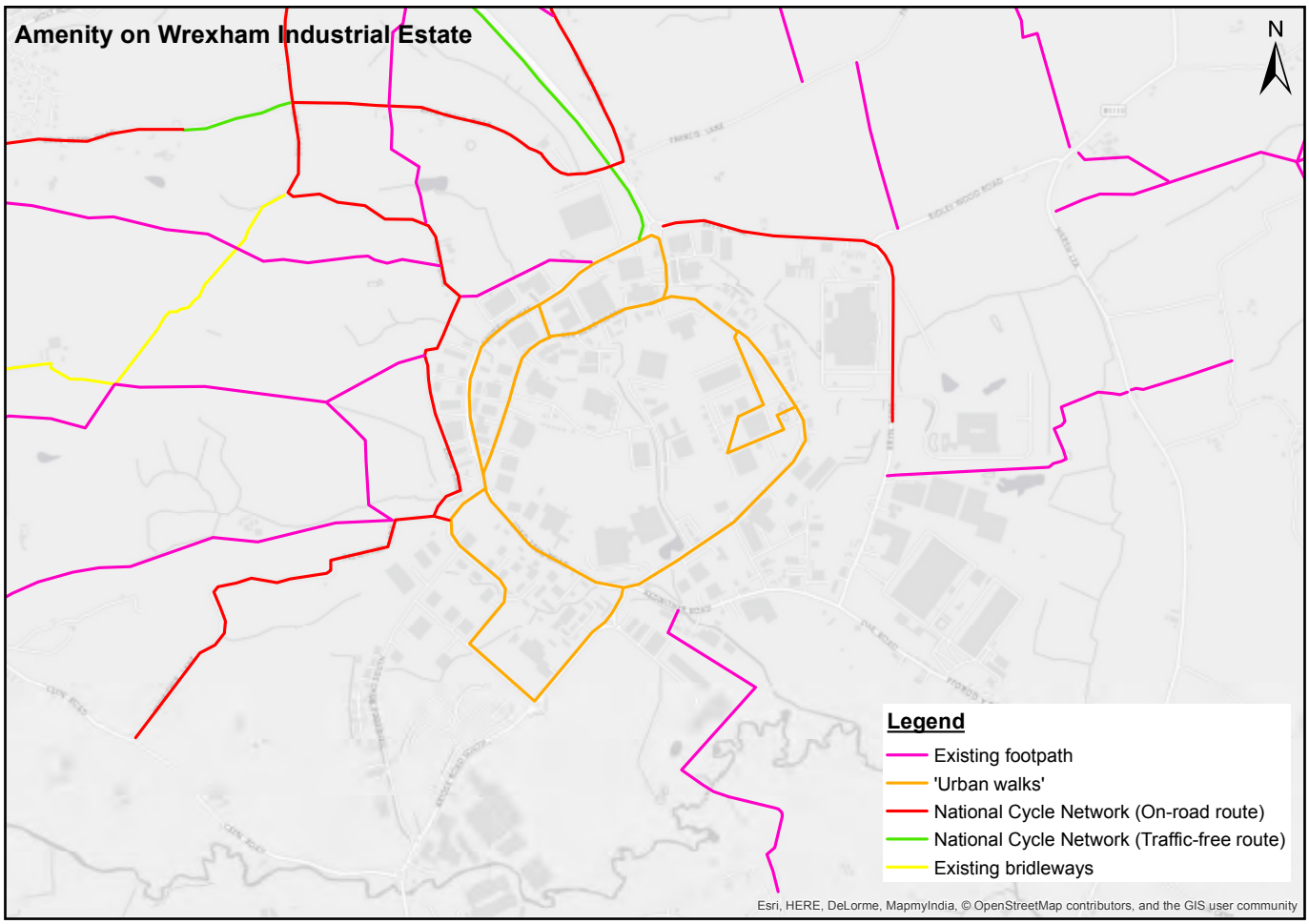
Footpaths and cycle routes lead into the Wrexham Industrial Estate from all directions and includes on-road and traffic-free routes and bridleways. Wrexham County Borough Council in partnership with 'Urban Walks' and the Welsh Assembly Government, have promoted a number of urban walks around the estate, with the aim of getting people enjoying more activity, more often in their everyday environment, and this has been promoted through a website and leaflet. However, most of the existing footpaths, cycle routes and 'Urban Walks' follow busy roads or terminate at the Wrexham Industrial Estate boundary. We are proposing the extension of existing public rights of way to include areas of green space within the Wrexham Industrial Estate. These new routes will improve existing urban walks by providing a more sensory, invigorating lunchtime walk or picnic for workers on the estate. They will link up with abandoned routes and encourage people to explore the landscape in which they work, and discover the Wrexham Industrial Estate's rich biodiversity for themselves. At certain points along these routes, interpretation panels would be installed to raise awareness about the habitats, species and heritage of the Wrexham Industrial Estate. These routes were ground truthed where access was possible and drawn up in GIS.

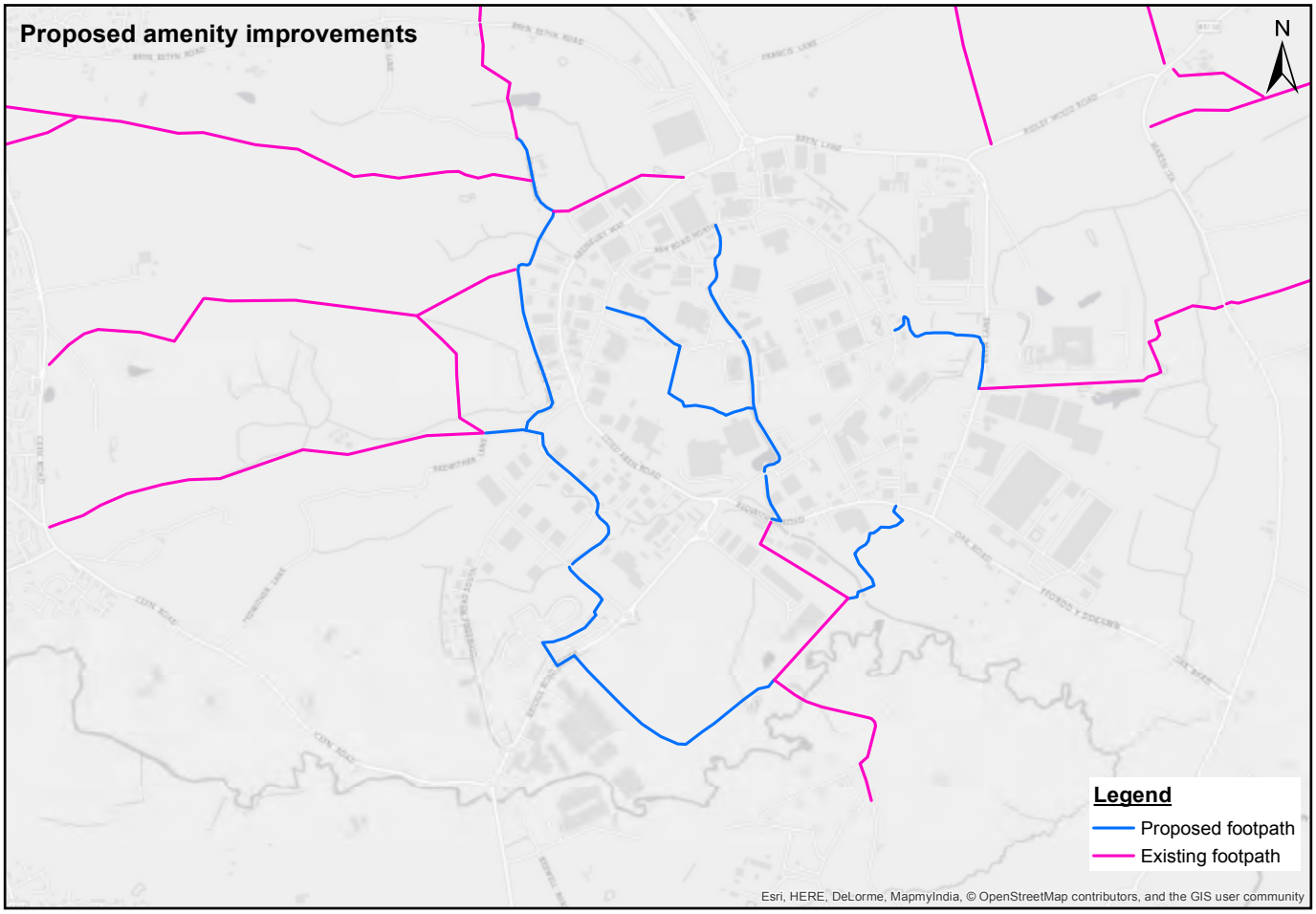
Redwither Road to Ash Road North - this proposed footpath follows-on from the existing path on Redwither Road and runs right through the centre of the Wrexham Industrial Estate. It follows Redwither Brook, then across Bridge Road North and continuing along Redwither Brook, finishing on Ash Road North. There would also be a westward branch, skirting Erlas Black Wood, along Ash Road South and finishing at the junction with Ash Road North.

Bridge Road South to Erlas Lane - this proposed footpath would also join up with the existing path on Redwither Road, which runs to the south of the Wrexham Industrial Estate. This new path would start at the south of Calypso Soft Drinks and follow the ecological mitigation area around the Firestone site; it would then follow the desire paths to the east of the Oval and continue through ancient woodland off Clywedog Road East. It would then follow the pavement of Clywedog Road North, providing fantastic views of Grizzled Skipper butterfly as well as orchids and cowslips in patches of semi-improved grassland. To connect with the existing footpath on Redwither Lane, the proposed path would go through an area of species-rich grassland and broadleaf woodland.

Bryn Lane to Bridge Road North - this path would join up with an abandoned footpath which runs to the east of the Wrexham Industrial Estate. This new section of footpath would follow the pavement of Bryn Lane and cross the Bryn Lane nature reserve; skirting ponds and through managed broadleaf woodland. It would then terminate on Bridge Road North, connecting up with existing 'urban walks'.

'The Oaks' - this new footpath would cross the Oaks Wildlife Site, following existing desired paths on the site, and connecting with the existing footpath to the south of the Wrexham Industrial Estate. The new path would terminate on Oak Road.


Amenity on Wrexham Industrial Estate
N
Legend
Existing footpath
'Urban walks'
National Cycle Network (On-road route)
National Cycle Network (Traffic-free route)
Existing bridleways
Esri, HERE, DeLorme, MapmyIndia, © OpenStreetMap contributors, and the GIS user community


Proposed amenity improvements
N
Legend
Proposed footpath
Existing footpath
Esri, HERE, DeLorme, MapmyIndia, © OpenStreetMap contributors, and the GIS user community

Abbey Road Picnic Area - a small picnic area would be created in a copse off Abbey Road. After some tree thinning and the creation of an informal access path, this would be a pleasant and sheltered picnic space, and would connect-up with existing walking routes from Redwither Tower, and could be used for recreation.

Community engagement
A key component of this Living Landscapes scheme is engagement with community groups and volunteers. The Wrexham Industrial Estate's green infrastructure offers enormous potential for a wide range of community engagement activities. For example, Coveris Advanced Coatings provide outdoor mindfulness sessions for their employees; workers from Redwither Tower take regular strolls through nearby Wildlife Sites, and employees at Hauck and Ball Packaging are keen birdwatchers and botanists, recording elusive species on their landholdings. Volunteers are essential to the overall sustainability of this Living Landscapes scheme, as monitoring of species and the management of habitats is a continual process, that can always be expanded. By working with businesses, local community groups, schools and voluntary organisations, a substantial programme of conservation and recreational activities can be developed for the Wrexham Industrial Estate.


Volunteers planting plugs in scarified plots
© Buglife

Vermin control
Vermin control is a major problem on the Wrexham Industrial Estate, particularly because of the number of food production


Barn owl with Brown rat
© Phil Winter (www.flickr.com/photos/92372818@N04/)

companies on the estate. Birds of prey such as Barn owl and Kestrel are extremely effective in reducing rat populations, and these raptors can be encouraged by planting hedgerows, leaving areas of rough grassland for hunting, and providing artificial nest boxes. Rats and mice can also be controlled by encouraging Polecats, which actively hunt these species in and around the Wrexham Industrial Estate. Unfortunately, Polecats and birds of prey are indirectly contaminated by rodenticides and these poisons should only be used as a very last resort.

Environmental standards
Managing landholdings to improve biodiversity can contribute to an organisation's attainment of the Green Dragon Environmental Standard, ISO 14001 or the Eco-Management and Audit Scheme.

There are many ways that an organisation can reduce their carbon footprint and contribute to the Wrexham Industrial Estate's sustainable development. Tree and hedge planting plays a significant role in reducing air pollution and capturing carbon. The 2014 Forest Research i-Tree Eco report, Valuing Wrexham's Urban Forest, commissioned by Natural Resources Wales and Wrexham County Borough Council, identified that 60 tonnes of air pollution were

removed annually across Wrexham's 12 urban areas (saving the NHS £700,000 - by reducing asthma and heart disease). The ecosystem services provided by Wrexham's trees are collectively valued at £1.2 million per year.

Sustainable verge management is another method, whereby increasing the nectar resource for pollinating bees and wasps; helping to support agriculture and food production. Managing grassland and roadside verges as wildflower meadows is cheaper and less intensive than usual cutting regimes, and helps in the control of water and sediment run-off.

Pond creation benefits a range of freshwater species, and also helps with flood alleviation when it is integrated as part of a sustainable urban drainage system. By managing ponds and surrounding vegetation for the benefit of biodiversity, these wetlands also become attractive amenity areas for future generations to enjoy.

Management prescriptions for landholders
We have developed some brief management prescriptions for individual landholders. These provide an overview of targeted conservation works specific to each site, and can be modified as necessary. The land management proposals have been developed through informal liaison with businesses and landholders, and following advice from project partners Buglife, Butterfly Conservation and Wrexham County Borough Council. They are intended as guidelines for any future wildlife habitat conservation works on the Wrexham Industrial Estate.

During the scoping phase of this project, all the Wrexham Industrial Estate landholders and businesses were contacted to enable access for habitat surveys and to identify any opportunities for habitat maintenance, creation or restoration. Following habitat surveys and assessment of biological records, some areas have been prioritised for conservation action. The overall response by businesses and landholders has been positive, and it is envisaged that many more landholdings will be brought into the scheme in the future.

In some instances, landholders and contractors are already working towards an informal management plan, and this has been shown as areas of maintenance in the prescription maps.

Road corridors
The following road corridors have been identified by Wrexham County Borough Council as containing important wildlife connectivity features, and therefore development adjacent to these areas should provide a means to link existing habitats and support the development of a wider 'green network' throughout the Wrexham Industrial Estate:

- Clywedog Road - near to River Clywedog
- Bridge Road North - near to Wildlife Site and ponds
- Ash Road South - near to Wildlife Site and ponds
- Redwither - Road, near to Wildlife Site and River Clywedog
- Oak Road - near to Wildlife Site and River Clywedog
- Abenbury Way - close to watercourses

A brownfield site on Bridge Road was identified as a key stepping stone for birds and invertebrates moving between the former Firestone site and an adjacent pocket of broadleaved woodland. To improve wildlife connectivity in this area, we have planted a mixed species hedge around the periphery of this site. This will eventually provide nesting and foraging opportunities for song birds and early flowering Blackthorn will provide an important early source of nectar for invertebrates. It will also encourage owls and kestrels, which breed and hunt nearby, to fly high overhead, minimising collision with road traffic.

4. Conclusions and Future Actions

The Wrexham Industrial Estate has the potential to become a role model for commercial, social and environmental integration. As the commercial, nature conservation and administrative communities work together in a creative partnership, the Living Landscape will undoubtedly become better understood and its wildlife will become richer. The local businesses will learn to make creative use of their natural surroundings, and to recognise the many ways in which the quality of the work environment can benefit the reliability and productivity of their companies. The local authority will have a unique offer to make to inward investors, and the Wrexham Industrial Estate can set new standards for commercially and ecologically successful sustainable development.
In order to progress the development of a Living Landscape Scheme for the Wrexham Industrial Estate, a number of actions need to be undertaken, including:

- With Wrexham County Borough Council, other appropriate partners and key businesses, agree on the long-term strategy for the Wrexham Industrial Estate

- Develop a definitive 'spatial plan' for the Wrexham Industrial Estate, undertaking additional surveys as required to highlight the features that must be:

    - protected from inappropriate development
    - compensated/mitigated for damage or loss as a result of development
    - improved for people and wildlife as appropriate

- Formally incorporate the spatial plan into the Local Development Plan for Wrexham County Borough

- Develop mechanisms for funding the maintenance and enhancement of biodiversity and amenity features of the Wrexham Industrial Estate into the future

- Seek funding from a variety of sources as required to take forward the above actions

Green Woodpecker © Ron Knight
http://creativecommons.org/licenses/by/4.0/

5. Bibliography

Fuller, R.M. (1987) The change, extent and conservation interest of lowland grasslands in England and Wales; a review of grassland surveys 1930-1984. Biological Conservation 40: 281-300.

Ellis, S., Bourn, N. A. D. and Bulman, C. R. (2012) *Landscape-scale conservation for butterflies and moths: lessons from the UK.* Butterfly Conservation, Wareham, Dorset.

Tordoff, G. and Williams, C. (2014). Status of the Grizzled Skipper butterfly (*Pyrgus malvae*) in Wales. Butterfly Conservation Wales, Swansea.

Langton, T.E.S., Beckett, C.L., and Foster, J.P. (2001), Great Crested Newt Conservation Handbook, Froglife, Halesworth.

JNCC (1993). Handbook for Phase 1 Habitat Survey. A technique for environmental audit (reprint). Joint Nature Conservation Committee, Peterborough.

Wrexham County Borough Council (2003). Great Crested Newt Species Action Plan.

Wrexham County Borough Council (2009). Local Guidance Planning Note No. 29.

Countryside Council for Wales (CCW) (no year). Population Review Wrexham Industrial Estate.

Wrexham Prison Addendum to Ecological Mitigation Strategy and Habitat Management Plan. December 2013. Environ.

Amphibian and Reptile Conservation (November 2013). Firestone GCN Modelling: Comparative Impact Modelling to Inform Planning. Middlemarch Environmental Ltd.

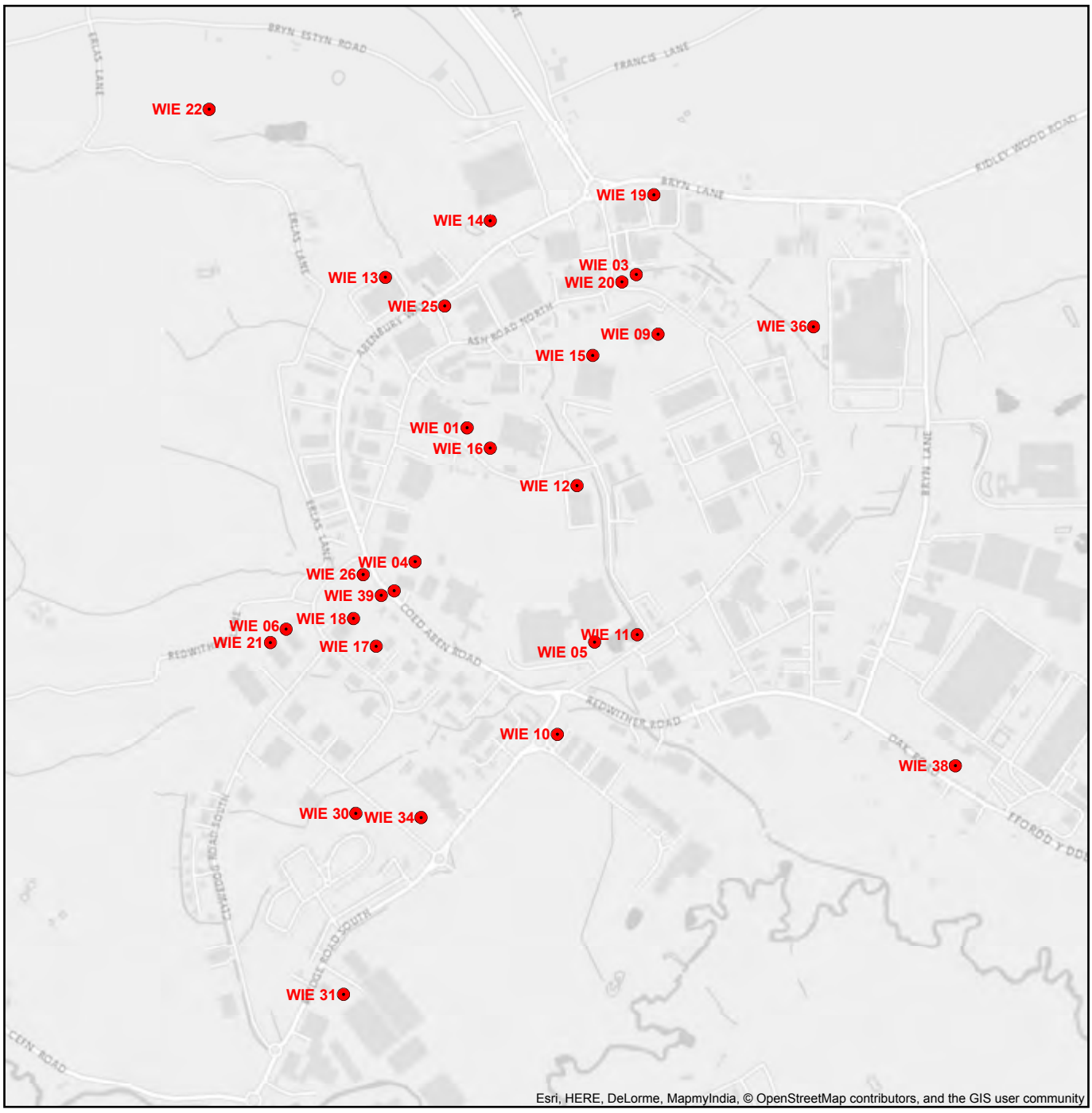
Wrexham Industrial Estate – Great Crested Newt Strategy. July 2007. Middlemarch Environmental Ltd.

Wrexham Industrial Estate – Green Wedges with Emphasis on Great Crested Newt – Brief Letter and Drawings. September 2007. Middlemarch Environmental Ltd.

Rumble, H., Rogers, K., Doick, K., and Hutchings T. (June 2014), Valuing Wrexham's Urban Forest - Assessing the Ecosystem Services of Wrexham's Urban Trees: A Technical Report. Forest Research.

Roos, S., Johnston, A. & Noble, D. (2012) UK Hedgehog datasets and their potential for long-term monitoring. BTO Research Report 598

6. Appendix - Prescriptions for Landholders



WIE 01 - Hauck
WIE 02 - JCB
WIE 03 - Coveris
WIE 04 - Ecodek
WIE 05 - Ball Packaging
WIE 06 - Dragon Packaging
WIE 08 - Village Bakery
WIE 09 - IMC
WIE 10 - Hi-mark
WIE 11 - Redwither Brook (WAG)
WIE 12 - Caparo Wire (factory 2)
WIE 13 - Annyalla Chicks
WIE 15 - Norish Foods
WIE 16 - Rowan Foods
WIE 17 - Roil Foods
WIE 18 - Riello UPS
WIE 19 - Wockhardt
WIE 20 - Wrexham County Borough Council #1
WIE 21 - TCB
WIE 22 - Clays Golf
WIE 26 - Owens Road Services
WIE 31 - Clwyd Precision Engineering Ltd
WIE 34 - Hydro Aluminium
WIE 36 - Kelloggs
WIE 38 - Prysmian Group
WIE 39 - RKP Engineering

Hauck (WIE 01)

• Bank to east of premises (unmanaged) - provides foraging resource for invertebrates, larger shrubs should be removed, leaving bare ground.

• Opportunities to expand areas of bare ground adjacent to car park edge; rotational ground disturbance or adding crushed limestone. These should be seeded with larval foodplants/plugs as there is no guarantee that they will colonise naturally.

• Two small strips of semi improved grassland - cut in Autumn/Winter - encourage a more diverse sward of herbs and grasses. Bird's-foot Trefoil and Creeping Cinquefoil present but sward quite tall - remove regenerating shrubs.

• Wet woodland - a habitat of principal importance for conservation of biological diversity in Wales (S42) - requires Phase 2 habitat survey. Location for Green woodpecker and Schwegler bat boxes.

JCB (WIE 02)

Legend

Wildflower meadow

• Designated areas within amenity grassland - revert to early spring and late autumn hay cut, to encourage native floral diversity

• Roadside verges - managed as wildflower meadow. Area to be managed and sown with annual/perennial wildflower seed: approximately 250 m2. First year (2015) rotovation and application of mulch mat to suppress grass growth; second year sowing of wildflower seed (mixture of arable & perennial species

• Interpretation sign positioned at edge of roadside verge to inform public about the conservation work and species targeted. Sign would be about A4 size and would be mounted on Sweet chestnut post

• Installation of bird nest boxes on various trees around site. Also, installation of Barn owl box on mature oak tree

•Tree planting around balancing pond (same species - Alder and Willow species)

Coveris Advanced Coatings (WIE 03)

• Area of scarification adjacent to car park: approximately 80m2 of scrub clearance to open-up site; shallow scraping of ground to expose substrate. Retain brash on site as habitat pile, remove topsoil from site.

• Planting of larval foodplant plugs to benefit Dingy/Grizzled Skipper butterflies: Agrimony (*Agrimonia eupatoria*), Creeping Cinquefoil (*Potentilla reptans*), Wild Strawberry (*Fragaria vesca*), Barren Strawberry (*Potentilla sterilis*), Tormentil (*Potentilla erecta*), Salad Burnet (*Sanguisorba minor*), Common Bird's-foot-trefoil (*Lotus corniculatus*) and Greater Bird's-foot-trefoil (*Lotus pedunculatus*)

• Interpretation sign positioned at edge of scarified area to inform employees about the conservation work and species targeted. Sign would be about A4 size and would be mounted on Sweet chestnut post

• Installation of bird nest boxes on various trees around site, including boxes for Green woodpecker.

COVERIS™
ADVANCED COATINGS

Ecodek (WIE 04)

• Grassland A - maintain species diversity and reduce encroaching scrub by introducing winter grazing (4 hebridean ewes). Installation of stock-proof post and wire fence and access gate.

• Grassland B & C - cut in October, arisings moved to compost heap. Remove any encroaching scrub and create habitat piles. Possible location for bee hives.

• D (Roadside verge/amenity grassland around car park) - creation and maintenance of wildflower meadow. Cut in autumn and spot-treat any encroaching vegetation with non-residual herbicide.

• E (woodland and scrub with areas of bare ground) - creation and maintenance of informal access track and open area for picnic table and interpretation panel. Installation of bird and bat boxes, as well as woodpecker nest box and owl box.

ecodek
CAREFREE COMPOSITES
A SOLID PRODUCT

Ball Packaging (WIE 05)

• Large spoil bank with areas of bare soil: this area should be maintained and extended by further scrapes and rotational ground disturbance. Plug planting would be beneficial to increase larval foodplants of Grizzled Skipper butterfly. South east facing slope could be enhanced with sowing wildflower seed to improve nectar resource. This should be a maximum of 50% of the area and only seeds of local provenance should be used.

• Broadleaf plantation: coppicing and pollarding to diversify conditions, some brash should be piled up and retained on site to create sheltering and overwintering areas. Timber can be retained by Ball employees. Implement rotational coppice management (6 or 7 years).

• Large areas of semi-improved grassland: current cutting regime should be maintained, ideally implement a long rotation only cutting small patches of grassland in anyone year – this will ensure that longer grassland including tussocks with accumulated leaf litter are retained to provide structural diversity and overwintering sites.

• Installation of various types of nest boxes around the site, including Kestrel, Green Woodpecker and open fronted tit boxes and Schwegler bat boxes.

Dragon Packaging Ltd (WIE 06)

Legend

Grassland management

• Grassland: implement a long rotation - only cutting small patches of grassland in any one year, this will ensure that longer grassland including tussocks with accumulated leaf litter are retained to provide structural diversity and overwintering sites for invertebrates. Cut in autumn after flowering plants have set seed and remove all arisings from site.

• Increase nectar resource by sowing margins/verges with annual/perennial wildflowers and manage appropriately.

• Species-rich hedge and copse - should be maintained and cleared of scrub and dominant ruderal species. Create piles of decaying wood, remove mature Willow and pollard other species. Some planting of native broadleaf trees and/or fruite trees would also be worthwhile here.

Village Bakery (WIE 08)

Legend

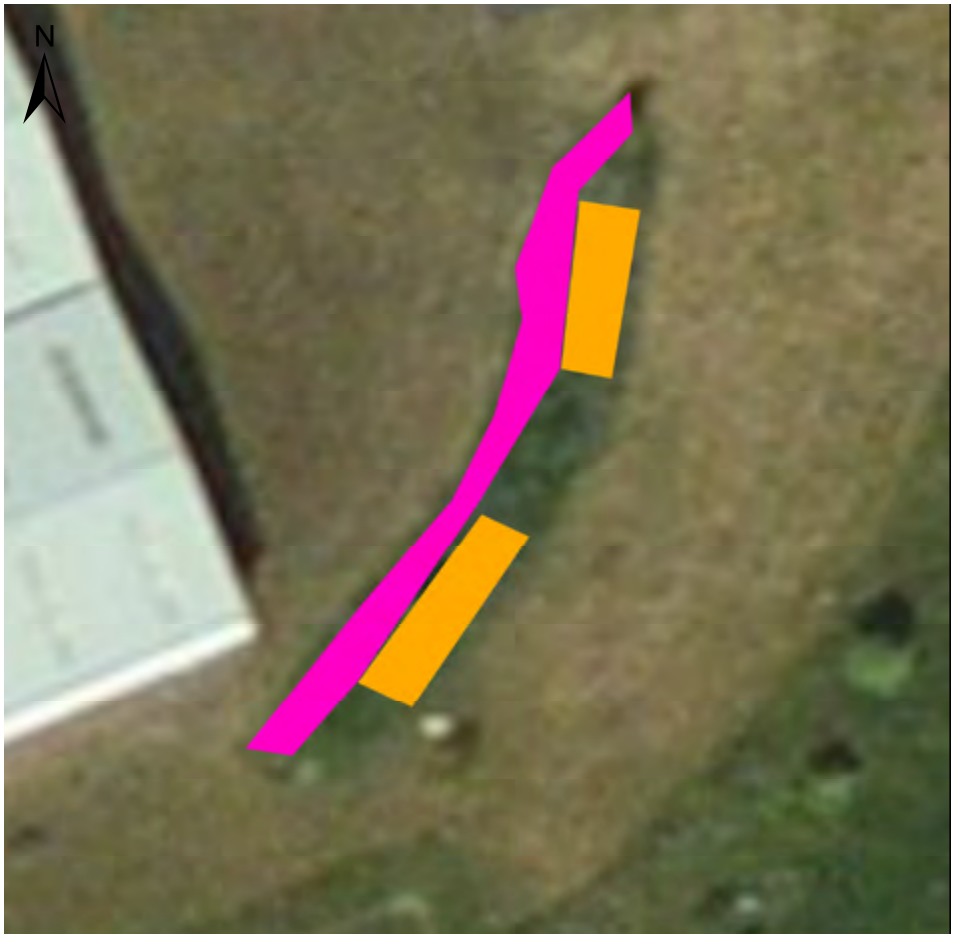
Wildflower meadow

• Roadside verges and grassland around car park managed as wildflower meadow. Area to be managed and sown: approximately 1,100 m2. First year (2015) rotovation and application of mulch mat to suppress grass growth; second year sowing of wildflower seed (mixture of arable & perennial species, including relevant larval foodplants of Grizzled/Dingy Skipper butterflies).

• Whole area to be cut every October with all arisings removed. Some areas can be cut by traditional scything (team building/ skills development exercise for employees at Village Bakery).

• South facing bank: 10% of area topsoil stripped and plug planted with larval foodplants of Grizzled Skipper (5 year rotation).

IMC (WIE 09)



Legend

Scarification

Arable weeds

- Earth bank - scarify south east facing slope to expose subsoil (two 6 x 2 metre scrapes, repeated in small areas on three year rotation).

- Plug planting within scrapes - Agrimony, Creeping Cinquefoil, Wild Strawberry.

- Surrounding grassland should not be cut between April and September and arisings should be removed from site. Increase larval food plant/nectar resource by sowing arable weeds. Where reseeding is needed it should be a maximum of 50% of the area and only seeds of local provenance should be used.

Hi-Mark Automotive Ltd (WIE 10)

Legend

- Hedge planting
- Maintenance
- Interpretation panel
- Picnic bench

• Planting of mixed species hedge along road boundary and Barclays Bank fence. Mature willows to be removed; Oak, Hawthorn and other fruit trees to be incorporated into new hedge. Liaise with landholder on position of access gate.

• Ephemeral areas should be maintained and expanded by rotational ground disturbance and stripping areas of topsoil every few years. These newly created bare areas should be sown with larval foodplants of Grizzled Skipper butterfly. (remove scrub and Japanese Knotweed).

• At edge of site, mindful of future development plans, possible creation of 'butterfly banks' using crushed limestone and top soil from patches of ground scarification (use digger). Scrapes can be sown with appropriate larval foodplants - Agrimony, Creeping Cinquefoil, Wild Strawberry, and butterfly banks left as bare areas for solitary bees and wasps.

• Install bird boxes on larger trees.

Redwither Brook (WAG) (WIE 11)

Legend

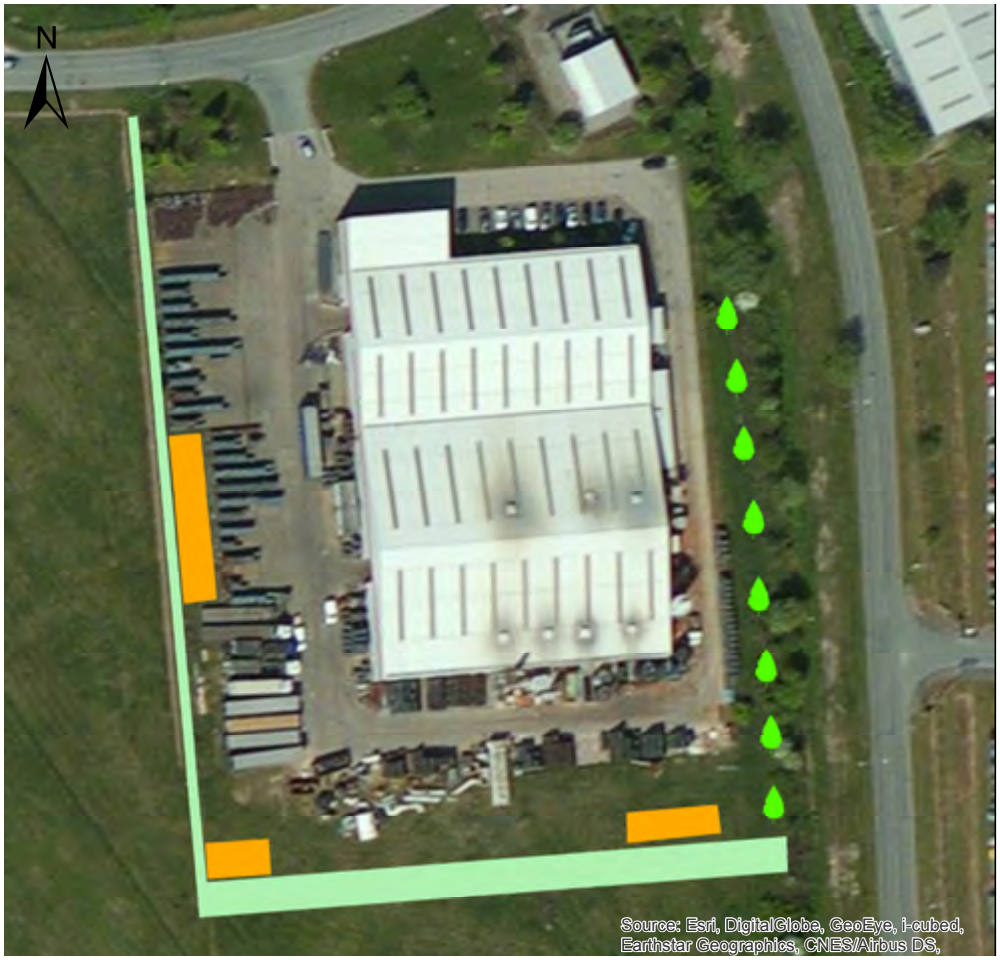
- Grassland management
- Hedge planting
- Path
- Interpretation panel
- Picnic bench

• Grassland: implement a long rotation - only cutting small patches of grassland in any one year, this will ensure that longer grassland including tussocks with accumulated leaf litter are retained to provide structural diversity and overwintering sites for invertebrates. Cut in autumn after flowering plants have set seed. Bramble scrub along west side of ditch should be managed on rotation.

• Wildlife hedge planted along roadside boundary, up to brook crossing (mindful of proposed footpath access). Mixed species - Blackthorn, Hawthorn, Hazel, Field Maple, Crab Apple, Damson, Rowan and Alder.

• Installation of interpretation panel and picnic benches in open glade at south of site. Installation of bird and bat boxes.

Caparo Wire (WIE 12)



Legend

Tree Planting

Hedge planting

Scarification

• South of site - periodic scraping to create areas of bare ground (2 @ 5m x 20m) using mini-digger. These scrape plots should be seeded with Agrimony, Creeping Cinquefoil and Wild Strawberry, and possibly some plug planting if slow to colonise. Top soil from scrapes should be piled into a bank along the boundary of these plots to create microhabitats. Retain areas of scattered scrub/tall ruderal vegetation.

• Hedge and tree planting around periphery of site to connect with scrub along Redwither Brook and planned mitigation area following adjacent Village Bakery development. This would be a mixed species hedges providing foraging and roosting opportunities for Whitethroat and song birds.

• Along eastern boundary, a number of fruit trees remain and this could be extended with further orchard planting - Apple, Damson, Plum.

• Provision of open-fronted nest boxes amongst hedgerow - to encourage Whitethroat breeding success.

• Larger tree species along eastern boundary may be suitable for Kestrel nest box and open fronted tit boxes.

Annyalla Chicks UK Ltd (WIE 13)

Legend

Wildflower meadow

Hedge planting

• Semi-improved grassland verge at rear of factory: plant mixed species hedge with trees, to improve connectivity between Redwither Brook and the wildlife mitigation area at SW (contains mature broadleaf trees, species-rich hedges and semi-improved grassland and dry ditches).

• Re-seed south-east facing bank with wildflower mix, and manage appropriately (Autumn hay cut only).

• Allow ant hills to develop, as this provides a foraging resource for Green Woodpecker, a species which has been recorded feeding on the ground adjacent to this site.

Norish Ltd (WIE 15)

• Large area of scrubland should be opened up, to extend and maintain existing glades and rides; some rotation scarification would also be worthwhile in these areas; either removing topsoil or the application of crushed limestone to create bare areas (varying sizes of patches - mechanically scraped free of all vegetation).

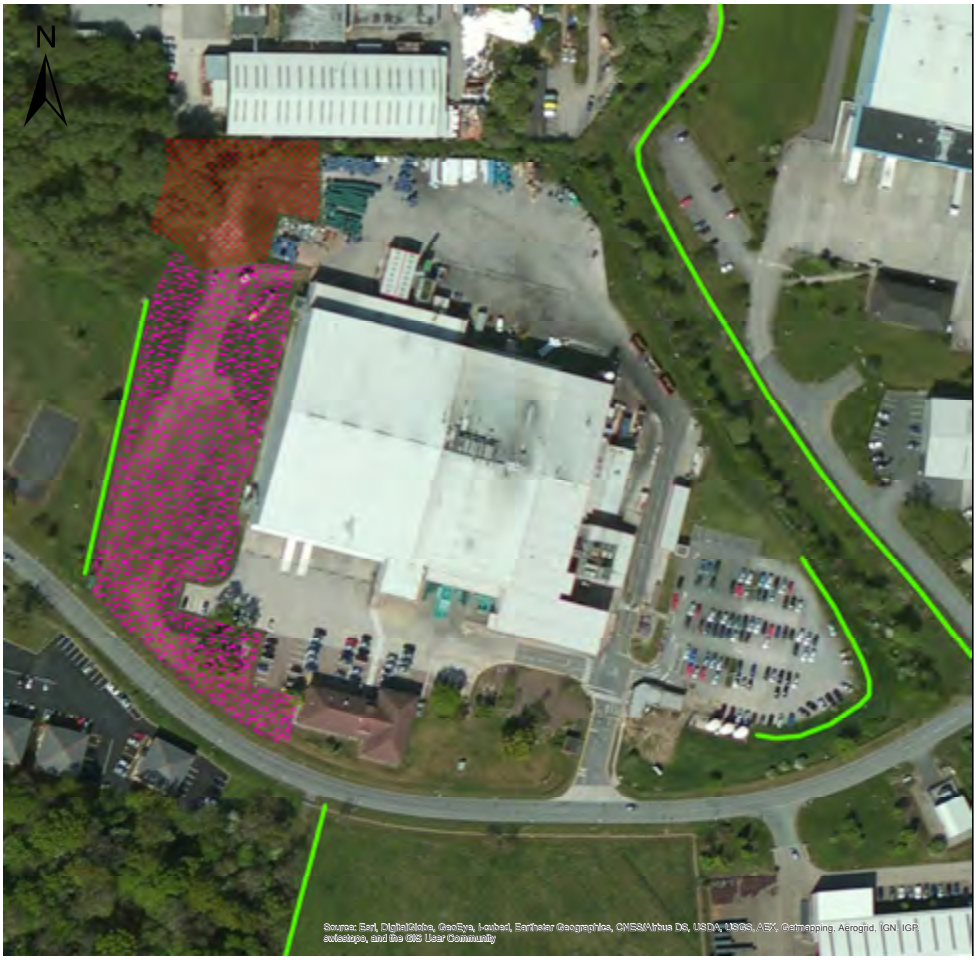
•This area should be monitored for the presence of Grizzled Skipper and other invertebrates (surveyor access will be required in season). Brash from scrub removal can be burned or piled into habitat piles around base of conifers.

• Significant areas of semi-improved grassland around site periphery should be maintained; no change in current cutting regime is required.

• Area of tall ruderal vegetation at east of site (about 40m x 30m) is a practical location for pond creation. Would act as a good retention pond to reduce periodic flooding of adjacent amenity grassland and would provide a much needed freshwater habitat resource in this part of The Wrexham Industrial Estate.

• Large conifers are suitable location for siting a Kestrel nest box.

Rowan Foods (WIE 16)



• Mixed species hedge to improve wildlife connectivity between wet woodland and 'Erlas Black Wood' opposite. Species included in planting include Hawthorn, Blackthorn, Crab apple, Field maple, Hazel, Damson, Rowan, Alder buckthorn. Potential to extend hedge planting along southern fenceline and adjacent to car park on eastern boundary.

• Revert to more senstive cutting regime of amenity/semi improved grassland - autumn hay cut. Area adjacent to Hauck should be cut on a two year basis to improve nectar resource for invertebrates, including the Grizzled Skipper butterfly which occurs on the adjacent landholding

• Control scrub and areas of tall ruderal vegetation at north west corner of site - to create areas of bare ground, which could be colonised by Grizzled Skipper butterfly.

• Installation of A-frame Barn owl box on mature oak tree. This will need to be checked once a year by the local bird recorder (sometime in the Spring).

OSCAR MAYER
QUALITY FOODS
ROWAN FOODS
A Division of Oscar Mayer Limited

Roil Foods Ltd (WIE 17)

This area is adjacent to good Grizzled Skipper habitat, and so conservation management should target this species. There may be future potential for the erection of an A-frame barn owl box on a pole.

• Grassland at west of site: implement a long rotation - only cutting small patches of grassland in any one year, this will ensure that longer grassland including tussocks with accumulated leaf litter are retained to provide structural diversity and overwintering sites for invertebrates. Cut in autumn after flowering plants have set seed. Leave verges uncut for two years (allows inverts to complete life cycles) *see roadside verge management guidelines on page 41.

• Patches of scattered young scrub (<5-10years old) should be retained and ideally managed so that a proportion is cut each year on rotation. Create habitat piles from brash in designated areas. Manage scrub to create varied scrub edge – cut back in places to create shallow bays.

• Use digger to scarify some areas on rotation (should be larger than 2.5m x 2.5m to reduce impact of encroaching vegetation), sow with appropriate larval foodplants of Grizzled Skipper butterfly - Creeping Cinquefoil, Agrimony etc.

Riello UPS Ltd (WIE 18)

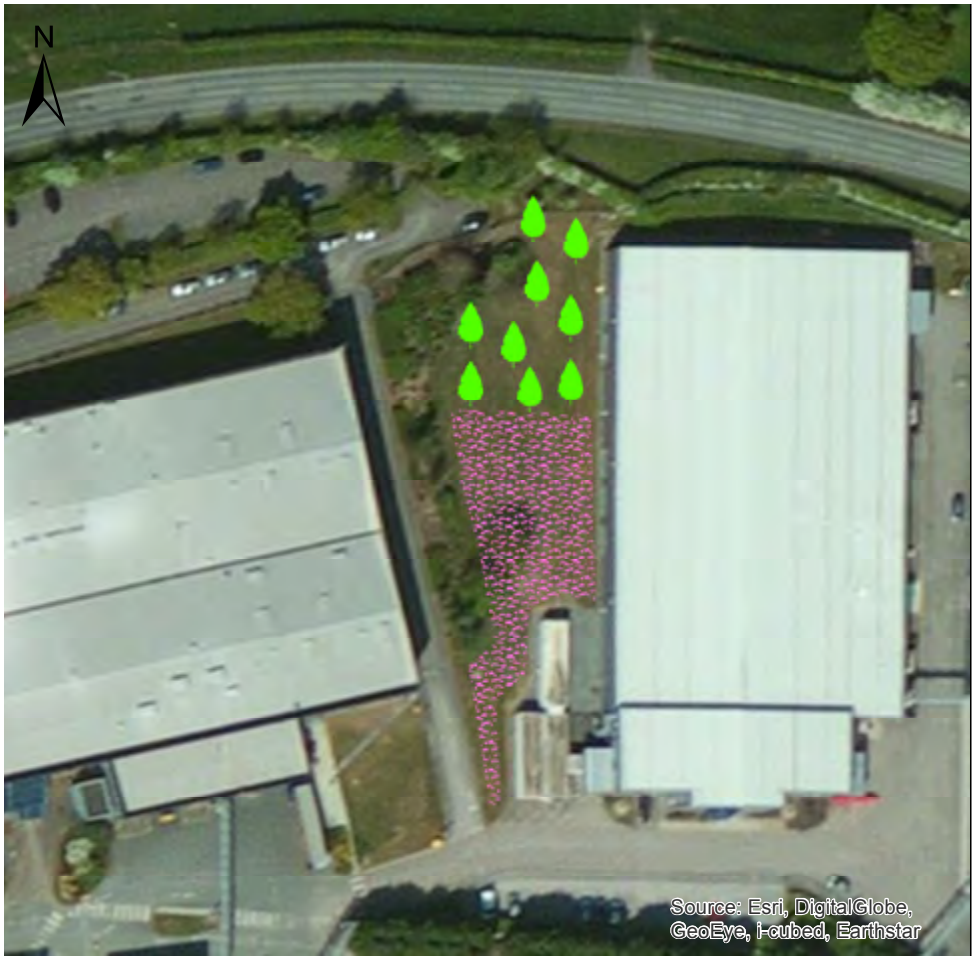
This is one of only a few areas on The Wrexham Industrial Estate which are occupied by the Grizzled Skipper butterfly, and so conservation management should target this species. A more sensitive management regime is urgently required to prevent breeding habitat being lost.

• Grassland at east and north of site: implement a long rotation - only cutting small patches of grassland in any one year, this will ensure that longer grassland including tussocks with accumulated leaf litter are retained to provide structural diversity and overwintering sites for invertebrates. Cut in autumn after flowering plants have set seed. Leave verges uncut for two years (allows inverts to complete life cycles).

• Patches of scattered young scrub (<5-10years old) should be retained and ideally managed so that a proportion is cut each year on rotation. Create habitat piles from brash in designated areas.

• Use digger to scarify some areas on rotation (should be larger than 2.5m x 2.5m to reduce impact of encroaching vegetation). Avoid scraping areas that could be used for breeding (small areas of sparse ground and adjacent rough vegetation). Plug planting within scrapes - Creeping Cinquefoil, Agrimony etc.

Wockhardt (WIE 19)



Legend

Wildflower meadow

Tree Planting

- Orchard planting on area of amenity grassland around car park – using fruit trees of local provenance - Apple, Damson, Plum, etc.

- Semi-improved grassland around car park - revert to single autumn hay cut, to allow regeneration of native wildflowers. All arisings should be removed from site

- Installation of various types of bird nest boxes and bat boxes on mature trees around car park

- Installation of round picnic bench and interpretation panel to explain Living Landscape project

Wrexham County Borough Council (WIE 20)

• Copse of broadleaf and coniferous trees requires small amount of selective thinning and planting of native broadleaf trees. Felled timber should be retained on site as hibernacular/habitat piles

• Creation of informal access path through copse - starting at existing footpath and finishing at north east corner of fence line

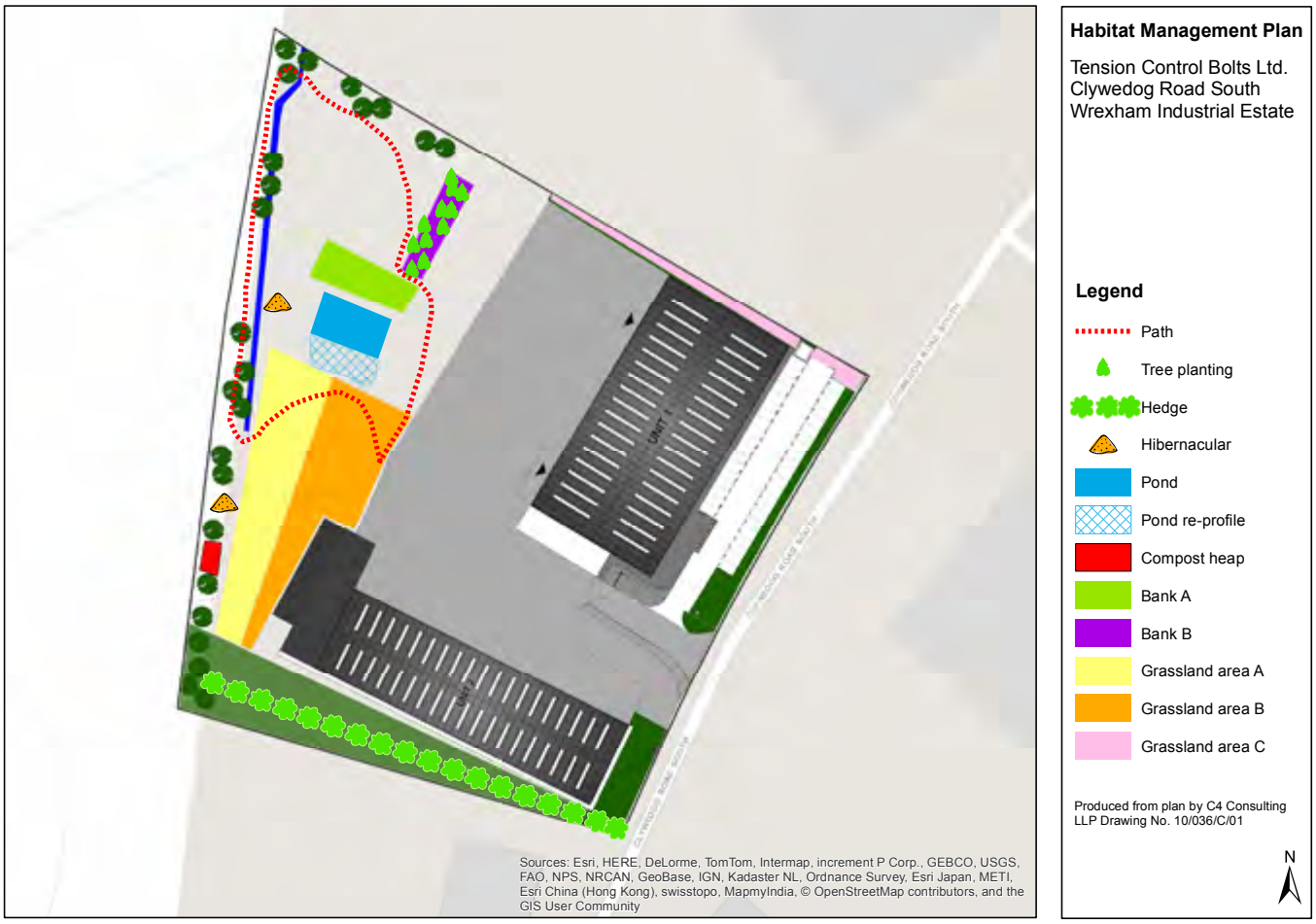
• Installation of picnic bench and interpretation panel

• Installation of various types of bird nest boxes and bat boxes, including Green Woodpecker box

• Area of semi-improved grassland - revert to autumn hay cut to allow regeneration of native wildflowers, all arisings should be removed from site

• Roadside verge managed as wildflower meadow - rotovated in the winter and covered with weed control mat to suppress outcompeting grasses. An appropriate mix of annual/perennial wildflower seed should be sown the following spring and the area should be lightly rolled. Cut in late September and remove all arisings from site. Preserve anthills along verge.

Tension Control Bolts Ltd (WIE 21)



- Creation of access path around ecological mitigation area, as well as picnic bench and interpretation panel

- Remove some scrub along west side of river bank, to create a bank-side 'nature trail'

- Planting around pond - rushes, sedges and grasses. Tree planting on spoil bank - Alder, Alder buckthorn, Aspen, Silver birch, Black poplar, Grey willow

- Spoil banks at north and south of site - sow with perennial wildflower mix (appropriate for clay soils)

- Maintain ephemeral habitat by rotational ground disturbance (4 year rotation of central area). Plug plant with larval foodplants of Grizzled Skipper butterfly - Creeping cinquefoil, Agrimony, Barren strawberry, Salad burnet, Tormentil etc.

- To create a 'mini nature reserve' feel - area could be demarcated with simple chestnut paling fence and access gate

- Native mixed species hedge planted along southern boundary and existing hedge along western boundary should be improved with further planting

Clays Golf Club (WIE 22)

Legend

Wildflower meadow

This landholding is outside the boundary of the Wrexham Industrial Estate, however it has been included due to its significant wildlife connectivity and ongoing favourable management.

- Rough grassland along south facing bank (adjacent to JCB): approximately 0.5 acres to by managed as wildflower meadow. In September, areas will need to be strimmed on a two-year rotation, with all arisings removed from site. Wildflower seed sowing and plug planting to improve nectar resource for pollinating insects, such as: Viper's bugloss, Teasel, Oxeye daisy, Corn cockle, Cornflower, Lady's bedstraw, Common poppy and Common knapweed
- Installation of interpretation panel at pond
- Installation of A-frame Barn Owl box on mature Oak (field surveyor will require access for future monitoring)
- Implement a species monitoring programme for invertebrates, as well as reptiles, Water Vole and other small mammals

Vacant plot, Clywedog Road North (WIE 26)

This is one of only a few areas on the Wrexham Industrial Estate which supports Grizzled Skipper butterfly, and so conservation management should target this species. A more sensitive management regime is urgently required to prevent breeding habitat being lost.

• Grassland at south of site: implement a long rotation - only cutting small patches of grassland in any one year, this will ensure that longer grassland including tussocks with accumulated leaf litter are retained to provide structural diversity and overwintering sites for invertebrates. Cut in autumn after flowering plants have set seed.

• Roadside verge and ditch: extend suitable habitat by improving nectar resource on verge; leave some areas uncut for two years, manage scrub to reduce shading, create bare ground patches on south-east facing side of bank

• Use digger to scarify some areas on rotation (should be larger than 2.5m x 2.5m to reduce impact of encroaching vegetation), Plug plant with larval foodplants of Grizzled Skipper butterfly - Creeping cinquefoil, Agrimony, Barren strawberry, Salad burnet, Tormentil etc.

• Clear rubbish and scrub from ditch at southern periphery

Clwyd Precision Engineering Ltd (WIE 31)

Legend

- Maintenance
- Scrub management
- Scarification

• Maintain brownfield area providing open mosaic habitat; remove larger shrubs and allow periodic disturbance of ground by machinery on site

• Scarify areas of bank along northern boundary (should be larger than 2.5m x 2.5m to reduce impact of encroaching vegetation) and sow with appropriate larval foodplants of Grizzled Skipper butterfly - Creeping Cinquefoil, Wild Strawberry, Agrimony

• Volunteer fieldworkers require infrequent access to site in order to monitor presence of Grizzled Skipper butterfly and other rare invertebrates

• Provision of habitat piles - make use of wooden pallets on site to create 'bug hotels', and improve the range of microhabitats by creating 'butterfly banks' with crushed limestone substrate. These should be sown with wildflower seed to improve nectar resource for invertebrates

• Installation of various types of bird nest boxes on mature trees around site

Hydro (WIE 34)

Legend

Maintenance

Large brownfield site adjacent to ancient semi-natural woodland (both are Habitats of Principal Importance for Conservation of Biological Diversity in Wales) - likely to support a diverse invertebrate community and provide roosting areas for elusive bird species such as Green Woodpecker and Snipe. To properly inform any future long-term conservation management, Phase 2 species surveys will be required.

•The mosaic of early successional and bare ground habitats should be maintained by rotational ground disturbance and topsoil stripping every 4/5 years.

• Some areas are reverting to scrub and secondary woodland - to maintain early successional habitats, saplings should be pulled up and large willows and Alder should be removed. Brash piles should be created in designated areas along east facing bank, to provide a hibernacular resource for invertebrates

• Site should be surveyed for the presence of Grizzled Skipper butterfly (surveyor access will be required in flight period)

• Mixed plantation woodland is an important wildlife corridor and could be expanded and enhanced with further planting and coppicing. Should be surveyed for bats and other mammals

Kelloggs (WIE 36)

• Maintain and expand area of unimproved grassland - autumn hay cut using BCS power scythe. Control encroaching scrub (on rotation and during winter months); create habitat piles from brash in a single designated area

• Roadside verge along factory frontage could be managed as wildflower meadow; sown with annual/perennial wildflower seed mix, and reverting to a single autumn hay cut

• Open up adjacent areas of broadleaf woodland by coppicing and pollarding, to allow colonisation by low growing plant species

• Large area of unmanaged wet woodland should be protected and may require hydrological and species surveys (this is a Section 42 Habitat of Principal Importance for Conservation of Biological Diversity in Wales). Area of woodland bordering Bryn Lane mitigation site; extend woodland ride

• Pond - enhance by creating hibernacular/ habitat piles from removal of non native tree species on site. Before this work starts, a licence from NRW will be required due to possible disturbance of Great Crested Newt

Prysmian Cables & Systems Ltd (WIE 38)

Legend

Grassland management

Maintenance

• Installation of A-frame Barn Owl box on mature oak (field surveyor will require access for future monitoring)

• Reduce cutting of area of rough grassland around pond and oaks: a single autumn hay cut every three years, the entire area can be topped to a height of no more than 13cm. This will improve habitat for short-tailed field vole - the principal prey item of Barn Owl

• Maintain current cutting regime of extensive hay meadow area. Implement a long rotation, only cutting small patches of grassland in any one year – this will ensure that longer grassland including tussocks with accumulated leaf litter are retained to provide structural diversity and overwintering sites for invertebrates

• Orchard planting along southern boundary - using trees of local provenance such as Denbigh Plum, Bardsey Apple, local Gooseberry etc.

Prysmian Group

RKP Engineering (WIE 39)

Legend

Wildflower meadow

Scarification

This site is adjacent to a known Grizzled Skipper butterfly population, so priority is to create and maintain an area of open mosaic habitat.

- Spoil heap at western corner of site: prepare 50% of area for sowing perennial wildflower mix, including seed of relevant larval foodplants (Agrimony, Salad burnet). Remaining 50%: maintain provision of bare ground/early succession habitat, by scarifying small areas on rotation, and plug planting of larval foodplants: Creeping cinquefoil, Agrimony, Barren strawberry, Wild strawberry, Tormentil and Salad burnet

- Volunteer fieldworkers require infrequent access to site in order to monitor presence of Grizzled Skipper butterfly and other rare invertebrates

Buglife Cymru
c/o RSPB Cymru
Sutherland House
Cardiff
CF11 9AB

029 2039 7096
www.buglife.org.uk

Butterfly Conservation Wales
10 Calvert Terrace
Swansea
SA1 6AR

01792 642972
www.butterfly-conservation.org/

Natural Resources Wales
Cardiff (Ty Cambria)
Cambria House
29 Newport Road
Cardiff
CF24 0TP

0300 065 3000
http://naturalresources.wales

North Wales Wildlife Trust
376 High Street
Bangor
Gwynedd
LL57 1YE

01248 351541
www.northwaleswildlifetrust.org.uk/

Wrexham County Borough Council
The Guildhall,
Wrexham,
LL11 1AY

01978 292000
www.wrexham.gov.uk

YMDDIRIEDOLAETH
natur
WILDLIFE TRUST
GOGLEDD CYMRU
NORTH WALES

North Wales Wildlife Trust
376 High Street
Bangor
Gwynedd
LL57 1YE

Phone: 01248 351541
Email: nwwt@wildlifetrustswales.org
Registered Charity no. 230772

Protecting **Wildlife** for the Future