

Environmental Character Area Profile for the Minerals Local Plan: 1. Teme Valley and Wyre Forest

1. Introduction

- 1.1. Minerals development usually takes place on previously undeveloped land and can therefore result in permanent change to the natural environment and green spaces in Worcestershire. The impacts of both the working and the restoration of mineral sites need to be considered in detail in the development of the Worcestershire Minerals Local Plan (the MLP).
- 1.2. The Council will take a 'green infrastructure' (GI) approach to considering these impacts. The GI approach is a different way of thinking about the green spaces in Worcestershire. It moves beyond solely considering the environmental benefits of green spaces and integrates the consideration of economic, health and social benefits in the planning and management of green spaces. Rather than considering each green space in isolation it looks at the ways in which individual sites and corridors of green space collectively form the distinctive character of Worcestershire that attracts both visitors and business to the County.
- 1.3. The components of GI include biodiversity, landscape, historic environment, access and recreation and water (also known as blue infrastructure). The GI approach requires thinking about the environment as an integrated system of stepping stones or nodes in a wider network¹.

Green infrastructure and mineral workings and restoration

- 1.4. There is significant potential for mineral workings to destroy existing networks of green infrastructure if the nature and character of these networks is not taken into account. However there is also significant potential to contribute positively to green infrastructure through the restoration of mineral workings.
- 1.5. The GI approach extends beyond thinking about designated sites of biodiversity or historic interest. This means that the impact of a mineral working on the wider environment and the integrated system of stepping stones or nodes in a wider network² will need to be considered.

Environmental Character Areas³ and the Minerals Local Plan

- 1.6. The Worcestershire Green Infrastructure Partnership has undertaken an analysis of the landscape character, biodiversity and the historic environment of Worcestershire to identify 30 distinct GI Environmental Character Areas (ECAs). Details about how these were developed is set out in *Planning for a Multifunctional Green Infrastructure Framework in*

¹ Green Infrastructure Guidance – Natural England.

² Green Infrastructure Guidance – Natural England.

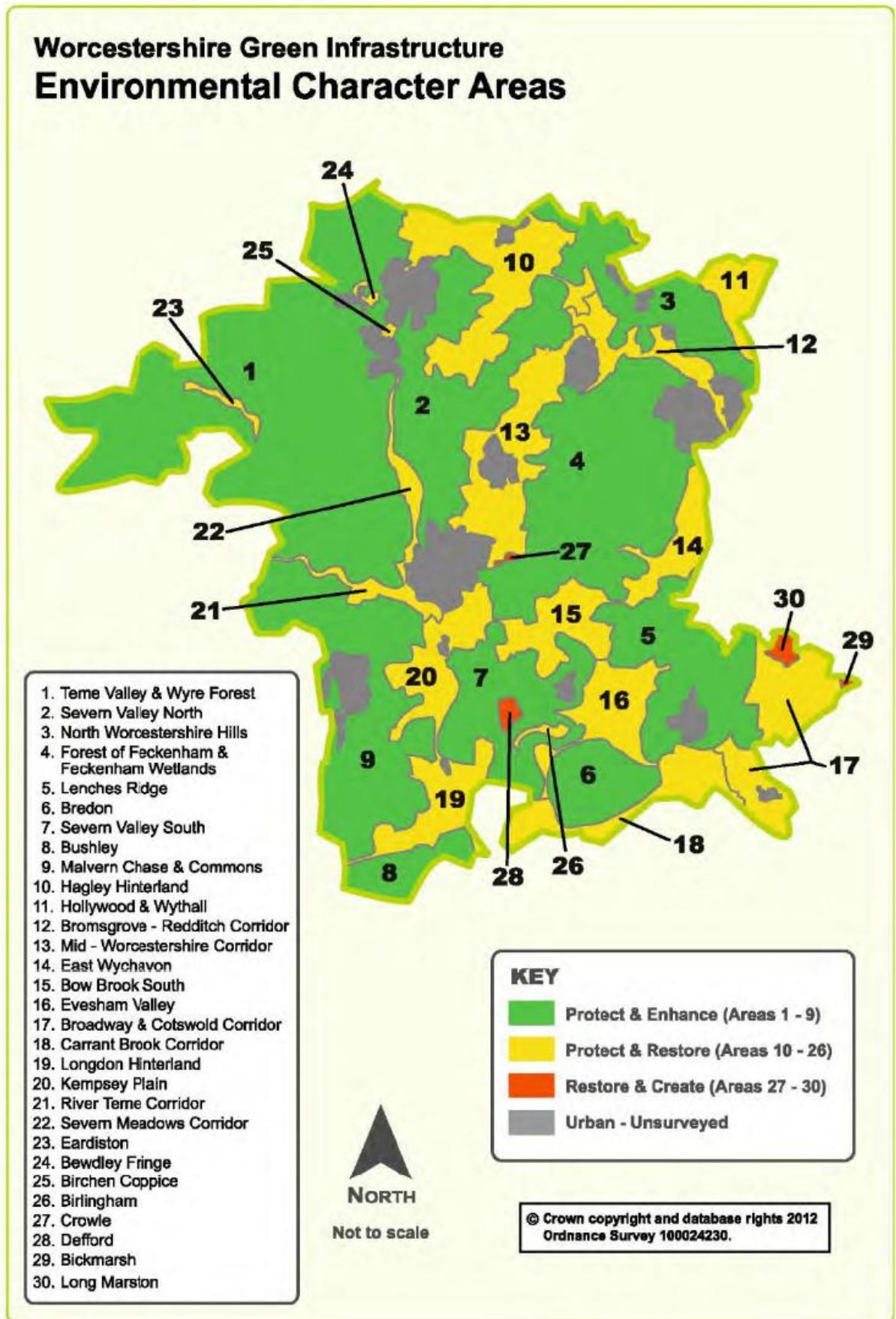
³ Worcestershire County Council (July 2012) *Planning for a Multifunctional Green Infrastructure Framework in Worcestershire: Green Infrastructure Framework 2*

Worcestershire: Green Infrastructure Framework 2 (2012) available at www.worcestershire.gov.uk/GI

- 1.7. These underlie the distinctive character of Worcestershire and it is the Council's intention that the unique characteristics of each area will drive the restoration strategy for the Minerals Local Plan.
- 1.8. This is one of 30 profile documents which set out the characteristics and priorities for the each ECA. It sets out the mineral resources in the ECA and the GI priorities identified by the Worcestershire GI Partnership. These priorities are structured around biodiversity, historic environment, landscape character, water environment (also known as blue infrastructure) access and recreation and transport. The document is also supplemented by other locally relevant information as appropriate.
- 1.9. This information will be used to develop the spatial strategy and restoration priorities for each ECA.
- 1.10. Profiles for each of the following ECAs are available on our website www.worcestershire.gov.uk/mineralsbackground:
- 1.11. The Environmental Character Areas are:
 1. Teme Valley & Wyre Forest
 2. Severn Valley North
 3. North Worcestershire Hills
 4. Forest of Feckenham & Feckenham Wetlands
 5. Lenches Ridge
 6. Bredon
 7. Severn Valley South
 8. Bushley
 9. Malvern Chase and Commons
 10. Hagley Hinterland
 11. Hollywood & Wythall
 12. Bromsgrove – Redditch Corridor
 13. Mid-Worcestershire Corridor
 14. East Wychavon
 15. Bow Brook South
 16. Evesham Valley
 17. Broadway & Cotswold Corridor
 18. Carrant Brook Corridor
 19. Longdon Hinterland
 20. Kempsey Plain
 21. River Teme Corridor
 22. Severn Meadows Corridor
 23. Eardiston
 24. Bewdley Fringe
 25. Birchen Coppice
 26. Birlingham
 27. Crowle
 28. Defford
 29. Bickmarsh
 30. Long Marston

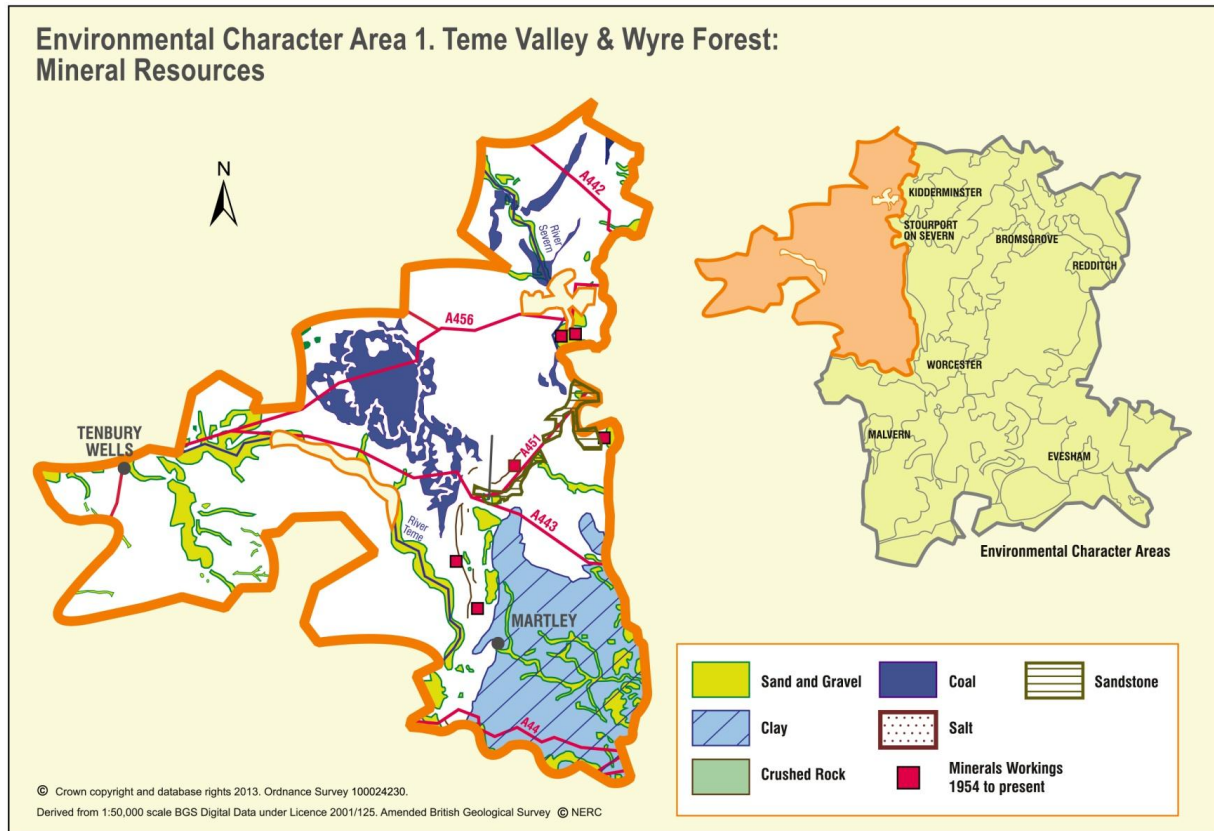
These are illustrated on Figure 1. Environmental Character Areas.

Figure 1. Environmental Character Areas



2. Characteristics and priorities of the Teme Valley and Wyre Forest ECA

Figure 2. Environmental Character Area 1. Teme Valley: Mineral Resources



Mineral Resources

Aggregates

2.1. Details about the aggregate resources in this ECA are given in the background report "Analysis of Mineral Resources in Worcestershire" available on www.worcestershire.gov.uk/mineralsbackground. The following is therefore only a simple summary.

Sand and gravel

2.2. Large terrace, glacial and solid sand and gravel resources exist in ECA 1 but are of both uneven quality and quantity. The geological mapping of the valley within ECA1 is poor and exposures are scarce.

2.3. Potential sand and gravel deposits exist along the length of the Teme Valley. They are most extensive near its confluence with the River Sever but extend, to some extent, all the way to the county's western border with Herefordshire and Shropshire. In many places details are poor, deposits are shown along the Kyre Brook on the 1:50,000 digital BGS map for example but not referred to in the (much older) memoir.

- 2.4. The memoir also reports that the Teme valley is reported to be "free from glacial deposits except for a few scattered patches of glacial sand and gravel and of boulder clay." These are not shown on the 1:50,000 map and are assumed to be insignificant. There are no active or recorded historic planning permissions for mineral working along the Teme or Kyre valleys. The memoir records that "The limited gravels along the Teme valley have been used locally for roads." There is no evidence at present that the sand and gravel deposits in the Teme and Kyre valleys are likely to be of any commercial interest. By contrast the Severn and Stour Valleys (north of Stourport and around Kidderminster) have been extensively worked in the past for sand and gravel notably at a relatively large-scale at Lickhill Quarry and the adjacent Brant Farm Quarry, near Stourport in the Severn Valley. The last of these sites is however now being restored. Sand and gravel working was also undertaken in the Stour Valley before planning controls were introduced. Deposits of Wildmoor sandstone are present and were worked in the past to produce moulding (Silica) sand. There are no however no active sand and gravel quarries in the area today.
- 2.5. Significant deposits of Kidderminster Formation (formerly Bunter Pebble Beds) run North-east –South-west from Kidderminster. These deposits extend northward into ECA 10 and could be very deep but no planning permissions appear to have been made to work this resource in the past.

Hard rock

- 2.6. There are locally significant limestone resources in this area along the hill ridges between Abberley, and Martley. Limestone quarrying took place over very long periods and at a large scale in the Abberley Hills at Shavers end, Woodbury Hill and Rodge Hill and Penny Hill. All of these operations have now ceased, the quality of the resource was not high by modern standards and large permitted reserves were left unworked at Shavers End.

Building stone

- 2.7. Building stone was produced in the past from a variety of strata and many of the local churches and historic buildings are constructed from local stone. The Abberley Clock Tower is constructed from a small, local Inlier of the Upper Ludlow beds. One of the largest outcrops of calcareous tufa in the country is at Southstone Rock and has been used in the construction of the church at St Andrew's church Shelsley Walsh and for the vaulting of Worcester Cathedral. The Upper and Lower Mottled (Wildmoor) Sandstone strata have been used as a building stone but the material is often very soft.

Sandstone

- 2.8. Sandstones in the Highley group have been worked near Upper Arley and were used to build Arley Castle among other buildings.
- 2.9. Keele group Sandstones have also been worked for building stone in the upper Arley area and are capable of producing large blocks.

Industrial minerals

Clay

- 2.10. Fire Clay was worked in the 19th century in the north of this ECA, next to the River Severn for the production of fire bricks and common red bricks, coarse pottery bricks and tiles.
- 2.11. Clay from the Mercia Mudstone group is found in the south of the ECA.
- 2.12. There is no history of planning permissions for clay working in the ECA.

Lime

- 2.13. Lime was produced at some scale in the north of the ECA and the remains of kilns can still be found.

Silica sand

- 2.14. The area has also formed a focus for a number of small quarries exploiting the Wildmoor Sandstone formation, a fine-grained and weakly cemented stone which was used widely in the past to produce silica sand for the foundry castings industry but is now more commonly used as a source of building sand. All of these sites have ceased production.

Brine

- 2.15. There is no evidence of brine working in this area or that Halite deposits might exist at depth.

Energy minerals

Coal

- 2.16. Coalfields in Worcestershire are restricted to the north of the county, to the west of Kidderminster and just south of Stourbridge. These are part of larger coalfields that extend north of the county into Staffordshire, but the area of workable coal in the county is relatively small. Despite their presence it is unlikely there will be any interest in working them in the lifetime of the Minerals Local Plan. BGS mineral reports for the area and both the Coal Authority and Coal Pro state that the coalfields are unlikely to attract further interest. No applications for coal working have been received in the last 20 years and all applications in the 10 years prior to this were refused.⁴ The Coal Authority has however drawn attention to the legacy of coal working in this area and the need to recognise that large number of hazards exist as a result.

Future Growth

- 2.17. The key driver for mineral extraction is to provide the raw materials required for the economy to function properly and for homes and

⁴ Worcestershire County Council (2012) *Worcestershire Minerals Local Plan Background Document: Coal Mining in Worcestershire*

infrastructure to be built. Minerals are unevenly distributed. Some of the minerals that we need are not found in Worcestershire and will need to be imported from outside the County. Many minerals are expensive to transport, particularly aggregates as they are a relatively low value and bulky material, and they are likely to be used close to their source, meaning that some local mineral extraction will be needed to support local growth in housing and the associated infrastructure that is required, or to provide raw materials for local industry. On average, about 80 per cent of mineral products are used within 30 miles of the quarry but this section considers the likely levels of development within 10 miles of the ECA.

- 2.18. This ECA is a largely rural area spanning Malvern Hills District and Wyre Forest District. Malvern Hills District anticipates the development of 2,592 homes and 29.76 ha of employment land and Wyre Forest anticipates 2,946 homes, 35.17 ha of employment land and 17,000 sq m of retail space in the next 14-18 years⁵.
- 2.19. The ECA incorporates the Worcester urban expansion area of Worcester West⁶, the town of Tenbury Wells and the Category 1 villages of Abberley Common, Clifton-on-Teme, Great Witley, Hallow, Lower Broadheath and Martley, the Category 2 villages of Bayton, Broadwas and Clows Top and the Category 3 villages of Astley, Eardiston, Lindridge, Mamble, Shrawley and Upper Broadheath⁷ which are proposed for some development in the South Worcestershire Development Plan proposed submission document. It is also adjacent to the towns of Kidderminster and Stourport-on-Severn, surrounds the market town of Bewdley and incorporates the village of Fairfield which are proposed for some development in the Wyre Forest Core Strategy⁸.
- 2.20. These and other areas beyond Worcestershire could create further demand for minerals in this Environmental Character Area.

⁵ Information gathered by Worcestershire County Council in early 2013. This gives a good indication of the likely levels of development which can be expected, but for the latest figures please refer to the relevant City, District or Borough Council.

⁶ Worcester city is the first in the five tier settlement hierarchy set out in the South Worcestershire Development Plan proposed submission document. It is the administrative centre of the county and provides the greatest range of services. It is the main employment destination for Malvern Hills and Wychavon. The city is a sub-regional focus for strategic employment, housing and retail development.

⁷ Category 1, 2 and 3 villages are fourth in the five tier settlement hierarchy set out in the South Worcestershire Development Plan proposed submission document. Their role is predominately aimed at meeting locally identified housing and employment needs. They are therefore suited to accommodate market and affordable housing needs alongside limited employment for local needs. The scale of allocated development is significantly less than that for the urban areas and is aimed at helping to address housing needs and support local services.

⁸ Market towns are third and villages are the fourth in the five tier settlement hierarchy set out in the adopted Wyre Forest Core Strategy. They are suitable for some development such as housing to meet local needs, local services or small scale rural employment.

Green Infrastructure priorities⁹

2.21. All Environmental Character Areas (ECA's) have been placed into one of three categories based on their overall score for Green Infrastructure.

These are:

1. Protect and enhance
2. Protect and restore
3. Restore and create

2.22. The category is based on an assessment of the ECAs landscape character, biodiversity and the historic environment characteristics. These characteristics were each attributed a score, with biodiversity being given a greater weighting than landscape and the historic environment, each of which were given equal but lower weightings.

2.23. The strategic GI approach for the Teme Valley and Wyre Forest ECA is to *protect and enhance*. The overarching principles identified by the GI partnership are to:

- enhance stream and river corridors,
- protect ancient countryside character,
- protect and enhance the ancient woodland habitats of the Wyre Forest; and
- to enhance and expand acid grassland habitats.

Landscape and biodiversity

2.24. The landscape character of this area is a mixture of Principal Timbered Farmlands, Timbered Plateau Farmlands, Wooded Estatelands, Principal Wooded Hills and Wooded Forest on the higher ground, Forest Smallholdings and Dwellings on the edge of Wyre Forest, Settled Farmlands with Pastoral Land Use on the western boundary and Riverside Meadows along the River Teme¹⁰. Generally, the Teme Valley and Wyre Forest are important areas of semi-natural habitats, including woodland, grasslands and scrub with a good network on watercourses.

2.25. The northern part of the area corresponds to the Wyre Forest Plateau Regional Landscape Character Area and is centred on the ancient Royal Forest of Wyre which is closely associated with the poorest soils in the region. The Wyre Forest is designated a National Nature Reserve and is one of the largest areas of ancient oak woodland in the country, extending into Shropshire. Other habitats present in the forest include unimproved meadows and orchards. The pattern of settlement on the Wyre Forest Plateau is largely one of scattered farms and dwellings with occasional small villages, mainly in the south. In later centuries, irregular encroachment settlements developed around the margins of the forest on

⁹ Worcestershire County Council (July 2012) *Planning for a Multifunctional Green Infrastructure Framework in Worcestershire: Green Infrastructure Framework 2*

¹⁰ Worcestershire County Council (October 2011) *Landscape Character Assessment: Supplementary Guidance*

the relic commons, such as Far Forest and Callow Hill on the southern side and Pound Green to the north-east, with cottages built of brick or the local yellow grey sandstone, linked to mazes of narrow lanes but set away from the main roads. These distinctive areas are now classified as Forest Smallholdings and Dwellings and are found nowhere else in Worcestershire.

- 2.26. The central and western parts of the area generally correspond to the Teme Valley Regional Landscape Character Area. The area as a whole is characterised by an undulating topography and rich red soils derived from the underlying mudstones. These give rise to the fertile farmlands that make up the distinctive “patchwork quilt” landscapes of the Teme Valley where the ancient small scale fields are separated by thick, species rich hedges with densely scattered hedgerow oaks.. The region, which extends west into Herefordshire, remains an important fruit growing area, the majority of the orchards being located on the warmer south-facing slopes to the north of the river. Elsewhere, land use is of traditionally mixed farming incorporating a notable proportion of unimproved meadows. Steep sided valley slopes are frequent with areas of semi-natural ancient woodland. The area is characterised by a dispersed settlement pattern of outlying farms and hamlets with many small commons. Tiny settlement nuclei occur along the Teme Valley, the market town of Tenbury, situated at a crossing point on the river, being the only settlement of any size. The Teme itself meanders across a flat, alluvial floodplain of Riverside Meadows, which is well defined by rising ground along much of its length. This is especially marked below Tenbury, where the floodplain is narrowly confined by the converging valley sides. The average fall of the river is almost one metre per kilometre, but rocky reefs break its course into a series of still pools and swift-running stretches.
- 2.27. The southern parts of this area, adjoining and straddling the border with Herefordshire have been identified by the county Landscape Character Assessment as the Bromyard Plateau Regional Character Area. This is a well defined area of upstanding relief lying to the south and west of the River Teme. The plateau is dissected by a series of valleys which drain southward to the River Frome and which are characterised by their linear woodland. The present day landscape owes its appearance partly to the frequent occurrence of ornamental grounds and to the many small plantations and game coverts that occur throughout the area particular around Kyre.
- 2.28. The south eastern quadrant of the area takes in part of the Malvern and Abberley Hills and the Mid Worcestershire Forests Regional Landscape Character Areas. Woodbury Hill and the Abberley Hills to the east of the Teme are prominent landmarks of this area, being a continuation of the spine of the Malvern Hills to the south. The tower of Abberley School, sited towards the summit of the Abberley Hills is a particularly noticeable landmark. The hills are heavily wooded with mixed woodland including yew and sweet chestnut as is the ridge of hills to the west of the Teme in the Shelsley and Clifton areas. Further to the east the land becomes flatter as it reaches the plain of the River Severn. Here there are more orchards on the flatter fertile ground and the woodlands tend to be discrete areas of

varying sizes, often no bigger than the surrounding fields. Settlement here tends to be slightly denser as the land is easier to colonise and farm.

- 2.29. Overall the Teme Valley and Wyre Forest ECA are well wooded with scattered settlement and wide alluvial meadows along the River Teme. Other notable biodiversity action plan habitats within this ECA are acid grassland and heath.

GI Priorities:

- 2.30. The landscape and biodiversity priorities identified for the Teme Valley and Wyre Forest ECA are¹¹:
- Protect and enhance ancient woodland cover through management and replanting with mixed, native species where appropriate, respecting the characteristic tree cover pattern – discrete blocks in the Estatelands; linear, interconnecting woods along streams and dingles in the Wooded Hills and Plateau Farmlands); scattered hedgerow trees in the Timbered Farmlands and Forest Smallholdings.
 - Protect and enhance the hedgerow network, respecting the characteristic enclosure pattern of each Landscape Type (organic in the dominating Timbered Farmlands and Wooded Hills; sub-regular/variable in the Wooded Estates and Forest Smallholdings) including safeguarding or replanting of hedgerow trees to address age structure and density.
 - Restore and enhance the functional stream corridors, priority in the Wyre Forest and along the Laugherne Brook catchment and support ecological improvements to ensure that water bodies meet WFD standards and contribute to the favourable status of the Teme valley SSSI.

Geodiversity

- 2.31. This area forms part of the Abberley and Malvern Hills geopark and is rich in geodiversity. There are 36 identified local geological sites. Many of these are the result of historic mineral workings with 3 associated with coal working and more than a third associated with previous mineral workings in the area. Many of these workings took place before mineral extraction was regulated by the planning regime, however there are also local geological sites at Penny Hill Quarry, Woodbury Quarry and Shavers End Quarry.
- 2.32. Woodbury Quarry, a former mineral working, is the only geological SSSI in this ECA. This site shows extensive and continuous exposures of Upper Silurian rocks through the whole Ludfordian succession of the Abberley Area, from the Aymestrey Limestone Group, through the Upper Ludlow Shales into Downtonian. Both the Aymestrey and Ludlow Groups contain a rich, brachiopod-dominated shelly macrofauna. The well preserved acritarch microflora makes it possible to assign the section to the biozones of *Leoniella carminae* and *Visbysphaera whitcliffense*.

¹¹ Worcestershire County Council (July 2012) *Planning for a Multifunctional Green Infrastructure Framework in Worcestershire: Green Infrastructure Framework 2*

Historic Environment

- 2.33. Archaeologically the Teme Valley area is one of the most poorly understood areas in the county but the potential of the area covered by the sand and gravel reserves is likely to be similar to other principle river corridors, with prehistoric and Romano British settlements and funerary sites. Later utilisation of the river will include mill sites and flood meadows.
- 2.34. Historic extraction of coal has localised landscapes rich in industrial archaeological remains, including exhausted bell pits and industrial infrastructure. These occur in the region around Mamble and Pensax.
- 2.35. At a wider level, this character area contains two Iron Age Hill forts, a medieval castle motte, moated manors and the formal planned house and park at Great Witley.
- 2.36. The extensive Wyre Forest to the north the character area is known to overlay earlier prehistoric and medieval landscapes.
- 2.37. With the exception of Brant Farm, Blackstone and Larford Quarry, Astley none of the mineral workings in this area have received any archaeological investigation. Brant Farm was subject to a major rescue excavation in the 1970. The 1970s excavation and salvage recording work has unfortunately never been fully published. However interim reports record significant Iron Age settlement remains along with evidence for Neolithic and Romano-British activity. These demonstrate the high archaeological potential of this area as do a series of significant discoveries made during salvage recording along two pipelines running through this area in the 1990s (Dinn and Hemingway 1992; Jackson et al 1996a).
- 2.38. A pre-determination evaluation of a 1997 application to extend the neighbouring Lickhill Quarry and a watching brief condition at Lickhill on the 1999 application failed to identify deposits of any note.
- 2.39. Investigations at Larford Quarry, Astley between 1956-9 focused on a ring-ditch, three further sites were recorded which included an Iron Age pit, two Romano-British settlement enclosures and an oven or hearth and a sandstone-lined well.

GI Priorities:

- 2.40. The Green Infrastructure priorities identified for the Teme Valley and Wyre Forest ECA are¹²:
- Protect and enhance the diverse historic field boundary patterns and hedgerows that are associated with medieval assarting, post-medieval reorganisation and traditional orchards.

¹² Worcestershire County Council (July 2012) *Planning for a Multifunctional Green Infrastructure Framework in Worcestershire: Green Infrastructure Framework 2*

- Buffer historic landscape features, such as earthwork boundaries, ridge and furrow, abandoned prehistoric and medieval settlement remains.
- Protect historic water features and buffer key sites, such as moats, fishponds, Millponds and leats.
- Explore opportunities to protect below ground archaeology associated with multi-period settlements throughout the area, and particularly, adjacent to existing rural settlements.

Blue Infrastructure

- 2.41. This ECA is dominated by the river Teme and significant tributaries, notably the river Rea and Kyre, Grimley and Laughern Brooks; many smaller unnamed watercourses in Malvern Hills district drain into it. The ECA does however adjoin the river Severn along its entire eastern edge and everything in it ultimately feeds into the Severn, including important tributaries of the Severn itself within Wyre Forest district, the Dowles and Dick brooks, both main rivers, and Riddings, Snuffmill, Gladder and Burnthorne Brooks.
- 2.42. The geology can have an effect on the runoff, and the flooding, within a catchment as a result of the permeability of the strata. According to the River Severn Catchment Flood Management Plan (CFMP), the lower reaches of the River Severn, which adjoin this ECA, flow over Non Aquifer Triassic Mercia Mudstone Group strata and Jurassic Lower Lias Clays. The drift gravels at this point allow groundwater to flow from the drift deposits to the river and vice versa.
- The River Teme flows to the north of Tenbury Wells and the Kyre Brook south to north along the east of Tenbury Wells. The two are the main causes of flooding in Tenbury but surface water flooding from sewers and overland flow and blocked culverts are also important. Flooding usually occurs first from the Kyre Brook before flooding from the River Teme starts
- 2.43. Flood risk is a significant concern for Kidderminster, Stourport and Bewdley. Due to the size of the catchment and the length of the watercourse, the critical storm duration for the River Severn is very long, approximately six days, which allows sufficient flood warning time to make temporary and demountable defences a viable option for flood defence. Historically, the key source of flooding within the District was therefore from the Stour in Kidderminster, particularly where it combines with flooding from the canal. Stourport and Bewdley are most at risk from the Severn. However, the flooding that occurred as a result of the June and July 2007 events was attributable to drainage problems and flash flooding from the smaller tributaries, a number of which have not been enmained. Whereas a single incident of Main River flooding has the potential to cause disruption to a large number of properties, very heavy rainfall within the District has the potential to result in large numbers of individual local floods. Surface water run-off management in the entire District therefore remains an important issue for all developments which highlight the need for Sustainable Drainage Systems (SUDS) thereby maximising the use of source control measures.

- 2.44. The Dowles Brook flows in an easterly direction through the Wyre Forest and joins the River Severn at Dowles, just upstream of Bewdley. Due to the heavily afforested catchment channel maintenance is a key issue regarding flood risk from the brook.
- 2.45. The Snuffmill Brook is a small tributary flowing in an easterly direction through the centre of Bewdley. The brook flows through a number of on-line fishing ponds and lakes upstream of the town. The principal risk from this watercourse flows in an antiquated and poorly maintained culvert beneath back gardens and properties.
- 2.46. The Dick Brook rises from the hills in the west of Wyre Forest district to the north of the village of Rock. Significant flood risk arises from this watercourse as observed in the summer of 2007, exacerbated by the risk of blockage due to the highly vegetated valley. The storms of 2007 resulted in the formation of a series of “dams” caused by channel blockage, which caused water to back-up to significant depths before breaking through to the next blockage.
- 2.47. The Blakedown Brook drains an area of over 30 km², which includes much of the eastern side of the Wyre Forest district and together with a number of its tributaries flows through the villages of Broome, Churchill, Blakedown and Hurcott, before discharging into the River Stour at Broadwaters. There are a number of online lakes and pools, including the Ladies Pool, Swan Pool, Mill Pool, Hurcott Pool and Podmore Pool along its length, which affords a degree of attenuation to flood flows.
- 2.48. Although not within this ECA, Worcester City is affected by flooding from within it and the Local Planning Authority consider that locations in the city along the Rivers Severn and Teme and Laugherne Brook are not defended against flooding to a satisfactory standard. For the city the main causes of flooding are flooding from the River Severn, River Teme and the Barbourne Brook, localised surface water flooding and flooding in the Barbourne Brook catchment, caused by a (possible combination of fluvial and surface and sewer floods) and several smaller watercourses, surface water flooding from sewers and overland flow. Flash flooding from rainstorms, surface water flooding from sewers and overland flow at other locations are also considered a problem in the city.
- 2.49. Minor flooding in northwest Worcester and through Hallow is primarily from the Laughern Brook, from overtopping of the watercourse channel. Surface water flooding may also be a problem in this area; there are several ponds in this area that could pose another source of flooding. New development within this area will need to ensure that ponds and their overflow systems are adequately maintained. Malvern Hills LPA also considers that the area west of Worcester is not defended against flooding to a satisfactory standard.
- 2.50. Groundwater flooding is not considered to be a major issue in the South Worcestershire Joint Core Strategy area. The SFRA for Wyre Forest reports that the Environment Agency confirmed that they are not aware of any specific incidences of groundwater flooding within the District.

- 2.51. The River Severn Catchment Flood Management Plan makes the greater part of this ECA a Policy 3 area, where it will "Continue with existing or alternative actions to manage risk at the current level." The Northern and eastern parts however fall into the Policy 4 area where it will "Take further action to sustain the current level of flood risk into the future (responding to the potential increase in risk from urban development, land use change and climate change).
- 2.52. Water Quality: The whole of the River Teme has been designated a SSSI as a representative of near natural and biologically rich river type associated with mudstones and sandstones and has good ecological status. The Kyre Brook however has poor ecological status as a result of physical barriers creating poor levels of fish and the whole catchment in this county is categorised as a water body with agricultural /rural diffuse pollution pressure. The River Teme is currently failing to meet the requirements to pass the chemical quality assessment as designated under the WFD due to unacceptable levels of Tributyltin Compounds. Release of Tributyltin Compounds is primarily from their use in wood preservatives and in marine antifouling paints on for example ships.
- 2.53. Although outside the ECA the ecological quality for the majority of rivers within Worcester City is affected by ECA 1, at present all are below the recommended „good“ status or „good potential“ under the WFD. The area between Great Witley and Worcester is categorised as a water body with agricultural/rural diffuse water pressure and partly, with water company point source pollution pressure. The only river in Worcester to achieve good ecological status is the River Teme. The River Severn, Laughern Brook and Careys Brook have poor quality due to unacceptable levels of phosphorus. The overall quality of the River Severn in the ECA is moderate and downstream of the River Teme and Hatfield Brook it passes in terms of Chemical Quality. In Wyre Forest the river Stour and Blakedown Brook are most at risk of failing WFD quality standards. The Stour is already identified as eutropic, the status of the Dowles Brook is poor, the Dick Brook, moderate. No water dependent SSSIs are located along the River Severn Corridor in Wyre Forest district. Although most of the overall WFD ecological status of the ECA is therefore good or moderate, parts, north and south of Newnham Bridge, are poor.
- 2.54. Groundwater status is good throughout the ECA.
- 2.55. Water Quantity: Overall no water is available in this ECA. Most supplies in Wyre Forest District are from the Trimpey reservoir and River Severn. The Sherwood Sandstone aquifer beneath the central part of the district provides an additional source of supply and must be protected. It does however only serve a few areas in the WFDC notably Chaddesly Corbett, Deansford Lane in Blakedown and Green Street in Kidderminster. Both the river Severn and the aquifer are susceptible to over abstraction and pollution. There is no further water available for abstraction and licences due for renewal are likely to be reduced as far as possible. Some watercourses are already experiencing low flows and outside the district there have been abstraction restrictions to protect water dependent SSSIs.

GI Priorities:

- 2.56. The blue infrastructure priorities identified for the Teme Valley and Wyre Forest ECA are¹³:
- Reduce dependence on raised flood defences, as this is unsustainable in the long term, by taking opportunities to restore sustainable natural storage of floodwater on undeveloped floodplains.
 - Make more space for rivers through urban areas via 'blue corridors' (i.e. restoring access for floodwater onto key strips of floodplain. This requires redevelopment to be limited to flood-compatible land-uses e.g. parkland). Some designated 'aquatic conservation' sites are in unfavourable condition (for example Teme SSSI). Activities that affect these sites must be changed to improve their condition.
 - Ensure that the run-off from all proposed development is minimised. For example, SUDS must be encouraged and targeted within planning approvals.
 - Encourage the retro-fitting of SUDS where surface water flooding is already a problem. Support ecological improvements. Examples of this include Severn & Avon Wetlands Project and Natural England's three fluvial SSSIs.
 - Tackle issues of diffuse pollution in the catchment through the provision of advice to farmers under the England Catchment Sensitive Farming Delivery Initiative.

Access and informal recreation

- 2.57. There are four publicly accessible sub-regional GI assets in this ECA (Wyre Forest, Ribbesford wood, Arley Birch and Coldridge Wood and Kingsford Forest Park). The river Teme and River Severn also run through or alongside this ECA.
- 2.58. Visitor pressure on the sub-regional assets in the District is quite mixed. The Wyre Forest and Kingsford Forest Park are both felt to be under significant visitor pressure already with only limited capacity to accommodate increases in visitor pressure. In a large site such as the Wyre Forest, visitor demand does vary greatly across the site, with areas close to car parks, and offering visitor facilities experiencing the greatest pressures.
- 2.59. The other recreational assets within the districts are not under such severe visitor pressure and could accommodate an increase in visitor pressure, such as Ribbesford Wood and Stourport-on-Severn are underutilised.
- 2.60. In addition much of this ECA is part of the Abberley and Malvern Hills Geopark which covers 1250 square kilometres of Gloucestershire, Herefordshire, Shropshire and Worcestershire. The 109 mile Geopark Way walking trail also runs through part of the ECA. The Severn Way riverside walking route follows the River Severn through the north western corner of the ECA to Stourport and close to the western edge of the ECA to Worcester.

¹³ Worcestershire County Council (July 2012) *Planning for a Multifunctional Green Infrastructure Framework in Worcestershire: Green Infrastructure Framework 2*

GI Priorities:

- 2.61. The access and recreation priorities identified for the Teme Valley and Wyre Forest ECA are¹⁴:
- Consider the proximity to and ability to integrate with the rights of way network, recreational way-marked routes and the cycle network;
 - Accommodate associated facilities necessary for the use and enjoyment of the site in a manner that is appropriate and able to integrate with the landscape character, wildlife and cultural interests.
 - Act as a greenway from town into the countryside and utilise existing canal, former railway lines, river corridors and wherever possible link with public transport routes.
 - Adopt minimum quality standards, (commensurate with its location and scale) that sites and routes should be expected to achieve will be those from the Green Flag Award Programme, and the Country Parks Accreditation Scheme, as appropriate.

Transport

Road

- 2.62. The A456 connects Kidderminster in the east through Tenbury Wells to Herefordshire and Shropshire in the west. The A442 connects Bridgnorth in the North to Kidderminster in the east. The A433, A4133 and A451 meet at Great Witley to connect Tenbury Wells to Stourport on Severn and Worcester. Other roads in this Environmental Character Area are more minor.
- 2.63. The Worcestershire Advisory Lorry Route Map shows a low bridge which would restrict the movement of vehicles over 15' (4.5m) on the A44 to the west of Worcester and steep gradients which could affect lorry movements on the A442, A456 and A443. Local roads may have further restrictions and will need further assessment if they are to be used for accessing mineral resources.

Rail

- 2.64. There are no network railways in this Environmental Character Area, although the Severn Valley Railway heritage line runs through the north eastern corner of the area from Kidderminster to Bridgnorth.

Water

- 2.65. The River Teme runs through the Environmental Character Area from Tenbury Wells to Worcester but there is no evidence available that it is navigable. The River Severn runs along part of the eastern edge of the Environmental Character Area and is navigable up to Stourport on Severn.

¹⁴ Worcestershire County Council (July 2012) *Planning for a Multifunctional Green Infrastructure Framework in Worcestershire: Green Infrastructure Framework 2*

GI Priorities:

- 2.66. The GI transport priorities identified for the Teme Valley and Wyre Forest ECA are¹⁵:
- Opportunities should be sought to protect, enhance and create green infrastructure that promotes sustainable movement by walking and cycling, reducing the need to travel by car by providing pleasant environments that promote sustainable transport as a means to minimise the impact of transport on the natural environment and mitigate the impacts of climate change.

LTP Priorities:

- 2.67. The LTP 3 transport priorities identified for the Teme Valley and Wyre Forest ECA are:
- **A443/A4133 Tenbury Wells-Worcester (M5) interurban corridor maintenance and improvement scheme** - a programme of improvements to transport infrastructure on this route, which is likely to be progressed in the medium term and will include junction enhancements, street furniture decluttering, replacement and enhancement.
 - **Tenbury Wells town centre public realm enhancement** – a package of public realm enhancements, including enhancements to and strengthening of the Teme Bridge. Works to the bridge were completed in 2012 ensuring a carrying capacity of 40t.

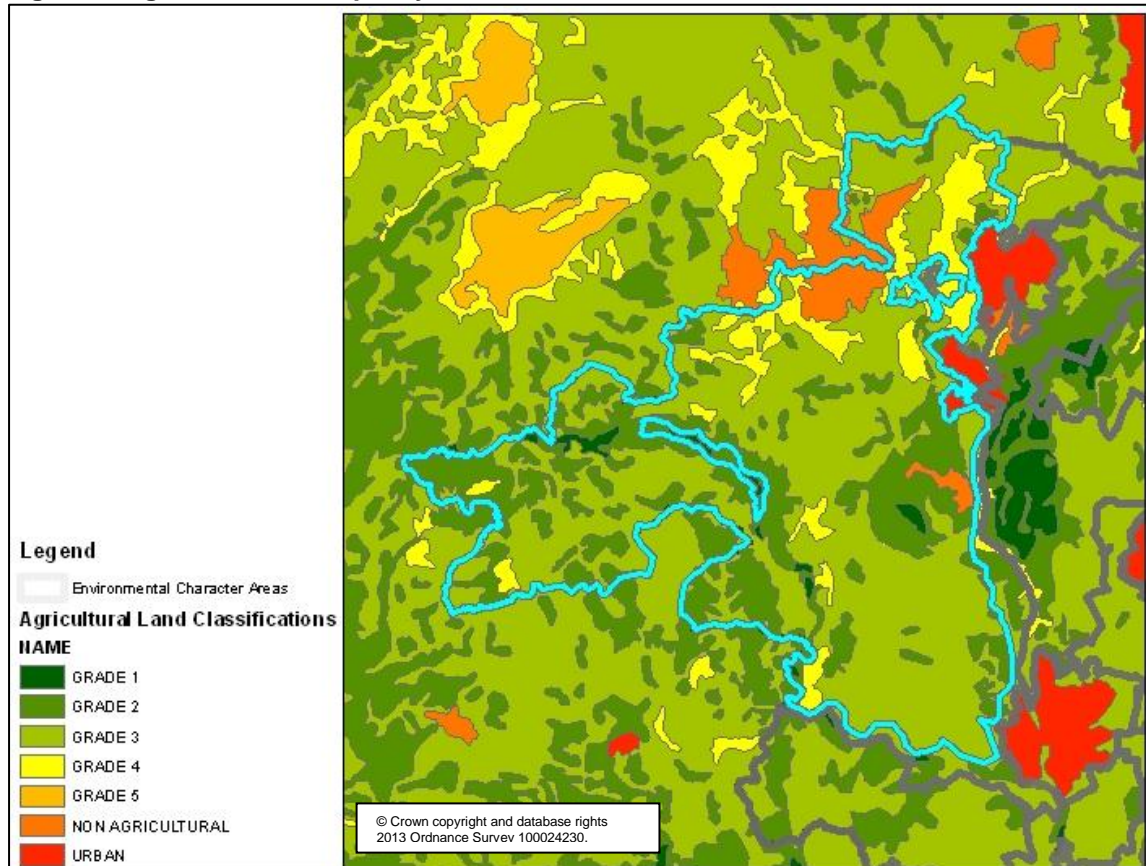
Green Economy

Agriculture/Forestry

- 2.68. The majority of the land use in this ECA is mixed farming, with some pastoral use particularly along river valleys, and with woodland in the Wyre Forest. The whole of this ECA apart from a very small area around Grafton, is part of the Environment Agency's Catchment Sensitive Farming Priority Catchment for the River Teme.
- 2.69. Agricultural land quality varies across the area, with high quality grade 1-3 land in most of the southern half and areas of lower grade 4-5 land in the northern half on the ECA, as shown in Figure 3.

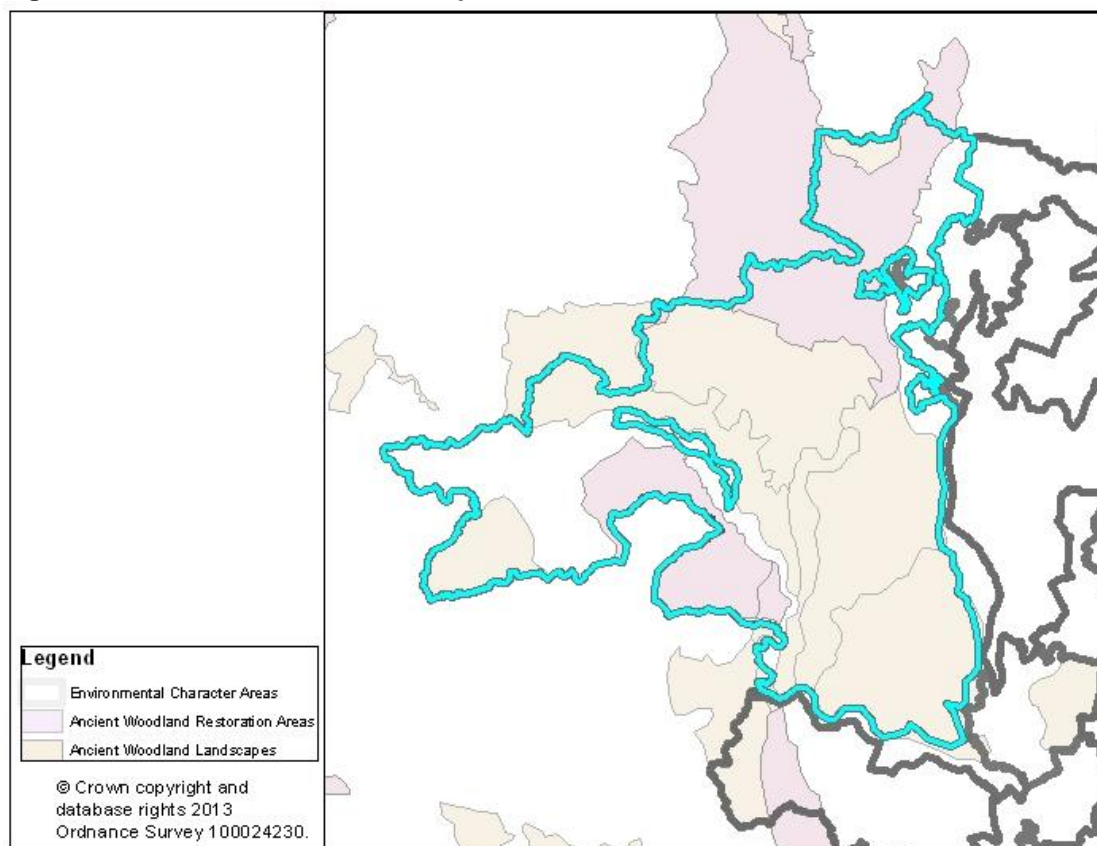
¹⁵ Worcestershire County Council (July 2012) *Planning for a Multifunctional Green Infrastructure Framework in Worcestershire: Green Infrastructure Framework 2*

Figure 3. Agricultural land quality



2.70. The forestry commission's woodland opportunity maps show that much of this ECA is listed as priority 1 for woodland creation which could benefit landscape character, biodiversity, cultural heritage and/or public access. They also show that woodland restoration in the Wyre Forest and to the south west of the River Teme could benefit ancient woodland as almost all of the ECA is an ancient woodland landscape (Figure 4).

Figure 4. Ancient woodland landscape and restoration



Tourism

- 2.71. The tourism industry plays a vital role in strengthening the Worcestershire economy by increasing inward investment, creating new business opportunities and supporting jobs. Tourism also provides leisure and recreational opportunities for residents making it an attractive place to live, helping to provide a good quality of life.
- 2.72. There are a number of visitor and tourist attractions in this ECA. The Severn Valley Railway heritage line runs through the north eastern corner of the area from Kidderminster to Bridgnorth, stopping at Arley Station in the ECA. Other attractions include Arley Arboretum, Witley Court, Elgar's birthplace museum, the Wyre Forest and Go Ape. There is a high proportion of day visitors to these attractions and to Tenbury Wells town.
- 2.73. Walking and hiking are an important part of the visitor attractions in Worcestershire. There are three long distance way-marked routes in this ECA. The Severn Way riverside walking route follows the River Severn through the north western corner of the ECA to Stourport and close to the western edge of the ECA to Worcester. The North Worcestershire Path crosses the northern tip of the ECA on its route from Majors Green in Birmingham into Bewdley. The Worcestershire Way runs north-south across the centre of the ECA from Bewdley to Malvern. There are also a large number of circular way-marked walks and a network of Public Rights of Way throughout the ECA.

- 2.74. The Abberley and Malvern Hills Geopark promotes tourism, education and geology and landscape trails and covers the majority of this ECA, it extends north into Shropshire, south along the Malvern Hills in Worcestershire and into Gloucestershire and crosses into Herefordshire in the west.

Climate Change

- 2.75. Some effects of climate change will be similar across the whole county and many of the issues which can be addressed are likely to be common to all ECAs, such as:

- Improving air quality
- Providing flood risk management solutions
- Preventing water and soils pollution as a result of climate change related extreme weather conditions
- Promoting energy efficient and low carbon solutions
- Contributing to renewable energy production

Opportunities and issues

- 2.76. Green Infrastructure features such as buffering of watercourses provide a way of minimising fluvial flooding. Planned landscaping incorporating flood defences could provide both and short term benefits and sustainable drainage schemes (SUDS) are a mechanism for managing both fluvial and pluvial flood risk.
- 2.77. Agricultural and horticultural businesses could face damaging water shortages in the coming decades as a result of climate change. In many parts of Worcestershire, water resources are under severe pressure. The majority of catchments in which horticultural production is concentrated have been defined by the Environment Agency as being either over-licensed and/or over-abstracted. Well executed water storage facilities could not only provide water supply for the business in the dry periods but a wide range of green infrastructure benefits such as biodiversity or landscape and opportunities for increased physical activity and exposure to nature.
- 2.78. Significant areas of heathland, bracken and conifer woodland, notably in the north west of this ECA, are amongst the habitats most at risk from fire as a result of climate change.

Socio-economic considerations

- 2.79. The analysis of the socio-economic situation in Worcestershire in this strategy considers the economy and health & well-being at a high level. It is not intended to draw a full picture of the economy or health and well-being in the county, instead it focuses only on the indicators which are of most relevance to green infrastructure:
- **Economy:** unemployment, household income and deprivation levels.
 - **Health and well-being:** health deprivation, heart diseases, obesity, mental health problems and respiratory conditions.

- **Access to sites for informal recreation:** considers links between informal recreation opportunities and mental and physical well-being.
- 2.80. There is thought to be a link between green infrastructure and some aspects of health. The issues of obesity, respiratory conditions, mental health, heart disease and health deprivation have been considered in this context.
- 2.81. 26% (120,000) of all adults in Worcestershire are obese which equates 3% above the national average. Another 40% of adults are overweight. Childhood obesity, estimated 10% for 5 year olds and 18% year olds, is closely linked to the deprivation levels.¹⁶ Parts of this ECA, north of Bewdley and north of the river Teme, have fewer problems with obesity than the county average.
- 2.82. Obesity and respiratory problems in this county generally follow the same geographical pattern. Mental health problems, by contrast, tend to be found in the and around major settlements. Although mortality rates from cardiovascular diseases are significantly lower than the national rate, patterns of heart diseases are more dispersed than the other health indicators assessed and poor performance is found across the county. Contrary to other health indicators, heart diseases are least prevalent in some of the urban areas.
- 2.83. The overarching principles identified by the GI partnership regarding socio-economic matters for this ECA are:
- Enhance economic wealth and address health inequalities.
 - Main economic issues: below average household income.
 - Main health issues: respiratory, heart diseases and mental health

¹⁶ Worcestershire Health and Well-being Board (2012) Joint Strategic Needs Assessment