LAND ON THE SOUTH-WEST SIDE OF LEVEDALE ROAD, PENKRIDGE

APPEAL FOR PLANNING APPLICATION REFUSAL
REF NO 23/00145/FUL

LANDSCAPE AND VISUAL IMPACT APPRAISAL P02

on behalf of Anglo Renewables Ltd

May 2024

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1.0 INTRODUCTION

1.1 Enplan is a multi-disciplinary practice of planners, landscape architects and environmental consultants. Enplan were appointed by Anglo Renewables Ltd to produce a Landscape and Visual Impact Appraisal and Landscape Strategy for an appeal that relates to The Refusal of Planning Permission (Application Number 23/00145/FUL) on Land on Southwest Side of Levedale Road, Penkridge, Staffordshire, ST18 9AH ('the Appeal Site').

1.2 The application was refused for the following single reason:

> *The proposed development, by way of its scale and location in the open countryside would create a discordant feature causing a detrimental effect on the immediate environment and the appearance and intrinsic rural character of the wider area contrary to South Staffordshire Core Strategy Policies OC1 (Development in the Open Countryside Beyond the West Midlands Green Belt) and EQ4 (protecting and Enhancing the Character and Appearance of the Landscape).*

1.3 The report defines the existing landscape conditions, assesses the character and quality of the landscape and analyses the visual and landscape effects of the proposals. The baseline position against which this assessment has been undertaken is as per the current position on the ground. There are no extant planning permissions for the land.

1.4 The Study Area for this assessment has been defined to incorporate all parts of the landscape that potentially may have a view of the proposals (referred to later in this chapter as the Zone of Theoretical Visibility or ZTV) with buffers and is limited to a 3km radius area that is sufficient in size to define the broad landscape context of the Appeal Site.

1.5 Assessments undertaken within this appraisal have been undertaken in accordance with the 3rd Edition of 'Guidelines for Landscape and Visual Impact Assessment (GLVIA3). The assessment and landscape design work has been led by Richard Hodgetts BA Hons DipLA CMLI, Landscape Director of Enplan and a Chartered Landscape Architect with over 30 years' experience.

2.0 LANDSCAPE RELATED PLANNING POLICY CONTEXT

2.1 This section describes the background of relevant national and local planning policies, in so far as they relate to landscape matters, against which the development proposals have been determined.

National Planning Policy Framework:

2.2 National planning policy is provided for by the National Planning Policy Framework (NPPF), last updated in 2023, which will be material consideration in the determination of the application.

Local Policy

2.3 An Appeal Statement of Case has been prepared by DLP Planning Ltd and should be referenced for planning policy relating to this Appeal.

South Staffordshire Core Strategy 2012

2.4 SSC adopted the Core Strategy (Local Plan) Development Plan Document in December 2012. It sets out the spatial planning strategy for the District up to 2028. Whilst its policies provide a context for the determination of planning applications and Policy EQ6 is a policy for renewable energy, the plan predates the development of battery technology and the importance that is now placed on delivering a renewable energy strategy. Weight must therefore also be attached to national policy as noted above and in relation to the Framework.

Core Policy 2 (Protecting and Enhancing the Natural and Historic Environment) states that the Council will support development to improve the natural environment where it is poor and increase the overall biodiversity of the District including the development of green infrastructure links and to improve the historic environment where it is identified as at risk.

2.5 *Policy EQ1 (Protecting, Enhancing and Expanding Natural Assets)* states that permission will be granted for development (alone or in combination) which would not cause significant harm to sites and/or habitats of nature conservation, geological or geomorphological value, including ancient woodlands and hedgerows, together with species that are protected or under threat. Support will be given to proposals which enhance and increase the number of sites and habitats of nature conservation value, and to meeting the objectives of the Staffordshire Biodiversity Action Plan (SBAP).

Wherever possible, development proposals should build in biodiversity by incorporating ecologically sensitive design and features for biodiversity within the development scheme. Development proposals should be consistent with the Supplementary Planning Documents on Biodiversity and Landscape Character and other local planning policies.

2.6 *Policy EQ4 (Protecting and Enhancing the Character and Appearance of the Landscape)* outlines that the intrinsic rural character and local distinctiveness of the South Staffordshire landscape should be maintained and where possible enhanced. Trees, veteran trees, woodland, ancient woodland and hedgerows should be protected from damage and retained unless it can be demonstrated that removal is necessary and appropriate mitigation can be achieved. For visual and ecological reasons, new and replacement planting should be of locally native species.

Throughout the District, the design and location of new development should take account of the characteristics and sensitivity of the landscape and its surroundings, and not have a detrimental effect on the immediate environment and on any important medium and long-distance views. The siting, scale, and design of new development will need to take full account of the nature and distinctive qualities of the local landscape. The use of techniques, such as landscape character analysis, to establish the local importance and the key features that should be protected and enhanced, will be supported.

Where possible, opportunities should be taken to add character and distinctiveness through the contribution of new landscape features, particularly to landscapes which have been degraded.

2.7 *Policy EQ6 (Renewable Energy)* confirms that provision should be made for renewable energy generation within South Staffordshire to maximise environmental and economic benefits whilst minimising any adverse local impacts. However, it provides no detailed criteria for the consideration of technologies other than biomass and wind.

2.8 *Policy EQ11 (Wider Design Consideration)* outlines that proposals should respect local character and distinctiveness including that of the surrounding development and landscape, in accordance with Policy EQ4, by enhancing the positive attributes whilst mitigating the negative aspects and development should take every opportunity to create good design that respects and safeguards key views, visual amenity, roofscapes, landmarks, and focal points.

2.9 *Policy EQ12 (Landscaping)* promotes for landscaping of new development must be an integral part of the overall design, which complements and enhances the development and the wider area.

2.10 Overall, the environmental and local amenity impact of all renewable energy schemes (both small and large scale) including any infrastructure or buildings must be fully assessed and development proposals will be considered in accordance with Core Policy 2 and the relevant EQ policies in terms of the impact of any development on local amenities, including environmental and landscape impacts, impact on the historic environment and impact on the amenities of local residents.

3.0 LANDSCAPE CONTEXT

Landscape Character

3.1 Landscape character assessment (LCA) is the key tool for understanding the landscape and should be used to form the baseline for assessing landscape effects that may arise from development proposals. The main elements that make up the landscape are physical influences (geology, soils, landform, drainage and water bodies), land cover (types of vegetation and patterns and types of tree cover) and the influence of human activity (land use and management, character of settlements and buildings, pattern and type of fields and enclosure). The aesthetic and perceptual aspects of the landscape are also key factors such as scale, complexity, openness, tranquillity or wildness. Note the aspects of openness in relation to Green belt policy which is not a landscape designation is described in Section 4.27 and 4.28.

3.2 Many parts of the UK are already covered by existing character assessments at different scales, from broad-scale national or regional assessments, more detailed local authority assessments and in some cases fine-grain local or community assessments.

Published Landscape Character Assessments

3.3 The relevant published landscape character data and related assessments include the following:

- National Character Area Profile: Shropshire, Chesire and Staffordshire Plain (NCA 61);
- Planning for Landscape Change: Supplementary Planning Guidance to the Staffordshire and Stoke on Trent Structure Plan 1996-2011 Volume 3: Landscape Descriptions: Ancient Clay Farmlands

National Context

3.4 Countryside Character Volume 7: West Midlands sets the appeal site and study area (Figure 1) within the Shropshire and Staffordshire Plain character area (number 61). The key characteristics of the Shropshire and Staffordshire Plain relevant to this assessment are displayed as:

- *Extensive, gently undulating plain, dominated by thick glacial till from the late Pleistocene Period, producing productive, clay soils and exemplifying characteristic glacial landforms including eskers, glacial fans, kettle holes, moraines and a landscape of meres and mosses.*

- *Prominent discontinuous sandstone ridges of Triassic age, characterised by steep sides and freely draining, generally infertile soil that supports broadleaved and mixed woodland.*
- *Few woodlands, confined to the area around Northwich and to estates, cloughs and deciduous and mixed woods on the steeper slopes of the wind-swept sandstone ridges. Locally extensive tracts of coniferous woodland and locally distinctive orchards scattered throughout.*

- *Strong field patterns with generally well-maintained boundaries, predominantly hedgerows, with dense, mature hedgerow trees. Sandstone walls occur on the ridges and estate walls and Cheshire-style (curved topped) metal railing fences occur locally on estates in Cheshire.*

- *Dairy farming dominates on the plain, with patches of mixed farming and arable in the north and large areas in the south-east.*

- *Diversity of wetland habitats includes internationally important meres and mosses comprising lowland raised bog, fen, wet woodland, reedbed and standing water, supporting populations of a host of rare wildlife, including some species of national and international importance*

- *Extensive peat flood plains where flood plain grazing marsh habitats support regionally important populations of breeding waders in areas such as Baggy Moor, Weald Moor and Doxey Marshes*

- *Many main rivers and their flood plains lie in this area, including the Dee, Dane, Severn, Penk and Sow. Significant areas of grazing marsh, alluvial flood meadows and hay meadows associated with the rivers Dee, Sow, Gowy and Severn. The area has the highest density of field ponds in western Europe.*

- *Rich archaeological evidence of iron-age hill forts concentrated on the sandstone ridges and the Weald Moors. Remnant ridge and furrow and moated houses are features of the plain. The Roman Road, Watling Street, crosses the plain linking London to Wales via Wroxeter. Chester was an important Roman settlement.*

- *Regularly spaced, large farmsteads, dispersed hamlets, market towns and many other settlements including Macclesfield and Telford. Timber-frame buildings are*

a distinctive feature of the plain, often highly decorated in Cheshire, for example, the moated Little Moreton Hall. The historic towns including Stafford, Shrewsbury and the city of Chester have a wealth of 17th- and 18th-century half-timber, brick and red sandstone buildings.

- *Parklands and gardens associated with estates such as Chillington, Trentham, Tatton and Attingham; country houses such as Gawsworth Hall, Arley Hall and Adlington Hall; and fortified manor houses and castles such as at Shrewsbury, Stafford, Beeston, Acton Burnell and Cholmondeley.*

- *Nationally important reserves of silica sand and salt. Active extraction of salt has developed a locally distinctive landscape of subsidence flashes, particularly around the area of Sandbach. Adjacent to these saline flashes are areas of salt marsh rarely found at inland sites.*

- *The numerous canals are important for recreation as well as habitat. Several National Cycle Routes and nearly 5,000 km of public rights ofway cross the plain. Six National Nature Reserves (NNRs) are scattered throughout, close to large population centres and well used for recreation.*

3.3 The landscape character of the Shropshire and Staffordshire Plain is described as '' *Extensive, gently undulating plain …..with a strong field patterns with generally well-maintained boundaries, predominantly hedgerows, with dense, mature hedgerow trees….*

3.4 Within the character area description there are four statements of opportunity and SEO 2 states:

- *SEO 2: Protect the landscape of the plain, recognising its importance to food production and incorporating well-maintained hedgerows, ponds and lowland grassland margins within agricultural systems, to secure resource protection and maintain productivity, while reducing fragmentation of semi-natural habitats to benefit a wide range of services, such as landscape character, sense of place, water quality and biodiversity.*

Regional

3.5 Staffordshire County Council have published the Planning for Landscape Change: Supplementary Planning Guidance to the Staffordshire and Stoke on Trent Structure Plan 1996-2011 Volume 3: Landscape Descriptions: Ancient Clay Farmlands.

3.6 In Staffordshire this type is geographically well defined and restricted to the western side of the county. It is characterised by the irregular pattern of hedged fields with ancient hedgerows and oaks, by subtle evidence of former heathland, and by a dispersed settlement pattern with small rural towns. The major land use has been dairying, dictated by the stagnogley soils derived from boulder clay which covers Triassic mudstones, to create a rolling lowland plain; however, pockets of sandy soil have supported arable production, and this has spread to the heavier soils in recent years. There are estate land and parkland variants, but the major visual distinction between landscapes, from relatively well wooded to very open, appears only on further subdivision on the basis of landscape quality.

3.7 The Character Area describes the landscape under the following subheadings, *Visual Character, Characteristic landscape features, Incongerous landscape features, factors critical to landscape character and quality and potential value of new woodland planting* which are described below relevant to the appeal site:

Visual Character

3.8 This is a landscape of mixed arable and pastoral farmland, the character of which is strongly influenced by existing land use and farming practices.

In the areas of pastoral farming an intact irregular ancient pattern of hedgerows and hedgerow trees is still retained. In places this pattern is beginning to break down, with hedgerows either being allowed to grow up and become ragged or being mechanically trimmed and becoming gappy as a result. The mature hedgerow oaks are characteristic of this countryside and still numerous enough to coalesce visually and filter views across the landscape. These trees are now predominantly mature or becoming over-mature and stag headed. In more intensively farmed, predominantly arable areas, rationalisation has resulted in considerable removal of hedgerows and inappropriate maintenance of those remaining. The accompanying decline of hedgerow tree cover has led to a generally open character where landform has become dominant over vegetation cover and trees are now often viewed as individual elements.

Throughout this landscape type, the varying tree and hedgerow density and landform give changing scales from medium to large. The gently rolling landform, with occasional high points, allows long distance views through the landscape to show up the landcover elements. Local small scale ancient woodlands and plantations provide areas of denser visual containment. Especially important in this landscape are the many marl pits, meres and mosses, now surrounded by mature trees, and the series of small brooks. These, and canals running through the area, are picked out by lines of willow, poplar and alder, providing some structure in the more open arable areas.

Areas associated with villages are generally less intensively farmed and the scale is reduced by broadleaved linear woodlands. These divide the landscape into small discrete units and give a well-balanced interlock between the farmland and woodland elements. In these areas of smaller scale the field pattern is predominantly irregular, with dense mixed hedges and hedge banks. On areas of old common the hedgerows form a more regular pattern in the landscape.

This landscape has a very rural feel, with the small winding country lanes, large red brick farms and numerous old villages. Localised industrial and commuter development does not impact to any great extent on this general character, although a general decline, both of village character and land cover elements, could result in long-term irreversible erosion of the landscape character. Major road corridors have a significant localised effect and result in some areas being particularly well viewed.

Characteristic landscape features

3.9 Mature hedgerow oaks and strong hedgerow patterns; narrow winding lanes, often sunken; small broadleaved and conifer woodlands; well treed stream and canal corridors; hedgerow damsons; occasional native black poplars; numerous farmsteads, cottages, villages and hamlets of traditional red brick; a gently rolling landform with stronger slopes in places; dispersed settlement pattern; marl pits and field ponds.

Incongruous landscape features

3.10 Busy main roads and motorway; powerlines; stag headed over-mature oaks; some conifer and poplar plantations; horsey culture; large modern farm buildings; industrial developments; electrified railway line; urban edge; improved and new commuter dwellings; introduction of wire fencing for stock control associated with deteriorating field pattern.

Factors critical to landscape character and quality

3.11 The critical factors which currently limit landscape quality are the loss of characteristic landscape features (especially hedgerows and hedgerow trees), the poor condition of those features that remain, and the relatively poor survival of characteristic semi-natural vegetation (i.e.ancient woodland and hedgerows, semi-natural grasslands and riparian and wetland vegetation). A significant part of the area falling within this landscape character type has been identified as a ‘landscape at risk’ of sudden loss of quality and measures to meet the BAP targets listed below will be critically important in preventing such a loss.

This landscape character type is locally very sensitive to the impacts of development and land use change.

Potential value of new woodland planting

High to very high, to maintain a structure to the landscape to offset the decline in hedgerow pattern as a result of farm intensification. The southern part of the area

represented by this landscape type could benefit from the planting of large woodlands, and from the establishment of new native woodlands, strategically sited to counter ancient woodland fragmentation. The maintenance, restoration and planting of wet woodland would be of value throughout this landscape.

3.12 The character area then provides a table identifying the potential value of other habitat provision and management taking from the Staffordshire Biodiversity Action Plan. The only relevant items are as follows:

Habitat Type	Objective or target	Priority
Ancient/diverse hedgerows	maintain and manage maintain trees	very high very high
Hedgerows	plant species rich hedges	lower
Arable field margins	Maintain, improve and restore	medium

3.13 Finally, the character area citation provides guidelines on tree and woodland planting as follows:

- Increase planting of hedgerow trees and field corners to rebuild the structure of the landscape where decline is occurring.
- Plant new woodlands to adhere to existing field pattern and to reflect the scale of the landscape. In the more open areas, there is therefore the opportunity for large scale planting appropriate to those landscapes, provided that coalescence and views through them are considered. Consider the planting of new native woodland between ancient woodlands, to reduce fragmentation.
- Respect the existing broadleaved character of the landscape in any new planting proposals, although some conifer content would be acceptable provided it was carefully integrated into the woodland design. Care is needed over the treatment of woodland edges to reflect the hedgerow character in colour and texture. Retain the visual interest of views from roadsides by avoiding extensive planting up to roadsides along considerable distances. In areas of stronger landform, internal design of woodlands will become important.

Site Landscape Character

3.14 The Appeal Site follows the description within the character area citation as follows:

This is a landscape of mixed arable and pastoral farmland, the character of which is strongly influenced by existing land use and farming practices. In the areas of pastoral farming an intact irregular ancient pattern of hedgerows and hedgerow trees is still retained. In places this pattern is beginning to break down, with hedgerows either being allowed to grow up and become ragged or being mechanically trimmed and becoming gappy as a result. The mature hedgerow oaks are characteristic of this countryside and still numerous enough to coalesce visually and filter views across the landscape. These trees are now predominantly mature or becoming over-mature and stag headed.

3.15 The proposed development will follow the guidelines stated above in 3.13 particularly in relation to i*ncreasing planting of hedgerow trees and field corners to rebuild the structure of the landscape.*

Site Context and Landscape Character

3.16 The Appeal Site is located to the west of Levedale Road with the access into the Appeal Site almost opposite No.1 Holding Levedale. The access road runs parallel to the existing farm track that leads to existing cattle barns adjacent to the Appeal Site.

3.17 The Appeal Site comprises of half a field that is contained on the northern boundary by a clipped 2.5-3.0m tall hedge with individual mature oak trees located towards the western end. The hedge comprises, hawthorn, ash, hazel and black thorn. The eastern boundary is open and unvegetated. The southern and eastern boundary is formed by an unclipped overgrown hedge approximately 5.0 to 6.0 metres tall with semi mature and mature Oak trees located within it. Both the vegetated boundaries contain the Appeal Site visually from the surrounding landscape. The access track into the Appeal Site runs parallel to an existing overgrown hedge wit trees that is located along the northern boundary of the track. This is approximately a 6.0metre tall hedge with 12-15.0metre tall mature oak trees evenly spaced along its length.

3.18 There are no public rights of way within the Appeal Site. The closest public right of way (ref Penkridge 41) runs to the south- east of the Appeal Site.

3.19 A potential Zone of Theoretical Visibility (ZTV) with buffers is illustrated on **Figure 4**. The 'with buffers' represents the approximate zone within which it may be possible to see any part of the Appeal Site. Within the ZTV there may be a number of areas from which no views of the Appeal Site or development will be possible as a result of intervening landform, vegetation or built form, which may obscure views.

3.20 The Appeal Site is relatively small in comparison to the broad character descriptions described in the Shropshire, Chesire and Staffordshire Plain (NCA 61) but does have some of the characteristics of those described in Supplementary Planning Guidance to the Staffordshire and Stoke on Trent Structure Plan 1996-2011 Volume 3: Landscape Descriptions: Ancient Clay Farmlands. However, having undertaken a site appraisal and analysed both the character and visual issues we feel that the proposed site is relatively

well self-contained within its local setting and little visibility from publicly accessible viewpoints.

3.21 The existing character of the Appeal Site can be seen on **Views A to E** on **Figures 10 to 12** for the location of these on **Figure 9 Landscape and Visual (Location of Viewpoints and Site Appraisal Views).**

Visual Receptors/ Views

3.22 The Zone of Theoretical Visibility (ZTV with buffers) represents the approximate zone within which it may be possible to see any part of the Appeal Site. Within the ZTV there may be a number of areas from which no views of the Appeal Site or development will be possible as a result of intervening landform, vegetation or built form, which may obscure views. The starting point for the appraisal of potential visual effects is the identification of a zone of theoretical visibility (ZTV). This is presented as **Figure 4 Zone of Theoretical Visibility (With Buffers)**. The analysis takes into account landscape features such as wooded groups and buildings. The analysis is made using Environment Agency Lidar data, survey information, aerial photography and local knowledge. Generally, in a rural undulating and wooded landscape the visual influence of a medium scale development is imperceptible beyond 3.0km. Therefore, the maximum study area has been defined as 3.0km. The purple colour represents unobstructed views towards the Appeal Site and the light green are potential filtered views towards the Appeal Site.

3.23 As part of the mitigation strategy for the Appeal Site a Zone of Theoretical Visibility (ZTV) with buffers has been undertaken for Year 15 after the planting that forms the mitigation strategy has matured and is illustrated on **Figure 5 Zone of Theoretical Visibility (With Buffers Year 15**. The figure shows that only filtered views would be achieved depicted by the light green colour. This demonstrates that the Appeal Site is contained visually within it is own setting and will not be seen from the wider landscape. This could be argued therefore that the Appeal Site would not be visible within the countryside and would therefore not create a discordant feature causing a detrimental effect on the immediate environment and the appearance and intrinsic rural character of the wider area. **Figure 6 Zone of Theoretical Visibility (With Buffers) Year 1 and Year 15 combined** shows the comparison between the Year 1 and the Year 15 after the mitigation planting has matured. The purple colour represents unobstructed views towards the Appeal Site and the blue is the Year 1 and the light green are potential filtered views towards the Appeal Site.

3.24 This section identifies a range of visual receptors based upon the baseline desktop study and site investigation. Visual receptors are people who are likely to experience changes in views or visual amenity as a result of the proposed development. The potential effects are discussed and assessed in later sections. **The Appeal Site Context (Location of**

Wider Viewpoints) on **Figure 1** and **Landscape and Visual Appraisal (Location of Site in the Wider Context)** on **Figure 8** shows the location of the viewpoints that are described below.

Potential Receptors: Residential Receptors

3.25 There is no right to a private view in planning terms. Therefore, views from residential properties or their private gardens are not required to be considered as part of this LVIA. The purpose of the LVIA is to consider public views from the adjoining residential areas which are largely screened by boundary vegetation from the wider landscape. The public views from the nearest streets within the vicinity of the development have been considered from No. 1 Holding Levedale, Oak Barns and Poppywell Farm. These are represented in **Viewpoints 2, 3 and 4**

3.26 In accordance with the methodology the sensitivity of these individual residential properties to changes in views is thus considered to be **high** on the basis of the criteria set out in Appendix A Table 7.3

Potential Receptors: Recreational Receptors

3.27 There are a few recreational receptors within the surrounding landscape, and these are described below:

- **Viewpoint 5** from Public Right of Way ref no 13 Footpath looking north towards the Appeal Site.
- **Viewpoint 6** from Byway Open to All Traffic ref no Penkridge 0.1045 looking north-east towards the Appeal Site.
- **Viewpoint 8** from Public Right of Way ref no Penkridge 41 looking northeast towards the Appeal Site.

3.28 In accordance with the methodology the sensitivity of these recreational receptors is thus considered to be **high** on the basis of the criteria set out in Appendix A Table 7.3.

Potential Receptors: Road Users

3.29 Views of the proposed development site are limited to views from:

- Levedale Road (Viewpoints 1, 2, 3 and 4), and
- Whitson Road (Viewpoint 7); and,

The sensitivity of these individual road users to changes in views is **moderate** on the basis of the criteria set out in Appendix A Table 7.3.

4.0 LANDSCAPE AND VISUAL IMPACT ASSESSMENT

4.1 This landscape and visual assessment has been based upon the scheme defined above and as set out in the Planning Statement and the Design & Access Statement.

Visual Impact Assessment

4.2 The visual impact assessment of the proposed development is based upon an analysis of the Zone of Theoretical Visibility (ZTV) with buffers of the principal features of the scheme and on the individual impact assessment upon the 8 identified representative viewpoints, all of which has been undertaken to the methodology set out in **Appendix A**. **Figure 4** illustrates the potential ZTV with buffers of the development proposals. **Figure 5** illustrates the potential ZTV with buffers of the development proposals at Year 15 after the mitigation planting has matured. The locations of the selected representative viewpoints as shown on **Figures 1 and 6**.

4.3 The Visual Impact Assessment Table included in Appendix D sets out a summary for each viewpoint the sensitivity of the viewpoint receptor, the approximate distance of the viewpoint to the nearest part of the proposed development, the nature of the view (if there is a view, whether it is a full view of most or all of the development, or only a partial view and whether it is part of a clear, broad view or a narrower view or 'glimpse', i.e. through gaps in vegetation for example) and the overall impact assessments at the year of opening (i.e. Year 1). The assessment is based on the worst-case scenario and the significance of effect the proposed development would have from both a visual impact and landscape character point of view.

Viewpoint 1: Levedale Road (See Figure 13)

4.4 The sensitivity of the viewpoint for road user receptors is moderate, taking account of the criteria set out in Table 7.3 in Appendix A. The receptors will experience glimpses of the development as an oblique view to the direction of travel along the proposed access track into the Appeal Site which will be located on the land adjacent to Levedale Road. The magnitude of change will be **Slight** with a Moderate/ Minor Effect at Year 1, leading to a **Negligible** magnitude of change with a Minor Effect at Year 15 when assessed against the criteria set out in Table 7.9 in Appendix A. An extensive mitigation strategy is proposed along the south-eastern side of the access road which will comprise of a hedge with indigenous trees which, as they mature, will screen views of the proposed development. Therefore, the effects at both Year 1 and Year 15 will be **Not Significant** as identified in the methodology in Appendix A.

Viewpoints 2 and 3: Levedale Road and No 1 Holding Levedale and Oak Barns (See Figures 14 and 17) Note: Viewpoint 2 has updated Photomontages shown at Year 1 on Figure 15 and at Year 15 on Figure 16

4.5 *Receptor 2a and 3a: Levedale Road*

The sensitivity of the viewpoint for road user receptors is moderate, taking account of the criteria set out in Table 7.3 in Appendix A. The receptors will experience glimpses of the development and the proposed access track through the gaps in the hedge line that abuts Levedale Road. The Battery Storage, Sub Station Area and Acoustic Barrier will be located behind the hedge in the middle distance and will be partially obscured by the existing 2.5- 3.0m tall, clipped hedgerow. The magnitude of change will be **Slight** with a Moderate/ Minor Effect at Year 1, leading to a **Negligible** magnitude of change with a Minor Effect at Year 15 when assessed against the criteria set out in Table 7.9 in Appendix A. An extensive mitigation strategy is proposed along the south-eastern side of the access road which will comprise of a 5.0m wide linear hedgerow/buffer planting with indigenous trees which, as they mature, will screen views of the proposed access track. In addition, inside the southern edge of the existing hedgerow which runs along the north-eastern boundary in the middle distance will be new tree planting and understorey planting. In addition, the south-eastern boundary will be planted with a new 5.0m wide linear hedgerow/buffer with trees which will eventually screen the proposed development from view. Therefore, the effects at both Year 1 and Year 15 will be **Not Significant** as identified in the methodology in Appendix A.

4.6 *Receptor 2b: No. 1 Holding Levedale and Receptor 3b Oak Barns (residential dwellings) on Levedale Road*

The sensitivity of the viewpoint for residential receptors is high taking account of the criteria set out in Table 7.3 in Appendix A. The receptors will experience medium distance glimpsed views towards the northern boundary of The Battery Storage and Sub Station Area across open fields although the existing hedge along Levedale Road and the hedge along the northern boundary of the Appeal Site partially obscures views of the proposed development. The magnitude of change will be **Slight** with a Moderate Effect at Year 1, leading to **Negligible** Moderate /Minor Effect at Year 15 when assessed against the criteria set out in Table 7.9 in Appendix A. An extensive mitigation strategy is proposed along the south-eastern side of the access road which will comprise of a 5.0m wide linear hedgerow/buffer planting with indigenous trees which, as they mature, will screen views of the proposed access track. In addition, inside the southern edge of the existing hedgerow which runs along the north-eastern boundary in the middle distance will be new tree planting and understorey planting. In addition, the south-eastern boundary will be planted with a new 5.0m wide linear hedgerow/buffer with trees which will eventually screen the proposed development from view. Therefore, the effects at both Year 1 and Year 15 will be **Not Significant** as identified in the methodology in Appendix A.

Viewpoint 4: Levedale Road and Poppywell Farm (See Figure 18) Note: Viewpoint 4 has updated Photomontages shown at Year 1 on Figure 19 and at Year 15 on Figure 20

4.7 *Receptor 4: Levedale Road*

The sensitivity of the viewpoint for road user receptors is moderate, taking account of the criteria set out in Table 7.3 in Appendix A. The receptors will experience glimpses of the development and the proposed access track from the edge of Levedale Road. The Battery Storage and Sub Station Area will be located partially partially obscured by the existing 2.5- 3.0m tall, clipped hedgerow. The south-eastern edge is undefined, but it is proposed to plant a new hedgerow with trees which will eventually screen the proposed development from view. The magnitude of change will be **Slight** with a Moderate/ Minor Effect at Year 1, leading to a **Negligible** magnitude of change with a Minor Effect at Year 15 when assessed against the criteria set out in Table 7.9 in Appendix A. An extensive mitigation strategy is proposed along the south-eastern side of the access road which will comprise of a 5.0m wide linear hedgerow/buffer planting with indigenous trees which, as they mature, will screen views of the proposed access track. In addition, inside the southern edge of the existing hedgerow which runs along the north-eastern boundary in the middle distance will be new tree planting and understorey planting. In addition, the south-eastern boundary will be planted with a new 5.0m wide linear hedgerow/buffer with trees which will eventually screen the proposed Battery Storage units. Therefore, the effects at both Year 1 and Year 15 will be **Not Significant** as identified in the methodology in Appendix A.

4.8 *Receptor 4: Poppywell Farm (residential dwelling) on Levedale Road*

The sensitivity of the viewpoint for residential receptors is high taking account of the criteria set out in Table 7.3 in Appendix. The receptors will experience medium distance glimpsed views towards the northern boundary of The Battery Storage and Sub Station Area across open fields although the hedge along the northern boundary of the Appeal Site partially obscures views of the proposed development. The south-eastern edge is undefined, but it is proposed to plant a new hedgerow with trees which will eventually screen the proposed development from view the magnitude of change will be **Slight** with a Moderate Effect at Year 1, leading to **Negligible** Moderate /Minor Effect at Year 15 when assessed against the criteria set out in Table 7.9 in Appendix A. An extensive mitigation strategy is proposed along the south-eastern side of the access road which will comprise of a 5.0m wide linear hedgerow/buffer planting with indigenous trees which, as they mature, will screen views of the proposed access track. In addition, inside the southern edge of the existing hedgerow which runs along the north-eastern boundary in the middle distance will be new tree planting and understorey planting. In addition, the

south-eastern boundary will be planted with a new 5.0m wide linear hedgerow/buffer with trees which will eventually screen the proposed Battery Storage units. Therefore, the effects at both Year 1 and Year 15 will be **Not Significant** as identified in the methodology in Appendix A

Viewpoint 5: Public Right of Way ref no 13 (See Figure 21)

4.9 The sensitivity of the viewpoint for recreational receptors is high, taking account of the criteria set out in Table 7.3 in Appendix A. The receptors will experience long distance obscured views from the footpath towards the south-western boundary of the Appeal Site. The existing intervening vegetation and rolling topography provide natural mitigation for the proposed development. An extensive mitigation strategy is proposed along the south-western boundary which will comprise of a 3.0m wide linear hedgerow/buffer planting with indigenous trees located adjacent to the existing hedgerow which, as it matures, will screen views of the proposed development. The magnitude of change will be **Negligible** with a Moderate/ Minor Effect at both Year 1 and Year 15. Therefore, the effects at both Year 1 and Year 15 will be **Not Significant** as identified in the methodology in Appendix A.

Viewpoint 6: Byway Open to All Traffic ref no Penkridge 0.1045 (See Figure 22)

4.10 The sensitivity of the viewpoint for recreational receptors is high, taking account of the criteria set out in Table 7.3 in Appendix A. The receptors will experience long distance obscured views from the footpath towards the Appeal Site. The existing intervening vegetation and provide natural mitigation for the proposed development. An extensive mitigation strategy is proposed along the south-western boundary which will comprise of a 3.0m wide linear hedgerow/buffer planting with indigenous trees located adjacent to the existing hedgerow which, as it matures, will screen views of the proposed development The magnitude of change will be **Negligible** with a Moderate/ Minor Effect at both Year 1 and Year 15. Therefore, the effects at both Year 1 and Year 15 will be **Not Significant** as identified in the methodology in Appendix A.

Viewpoint 7: Whitson Road (See Figure 23)

4.11 The sensitivity of the viewpoint for road user receptors is moderate, taking account of the criteria set out in Table 7.3 in Appendix A. The receptors will experience long distance obscured views from the footpath towards the Appeal Site. The existing intervening vegetation and provide natural mitigation for the proposed development. An extensive mitigation strategy is proposed along the south-western boundary which will comprise of a 3.0m wide linear hedgerow/buffer planting with indigenous trees located adjacent to the existing hedgerow which, as it matures, will screen views of the proposed development. The magnitude of change will be **Negligible** with a Minor Effect at both Year 1 and Year 15. Therefore, the effects at both Year 1 and Year 15 will be **Not Significant** as identified in the methodology in Appendix A.

Viewpoint 8: Public Right of Way ref no 41 (See Figure 24)

4.12 The sensitivity of the viewpoint for recreational receptors is high, taking account of the criteria set out in Table 7.3 in Appendix A. The receptors will experience little to no view of the proposed development as the existing trees within the existing adjoining hedgerows to the west of the Appeal Site screens all views of the Appeal Site. An extensive mitigation strategy is proposed along the south-western boundary which will comprise of a 3.0m wide linear hedgerow/buffer planting with indigenous trees located adjacent to the existing hedgerow which, as it matures, will screen views of the proposed development. The magnitude of change will be **Negligible** with a Moderate/ Minor Effect at both Year 1 and Year 15. Therefore, the effects at both Year 1 and Year 15 will be **Not Significant** as identified in the methodology in Appendix A.

Night Time Illumination

4.13 The Institution of Lighting Engineers (ILE) suggests four environmental zones relating to extant lighting conditions. They are:

- E1: Intrinsically dark landscapes (National Parks, AONBs etc);
- E2: Low district brightness areas (Rural, small village or relatively dark urban locations);
- E3: Medium district brightness areas (Small town centres or urban locations); and
- E4: High district brightness areas (Town/city centres with high levels of night-time activity).

Conclusion

4.14 For the purposes of this LVIA, the existing conditions in the vicinity of the Appeal Site are considered to correspond with Environmental Zone E2.

Summary of Visual Impact Assessment

4.15 In summary, no short, medium and long-distance views are anticipated to be significantly adversely affected and thus all the views have a **Not Significant** effect. In fact, the Appeal Site is very well contained in its local setting and along with the proposed mitigation strategy the proposed Battery Storage and associated buildings will be barely visible.

4.16 The Appeal Site should be considered cumulatively alongside the planning application ref no 23/00009/FUL Land Around Preston Hill Farm, Preston Vale, Penkridge, Staffordshire, ST19 5RA. This was approved on 2nd February 2024 and is located to the

south-east of the proposed development. The approved development would add energy infrastructure into the existing landscape character and thus become a characteristic of the existing landscape character baseline. There is one middle distance view (as in within 2km) of the Appeal Site from the Public Right of Way ref no 13 (Viewpoint 5) where both the proposed site and the proposed solar farm may be seen near each other as a cumulative impact. However, as stated in 4.9 the proposed site is screened by natural mitigation comprising of the existing intervening vegetation and rolling topography and thus is a **negligible** impact and **Not Significant** cumulative impact.

4.17 The visual impacts of the construction process are likely to be more visible than the ultimate scheme, although these are of course temporary effects. It is likely that some parts of the construction process would be visible from some of the viewpoints at some time. The impacts of such temporary events are generally considered to be **Not Significant.**

Landscape Character Impacts

4.18 The Appeal Site falls within one National Character Area: Shropshire, Chesire and Staffordshire Plain (NCA 61) and one regional one called the Supplementary Planning Guidance to the Staffordshire and Stoke on Trent Structure Plan 1996-2011 Volume 3: Landscape Descriptions: Ancient Clay Farmlands. For the purposes of this report the regional character area describes its character more accurately and has been used to assess the landscape character impact assessment.

4.19 In evaluating landscape value, it is appropriate to consider a range of factors (as defined GLVIA3 and the Landscape Institute's recent guidance note) to understand the specific attributes of value which a landscape may have to a greater or lesser degree. Such aspects may include whether the landscape is or has been afforded any local designation and/or any management policies which recognise particular values, its condition, distinctiveness, natural and cultural heritage interests, recreational value, functional value, perceptual aspects (such as scenic value and tranquillity/remoteness) and, also, its associations, typically in art or history. It is also important to define the area being considered. In this case, the appropriate area is the immediate landscape context of the potential allocation plus the Appeal Site itself (as described in paragraphs 3.16 to 3.21 above); The table below sets out the assessment of landscape value against the criteria above.

Landscape unit	**Landscape Designation**	**Landscape Value Aspects**	**Assessment** (overall evaluation highlighted)
Immediate Landscape Context including	The Appeal Site is undesignated	Condition	**Good**, Generally, in a good physical state as the Appeal Site comprises of

the Application Site (as identified above)			existing agricultural farmland
		Distinctiveness	**Medium** distinctiveness. The Appeal Site comprises of existing agricultural land surrounded by hedges and mature trees that are inherent with the character of landscape in the locality.
		Conservation Interests	**Good** The ecological integrity virtually will be minimal as all of the Appeal Site comprises of existing arable farmland. The existing hedgerows may contain linear ecological foraging corridors for wildlife
		Heritage Interests	**Low** There are no heritage assets in the local landscape
		Recreational Value	**Low** There are no rights of way within the Appeal Site however the Staffordshire Way runs over 1km away to the south
		Functional Value	**Medium** value. The Appeal Site does form a function to the surrounding landscape.

		Perceptual Aspects (Scenic Quality)	**Good** value. The landscape has a rural feel but is influenced by settlement in the locality. Views can be restricted due to the local topography, closely spaced hedgerows, abundant hedgerow trees and linear woodlands to create a strong sense of enclosure.
		Perceptual Aspects (Tranquillity and Remoteness)	**Good** value. The gently rolling landform, with occasional high points, allows long distance views through the landscape to show up the landcover elements
		Associations	**None**

4.20 Overall, within the context of a **Local Value** landscape, this part of the Ancient Clay Farmlands demonstrates aspects of value which are representative of this landscape which would suggest that the value remains a **Local Value.**

4.21 An assessment of the landscape susceptibility of this part of the Ancient Clay Farmlands to this form of development requires an analysis of the key landscape characteristics and the ability of these to accept the type, scale and form of this development. Some of the key physical characteristics of the Ancient Clay Farmlands are exhibited in this context and state that the local landscape comprises of:

> *….a landscape of mixed arable and pastoral farmland, the character of which is strongly influenced by existing land use and farming practices. In the areas of pastoral farming an intact irregular ancient pattern of hedgerows and hedgerow trees is still retained. In places this pattern is beginning to break down, with hedgerows either being allowed to grow up and become ragged or being mechanically trimmed and becoming gappy as a result. The mature hedgerow oaks are characteristic of this countryside and still numerous enough to coalesce visually and filter views across the landscape. These trees are now predominantly mature or becoming over-mature and stag headed.*

4.22 Overall it is considered that the landscape susceptibility of this area of the Ancient Clay Farmlands, is **Moderate Susceptibility**, as defined in Table 7.6, in that the clarity of the key characteristics are clearly expressed and/or their robustness to change is moderately strong and/or views contribute to landscape character and/or policies and strategies promote or accept limited changes to key characteristics, and the changes to landscape character that could be brought about by a development of the type, scale and location proposed would have a moderate compatibility with these factors.

4.23 Taken together with a ***Local Value***, the ***Moderate Susceptibility*** of this landscape to the potential effects of this form of development means that the landscape character of this area of the Ancient Clay Farmlands is of ***Moderate Sensitivity*** to new development. As defined in Table 7.7 the landscape is of local value with features, elements, areas or special qualities of local value, that could have a moderate susceptibility to the type, scale and location of development proposed.

4.24 Assessments of the magnitude of landscape effects are concerned with making "judgements about the size and scale of the effect, the extent of the area over which it occurs, whether it is reversible or irreversible and whether it is short or long term in duration" (GLVIA3 Glossary page 158).

4.25 The Appeal Site should be considered cumulatively alongside the approved planning application ref no 23/00009/FUL Land Around Preston Hill Farm, Preston Vale, Penkridge, Staffordshire, ST19 5RA. This was approved on 2nd February 2024 and is located to the south-east of the proposed development. The approved development would add energy infrastructure into the existing landscape character and thus become a characteristic of the existing landscape character baseline. Both the Appeal Site and the proposed solar farm are located within the Ancient Clay Farmlands character type. The greatest effects would be on the character of the Appeal Site itself due to the addition of the battery storage development to what is currently an arable field. For the areas immediately adjacent or close to the proposed development the change in character would be perceived in the context of the adjoining land uses. It is however considered that the proposals would become a comparable characteristic of the existing landscape which comprises of energy infrastructure.

4.26 Therefore, with a Moderate magnitude of change on a site of Moderate sensitivity the effect that would be of a **Moderate Adverse Significance** but **Not Significant** in the meaning of significance as expressed in the methodology in Appendix A. A Landscape and Ecology Management Plan (LEMP) would help to enforce the mitigation strategy and ensure longevity to the mitigation strategy.

5.0 LANDSCAPE STRATEGY

5.1 The officers from the LPA were satisfied with the assessment of the Landscape and Visual Impact Assessment and Mitigation Strategy undertaken as part of the original planning application ref no 23/00145/FUL. In this appeal, we are going even further to mitigate any perceived landscape impacts and the proposals shown in the **Landscape Strategy** on **Figure 25** have been made more robust by further landscape mitigation proposals as described below in 5.2 onwards. This will reinforce the character of the landscape and provide additional habitat provision and local benefits.

5.2 Within the Staffordshire County Council Planning for Landscape Change: Supplementary Planning Guidance to the Staffordshire and Stoke on Trent Structure Plan 1996-2011 Volume 3: Landscape Descriptions: Ancient Clay Farmlands there is a table that identifies the potential value of other habitat provision and management taken from the Staffordshire Biodiversity Action Plan. This is shown in section 3.12 and in summary states that Ancient/ diverse hedgerows and trees should be maintained and managed; Hedgerows should comprise species rich plants and Arable field margins would be maintained improved and restored. The proposed landscape strategy aims to provide all these measure in the mitigation strategy.

In addition, the character citation provides guidelines on tree and woodland planting by encouraging the following:

- Increase planting of hedgerow trees and field corners to rebuild the structure of the landscape.
- Plant new woodlands to adhere to existing field pattern and to reflect the scale of the landscape.
- Respect the existing broadleaved character of the landscape in any new planting proposals. Care is needed over the treatment of woodland edges to reflect the hedgerow character in colour and texture. Retain the visual interest of views from roadsides by avoiding extensive planting up to roadsides along considerable distances.

5.3 The proposed landscape proposals will provide a mitigation strategy based upon the guidance set out in Section 5.2 and that will absorb the proposed development into the local landscape so that it will **not** be a discordant feature within the immediate environment and not affect the appearance and intrinsic rural character of the wider area in accordance with the South Staffordshire Core Strategy Policies OC1 (Development in the Open Countryside Beyond the West Midlands Green Belt) and EQ4 (protecting and Enhancing the Character and Appearance of the Landscape).

5.4 The accompanying **Landscape Strategy** on **Figure 25** provides a strategy identifying the landscape and mitigation proposals for the proposed development. The overriding

objectives of the Landscape Strategy are to conserve, manage and enhance the existing features along the Appeal Sites boundaries where possible and to introduce new tree and understorey planting that are characteristic of the wider landscape and to protect and enhance the visual amenity of local visual receptors.

5.5 The landscape strategy can be summarised as follows:

- Retention of all boundary trees and understorey where possible.
- New acoustic fence along the northeastern and southeastern boundary of the battery storage area. This will be manufactured from timber and thus will be become a natural element within the landscape. As the timber weathers it will become part of the landscape. The existing hedge and the proposed tree and native understorey planting will screen the acoustic fence from views towards it.
- New native tree planting along the northern boundary within or adjacent to the existing retained hedge and let the existing hedge grow taller.
- New native hedge/ buffer planting and tree planting along the south-eastern boundary to form a new hedge line to screen views from the Levedale Road receptors.
- New native hedge/ buffer and tree planting along the south-eastern edge of the new access road.
- New hedge and tree planting along the southern and south western boundary to strengthen the existing hedgerow.
- New swathes of wildflower planting along the margins to improve of the ecological value and potential of the Appeal Site. The landscape strategy highlights the use of native species of local source and the adoption of a landscape maintenance regime designed to encourage wildlife and provide a range of habitat environments.

6.0 CONCLUSIONS

6.1 The main landscape and visual issues associated with the proposals are considered to be:

- The visual impact on users of the public highways, public rights of way, and on nearby residencies; and
- The character and appearance of the landscape.

6.2 The case and landscape officers from the LPA were satisfied with the assessment of the Landscape and Visual Impact Assessment undertaken as part of the original planning application ref no 23/00145/FUL.

Visual Impact

6.3 The visual impact assessment has highlighted all of the available views of the Appeal Site from the publicly accessible locations, i.e., those from public rights of way, roads, and nearby residences.

6.4 No short, medium and long-distance views are anticipated to be significantly adversely affected and thus all the views have a **Not Significant** effect. In fact, the Appeal Site is very well contained in its local setting and along with the proposed mitigation strategy the proposed Battery Storage and associated buildings will be barely visible.

6.5 The Appeal Site should be considered cumulatively alongside the planning application ref no 23/00009/FUL Land Around Preston Hill Farm, Preston Vale, Penkridge, Staffordshire, ST19 5RA. This was approved on 2nd February 2024 and is located to the south-east of the proposed development. The approved development would add energy infrastructure into the existing landscape character and thus become a characteristic of the existing landscape character baseline. There is one middle distance view (as in within 2km) of the Appeal Site from the Public Right of Way ref no 13 (Viewpoint 5) where both the proposed site and the proposed solar farm may be seen near each other as a cumulative impact. However, as stated in 4.9 the proposed site is screened by natural mitigation comprising of the existing intervening vegetation and rolling topography and thus is a **negligible** impact and **Not Significant** cumulative impact.

Landscape Strategy

6.6 The officers from the LPA were satisfied with the assessment of the Landscape and Visual Impact Assessment and Mitigation Strategy undertaken as part of the original planning application ref no 23/00145/FUL. In this appeal, we are going even further to mitigate any perceived landscape impacts and the proposals have been made more robust by further landscape mitigation proposals. This will reinforce the character of the landscape and provide additional habitat provision and local benefits.

6.7 The overriding objectives of the Landscape Strategy are to conserve, manage and enhance the existing features along the Appeal Sites boundaries where possible and to

introduce new tree and understorey planting that are characteristic of the wider landscape and to protect and enhance the visual amenity of local visual receptors.

The landscape strategy can be summarised as follows:

- Retention of all boundary trees and understorey where possible.
- New acoustic fence along the northeastern and southeastern boundary of the battery storage area.
- New native tree planting along the northern boundary within or adjacent to the existing retained hedge and let the existing hedge grow taller.
- New native hedge/ buffer planting and tree planting along the south-eastern boundary to form a new hedge line to screen views from the Levedale Road receptors.
- New native hedge/ buffer and tree planting along the south-eastern edge of the new access road.
- New hedge and tree planting along the southern and south western boundary to strengthen the existing hedgerow.
- New swathes of wildflower planting along the margins to improve of the ecological value and potential of the Appeal Site. The landscape strategy highlights the use of native species of local source and the adoption of a landscape maintenance regime designed to encourage wildlife and provide a range of habitat environments.

Landscape Character

6.8 The Appeal Site should be considered cumulatively alongside the approved planning application ref no 23/00009/FUL Land Around Preston Hill Farm, Preston Vale, Penkridge, Staffordshire, ST19 5RA. This was approved on 2nd February 2024 and is located to the south-east of the proposed development. The approved development would add energy infrastructure into the existing landscape character and thus become a characteristic of the existing landscape character baseline. Both the Appeal Site and the proposed solar farm are located within the Ancient Clay Farmlands character type. The greatest effects would be on the character of the Appeal Site itself due to the addition of the battery storage development to what is currently an arable field. For the areas immediately adjacent or close to the proposed development the change in character would be perceived in the context of the adjoining land uses. It is however considered that the proposals would become a comparable characteristic of the existing landscape which comprises of energy infrastructure.

6.9 Therefore, with a Moderate magnitude of change on a site of Moderate sensitivity the effect that would be of a **Moderate Adverse Significance** but **Not Significant** in the meaning of significance as expressed in the methodology in Appendix A. A Landscape and Ecology Management Plan (LEMP) would help to enforce the mitigation strategy and ensure longevity to the mitigation strategy.

APPENDIX A: METHODOLOGY

APPENDIX A: METHODOLOGY

Methodology

The landscape and visual impact assessment has followed established methodologies practised by the landscape profession and in accordance with 'Guidelines for Landscape and Visual Impact Assessment' 3rd Edition, published by The Landscape Institute and Institute for Environmental Management & Assessment (April 2013). The photography has been undertaken in accordance with the Landscape Institute's Advice Note 01/11 'Photography and Photomontage in Landscape and Visual Impact Assessment' (January 2011).

The overall extent of the visibility of the proposals was established; this represents the Zone of Theoretical Visibility (ZTV) for the development. This was determined through a combination of desk top studies checked with fieldwork analysis, including the walking of most of the public highways and rights of way within the area. The desk top study identified the area from which it could potentially be possible to see a part of the development according to Ordnance Survey topographical information. The fieldwork then refined this area taking into account local features that would prevent these views, for example dense vegetation, local topographical changes, buildings or fences

The study area for the landscape and visual impact assessment was determined by the ZTV exercise. It was estimated that an area of 3.0km would be used for this assessment.

Tables 7.1 to 7.3 below set out the criteria for the assessments of the value and susceptibility of visual receptors (i.e. people) and, in combining these, to determine an overall assessment of visual receptor sensitivity. These are compatible with the principles outlined in paragraphs 6.30 – 6.41 of GLVIA3. Such categories are not strict and receptors may be more or less sensitive within each category depending on the particular circumstances. Table 7.4 sets out the terms and criteria used in the visual impact assessment to describe the magnitude of visual effects

Table 7.1: Visual Receptor Value Criteria

Value of Location or View	Description
Very High or National Value	A scenic view in a landscape that has been designated at a national level, e.g. National Parks or Areas of Outstanding Natural Beauty, particularly views from a national long distance trail or promoted routes in these landscapes, or a recognised view to or from a distinctive feature designated at a national level, e.g. Scheduled Ancient Monument, Listed Building and Registered Historic Park & Garden.
High or County Value	A view from within a designated landscape or a popular view recognised in publications and/or visitor guides for promoted routes and locations of interest.
Moderate or Community Value	A view in an undesignated landscape which may be locally valued and displays evidence of responsible use.
Low or Unvalued	Where the landscape has been despoiled and there is evidence that society does not value the view or landscape
Private Value	A private view, e.g. from a residential property, that is likely to be valued by the occupants.

Table 7.2: Visual Receptor Susceptibility

Receptor Group	Location Susceptibility
Residents	High - would view the proposed development in the primary views from their property (e.g. principal living rooms and sitting areas in gardens), would be stationary or moving slowly about their property, would see the development on a daily basis, could be orientated towards the development, and would value these views. High/Moderate - would view the proposed development in the secondary views from their property (e.g. bedrooms and driveway), would be stationary or moving slowly at these locations, would see the development on a daily basis, could be orientated towards the development, and would value these views. Moderate - would view the proposed development from limited locations on their property (e.g. bathrooms and attic windows), would be stationary or moving slowly at these locations, would see the development on a daily basis, could be orientated towards the development, and would value these views.
Recreational Receptors	High - are stationery or moving slowly (e.g. walking, cycling or horse riding), can be orientated towards the development, are at that location primarily in order to enjoy the view/landscape. High/Moderate - are stationery or moving slowly (e.g. walking, cycling or horse riding), can be orientated towards the development, are at that location primarily in order to enjoy the view/landscape but also for other purposes. Moderate - are stationery or moving slowly, can be orientated towards the development, may be at that location in order to enjoy the view/landscape but would have another primary purpose for being there (e.g. playing sport).

Road and rail users (motorists, passengers, bus and train travellers)	High/Moderate – in locations where they are moving steadily/swiftly, can be orientated towards the development, are likely to be at that location primarily in order to enjoy the view/landscape. Moderate - in locations where they are moving steadily/swiftly, can be orientated towards the development, may be at that location in order to enjoy the view/landscape but may also have other purposes (e.g. journey to work). Moderate/Low - in locations where they are moving swiftly, with a direction of travel that is oblique or side-on to the development, are likely to be travelling for a purpose other than in order to enjoy the view (e.g. higher speed long distance travel).
Outdoor workers	Moderate - outdoor workers and school children in locations where they may be moving slowly, can be orientated towards the development, may experience the view on a daily basis, may be at that location in order to enjoy the view but will have other purposes. Medium/Low - outdoor workers in locations where they may be moving slowly, can be orientated towards the development, may experience the view on a daily basis, but are at that location primarily to undertake activities unconnected with the view.
Indoor workers	Low - indoor receptors with limited views in this direction, who are in that location primarily to undertake activities unconnected with the view.

Table 7.3: Visual Receptor Sensitivity Criteria

Visual Receptor Sensitivity	Description
Very High Sensitivity	Where the receptor would be stationary or moving slowly, would be likely to be exposed for consistent and prolonged periods and/or whose attention or main interest would be likely to be the landscape and views; particularly, but not necessarily limited to, users of promoted Public Rights of Way within landscapes designated at a national level, users of national trails and promoted long distance routes or at heritage assets, in these landscapes or other valued landscapes, where awareness of changes to visual amenity is likely to be acute.
High Sensitivity	Where the receptor would be stationary, moving slowly or steadily, would be likely to be exposed for consistent and prolonged periods and/or whose attention or interest is likely to include the landscape and views; typically residents at home, users of Public Rights of Way and country lanes, where awareness of changes to visual amenity is likely to be elevated.
Moderate Sensitivity	Where the receptor would be moving steadily or swiftly, would be likely to be exposed to the change for infrequent and short periods, and/or whose attention and interest may include the landscape or views but not primarily; typically travellers on roads, rail or other transport routes where awareness of change to visual amenity is likely to be limited.
Low Sensitivity	Where the receptor would be moving swiftly, would be exposed to the change occasionally and for very short periods, and/or whose attention or interest is not on views or landscape; typically people engaged in higher speed travel, engaged in organised outdoor sport (which does not involve an appreciation of views) and outdoor workers where the setting may be of importance to the quality of working life.
Negligible Sensitivity	Where the receptor would be predominantly inside and at their place of work focused on their work activity and where setting is not important to the quality of working life and awareness of change to visual amenity is likely to be negligible.

Table 7.4 Magnitude of Visual Effects Criteria

Magnitude of Change	Description
Very Substantial	Where the proposed development would be perceived to be close to the viewpoint and openly visible in its entirety or near entirety, the development would be in stark contrast to the landscape context such that it would be the dominant feature in the scene.
Substantial	Where the proposed development would be perceived to be in the near or middle distance and visible in its entirety or partly screened, the development would contrast with the landscape context such that it would stand out as a prominent feature in the scene.
Moderate	Where the proposed development would be perceived to be in the middle distance and visible in its entirety or partly screened or at closer distances and more considerably screened, the development may contrast with the landscape context such that it would be evident as a noticeable feature in the scene.
Slight	Where the proposed development would be perceived to be in the distance or far distance and visible in its entirety or partly screened or at closer distances and substantially screened, the development may contrast with the landscape context such that it would be a visible feature in the scene.
Negligible	Where the proposed development would be perceived to be in the far distance, partly or largely screened or at closer distances and almost entirely screened, the development may contrast with the landscape context such that it would be a barely discernible feature

For landscape character effects, as per the principles outlined in paragraphs 5.38 – 5.57 of GLVIA3, assessments have been made as to landscape value and landscape susceptibility and, in combining these, to determine overall landscape sensitivity. The criteria used for assessing these are reproduced at Tables 7.5 to 7.7 below and the magnitude of landscape effects at Table 7.8.

Table 7.5 Landscape Value Criteria

Landscape Value	Description
International Value	Where the landscape has been designated at an international level, e.g. a World Heritage Appeal Site, and the purposes of which include landscape and/or recreational opportunities.
National Value	Where the landscape has been designated at a national level, e.g. National Parks (England, Scotland and Wales), Areas of Outstanding Natural Beauty (England, Wales and NI), Heritage Coasts (England and Wales), LANDMAP VSAA Outstanding Overall Evaluation (Wales) or where a landscape feature has been designated at a national level, e.g. Scheduled Ancient Monument, and forms a highly distinctive landscape feature.
County/District Value	Regional Parks, landscape designations in Structure, Unitary or Local Development Plans, LANDMAP VSAA High Overall Evaluation (Wales) or a landscape feature that has been designated at a County/Borough/District level and forms a distinctive landscape feature.
Local Value	For undesignated landscapes and landscape features which are locally valued, LANDMAP VSAA Moderate Overall Evaluation (Wales) and display evidence of responsible use and value.

Unvalued	Where the landscape and/or landscape features have been despoiled and there is evidence that society does not value the landscape and/or landscape features, e.g. fly tipping, abandoned cars, litter, vandalism, etc.

Table 7.6 Landscape Susceptibility Criteria

Landscape Susceptibility	Description
Very Susceptible	Where the clarity of the key characteristics are very strongly expressed and/or their robustness to change is fragile and/or views are an essential characteristic, and/or policies and strategies aim to achieve “no change” to landscape character, and the changes to landscape character that could be brought about by a development of the type, scale and location proposed would be incompatible with these factors.
Susceptible	Where the clarity of the key characteristics are strongly expressed and/or their robustness to change is weak and/or views are an important characteristic and/or policies and strategies aim to conserve the key characteristics, and the changes to landscape character that could be brought about by a development of the type, scale and location proposed would have a poor compatibility with these factors.
Moderate susceptibility	Where the clarity of the key characteristics are clearly expressed and/or their robustness to change is moderately strong and/or views contribute to landscape character and/or policies and strategies promote or accept limited changes to key characteristics, and the changes to landscape character that could be brought about by a development of the type, scale and location proposed would have a moderate compatibility with these factors.
Slight susceptibility	Where the clarity of the key characteristics are vaguely expressed and/or their robustness to change is strong and/or views are incidental to landscape character and/or policies and strategies promote or accept that the landscape could evolve, and the changes to landscape character that could be brought about by a development of the type, scale and location proposed would have a good compatibility with these factors.
Negligible susceptibility	Where the key characteristics are muddled and/or their robustness to change is very strong and/or views are irrelevant to landscape character and/or policies and strategies promote or accept major changes to key characteristics and the changes to landscape character that could be brought about by a development of the type, scale and location proposed would have excellent compatibility with these factors.

Table 7.7 Landscape Sensitivity Criteria

Landscape Value	Description
Very High sensitivity	A landscape with international or national value and/or with features, elements, areas or special qualities of international or national value, that could be very susceptible to the type, scale and location of development proposed.
High sensitivity	A landscape with national or County/Borough/District value and/or with features, elements, areas or special qualities of national value, that could be susceptible to the type, scale and location of development proposed.
Moderate sensitivity	A landscape with County/Borough/District or local value and/or with features, elements, areas or special qualities of County/Borough/District or local value, that could have a moderate susceptibility to the type, scale and location of development proposed.
Low sensitivity	A landscape with local value and/or with features, elements, areas or special qualities of local value, that could have a slight susceptibility to the type, scale and location of development proposed.

Negligible sensitivity	A landscape that is unvalued and/or with features, elements, areas or special qualities that are unvalued, and that could have a negligible susceptibility to the type, scale and location of development proposed.

Table 7.8 Magnitude of Landscape Effects Criteria

Magnitude of Change	Description
Very Substantial adverse (or beneficial)	Where the proposals would become a defining characteristic of the landscape, would override and be in stark contrast with (or would substantially enhance) the existing landscape context, would be in the context of no similar developments (or would reinstate particularly valued features that had been previously lost or degraded) and would be a dominant additional feature(s).
Substantial adverse (or beneficial)	Where the proposals would become a key characteristic of the landscape, would compete with and detract from (or enhance) the existing landscape context, would be in the context of few similar developments (or would reinstate particularly valued features that had been previously lost or degraded) and would be a prominent additional feature(s).
Moderate adverse (or beneficial)	Where the proposals would become a characteristic of the landscape and would contrast with (or complement) the existing landscape context, may be in the context of a few similar developments (and/or would reinstate valued features that had been previously lost or degraded) and would be a noticeable additional feature(s).
Slight adverse (or beneficial)	Where the proposals would become a characteristic of the landscape and would contrast with (or complement) the existing landscape context, may be in the context of some similar developments (and/or would reinstate features that had been previously lost or degraded) and would be a visible additional feature(s).
Negligible adverse (or beneficial)	Where the proposals) may contrast with (or would complement) the existing landscape context, may be in the context of several similar developments (and/or would reinstate minor features that had been previously lost or degraded) and would be a barely discernible additional feature(s).

What constitutes a significant effect; the meaning of a significant effect in a broad planning context; and what weight should be attached to it, are all matters which do not have any specific definition in any related guidance. GLVIA3 requires the process of the assessment of significance to be clearly defined for each EIA project and to be expressed as transparently as possible. It defines (at Table 5.10 of the GLVIA3) a sliding scale of significance (for landscape effects) and, at Table 7.9 below, a matrix is used to help structure the overall assessment of the significance of landscape or visual effect when the magnitude of change is combined with sensitivity, together with the degree of significance that applies. The gradation invites the decision-maker to consider the amount of weight that should be applied based on the degree of significance as part of the planning balance. However, also identified are those effects which are considered to be significant in the terms required for assessment by the EIA Regulations (those highlighted in bold type and in the darker blue shaded boxes) as distinct from those which are not and the reasoning is set out within the narrative of the assessment.

Table 7.9 Overall Assessment of Landscape and Visual Effects Criteria (Significance)

	Magnitude of change				
Receptor/ character area sensitivity	Very Substantial	Substantial	Moderate	Slight	Negligible
Very High	Major ++	Major +	Major	Major - Moderate	Moderate
High	Major +	Major	Major - Moderate	Moderate	Moderate - Minor
Moderate	Major	Major - Moderate	Moderate	Moderate - Minor	Minor
Low	Major - Moderate	Moderate	Moderate - Minor	Minor	Minor - Negligible
Negligible	Moderate	Moderate - Minor	Minor	Minor - Negligible	Negligible

Key

	Significant effect
	Potentially significant effect considered with other viewpoint effect evaluations
	Not a significant effect

APPENDIX B:

National Character Area Profile: Shropshire, Chesire and Staffordshire Plain (NCA 61)

National Character Area profile:

61: Shropshire, Cheshire and Staffordshire Plain

Supporting documents

NATURAL ENGLAND

www.naturalengland.org.uk

Introduction

As part of Natural England's responsibilities as set out in the Natural Environment White Paper[1], Biodiversity 2020[2] and the European Landscape Convention[3], we are revising profiles for England's 159 National Character Areas (NCAs). These are areas that share similar landscape characteristics, and which follow natural lines in the landscape rather than administrative boundaries, making them a good decision-making framework for the natural environment.

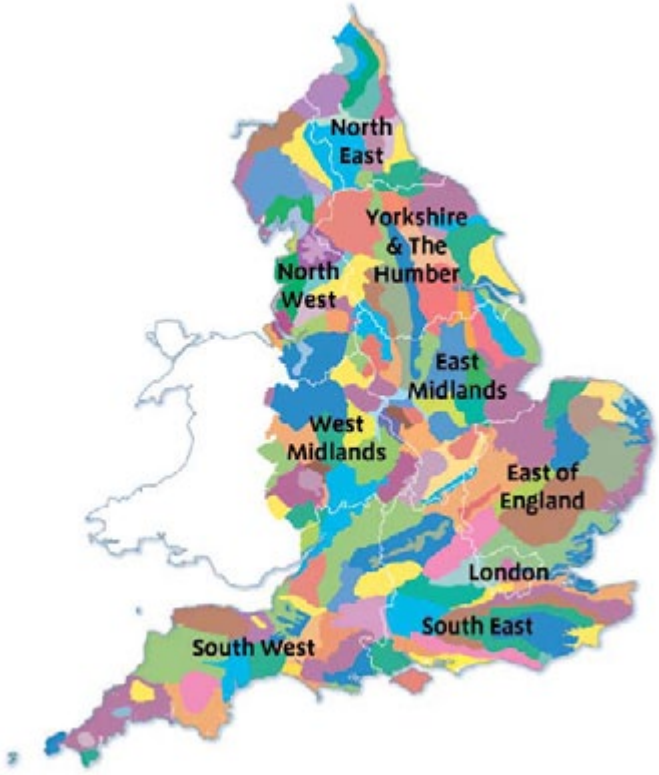
NCA profiles are guidance documents which can help communities to inform their decision-making about the places that they live in and care for. The information they contain will support the planning of conservation initiatives at a landscape scale, inform the delivery of Nature Improvement Areas and encourage broader partnership working through Local Nature Partnerships. The profiles will also help to inform choices about how land is managed and can change.

Each profile includes a description of the natural and cultural features that shape our landscapes, how the landscape has changed over time, the current key drivers for ongoing change, and a broad analysis of each area's characteristics and ecosystem services. Statements of Environmental Opportunity (SEOs) are suggested, which draw on this integrated information. The SEOs offer guidance on the critical issues, which could help to achieve sustainable growth and a more secure environmental future.

NCA profiles are working documents which draw on current evidence and knowledge. We will aim to refresh and update them periodically as new information becomes available to us.

We would like to hear how useful the NCA profiles are to you. You can contact the NCA team by emailing ncaprofiles@naturalengland.org.uk

National Character Areas map



[1] The Natural Choice: Securing the Value of Nature, Defra (2011; URL: www.official-documents.gov.uk/document/cm80/8082/8082.pdf)
[2] Biodiversity 2020: A Strategy for England's Wildlife and Ecosystem Services, Defra (2011; URL: www.defra.gov.uk/publications/files/pb13583-biodiversity-strategy-2020-111111.pdf)
[3] European Landscape Convention, Council of Europe (2000; URL: http://conventions.coe.int/Treaty/en/Treaties/Html/176.htm)

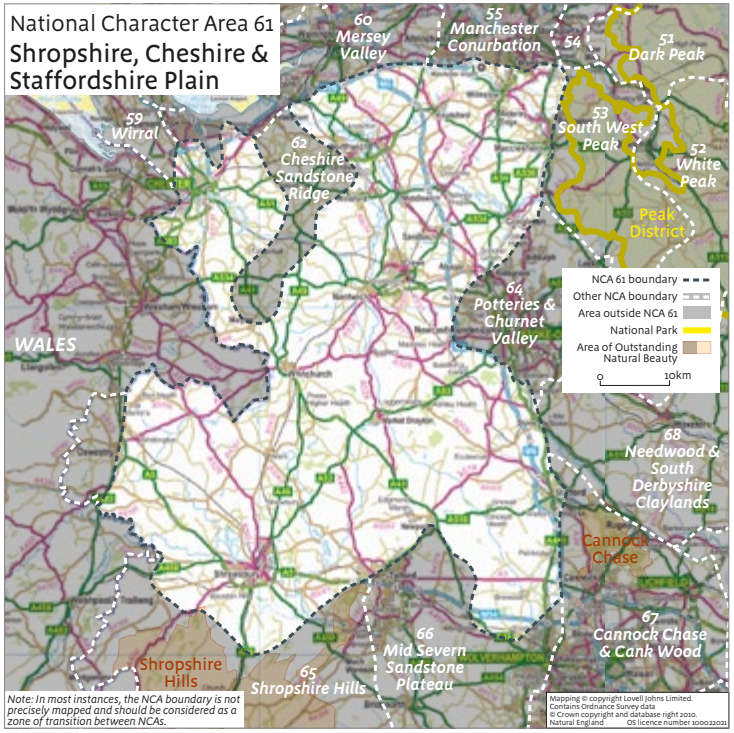
Summary

The Shropshire, Cheshire and Staffordshire Plain National Character Area (NCA) comprises most of the county of Cheshire, the northern half of Shropshire and a large part of north-west Staffordshire. This is an expanse of flat or gently undulating, lush, pastoral farmland, which is bounded by the Mersey Valley NCA in the north, with its urban and industrial development, and extending to the rural Shropshire Hills NCA in the south. To the west, it is bounded by the hills of the Welsh borders and to the east and south-east by the urban areas within the Potteries and Churnet Valley, Needwood and South Derbyshire Claylands, and Cannock Chase and Cank Wood NCAs.

A series of small sandstone ridges cut across the plain and are very prominent features within this open landscape. The Mid-Cheshire Ridge, the Maer and the Hanchurch Hills are the most significant. They are characterised by steep sides and woodland is often ancient semi-natural woodland which is notably absent from the plain, except around Northwich.

The landscape character of the plain owes much to its glacial origins. A thick layer of glacial till covers the lower slopes of the ridge and the surrounding plain and is punctuated by numerous ponds and meres. Subsequent colonisation by vegetation has resulted in the establishment of large areas of bog, known as mosses. Some are associated with the development of schwingmoor which is an advancing, floating raft of bog moss. The meres and mosses of the north-west Midlands form a geographically discrete series of nationally important, lowland open water and peatland sites; the finest examples are considered to be of international importance.

The NCA is important for food production. Throughout the plain, the water retention and fertility of the clay soils support lush pastures for grazing dairy cattle. There are a number of dairy processors making a range of dairy products that include ice cream and Cheshire cheese. The lighter soils in Staffordshire and parts of Shropshire support more mixed farms, combinable crops and potatoes in rotation.



Click map to enlarge; click again to reduce.

The NCA contains several significant flood plains. Its flat, low-lying basins carry meandering stages of ten main rivers, a number of which have sections notified as Sites of Special Scientific Interest for their nationally important geomorphological features or clough woodland and wetland habitats important to birds and insects. A section of the River Dee that flows north along the western boundary of the area is designated as a Special Area of Conservation for its vegetation communities and populations of Atlantic salmon, lamprey species, bullhead and otter.

The presence of large conurbations and the dense network of roads mean that development pressures are likely to continue. Road improvements risk the urbanisation of rural villages. The demand for mineral extraction sites and in-fill sites for waste disposal from the conurbations is likely to increase and, as the population increases, the demand for food will increase. Development will also increase water demand which, together with the effects of climate change, potentially threatens the internationally important peat wetland habitats of the NCA in terms of water availability and water quality, compounding the effects of climate change. These pressures have the potential to further fragment habitats and change settlement patterns and the vernacular, but can also provide opportunities to create a high-quality built environment with multifunctional greenspace with links to the rural area.

One of the finest examples in the country of a 'schwingmoor'. The central floating raft of sphagnum and diverse bog communities are surrounded by fen and mixed woodland. The range of habitats present at Wybunbury Moss is part of the suite of Midland Meres and Mosses Ramsar sites and is a Special Area of Conservation supporting many nationally and locally rare invertebrate species.

Statements of Environmental Opportunity

SEO 1: Restore, manage and protect from diffuse pollution the rivers, streams, lakes, ponds and wetland habitats (including flood plain grazing marsh and wet woodland) and support partnerships to maintain the integrity and unique conditions for the preservation of the internationally important meres and mosses and River Dee, to benefit water availability, water quality, landscape character, biodiversity and climate regulation.

SEO 2: Protect the landscape of the plain, recognising its importance to food production and incorporating well-maintained hedgerows, ponds and lowland grassland margins within agricultural systems, to secure resource protection and maintain productivity, while reducing fragmentation of semi-natural habitats to benefit a wide range of services, such as landscape character, sense of place, water quality and biodiversity.

SEO 3: Manage and restore lowland heathland and ancient and plantation woodland, support partnerships to plan appropriately scaled new woodland cover, particularly where this will link and extend existing woodlands, restore and reinstate traditional orchards and increase biomass provision to mitigate the impact of climate change, where this will benefit biodiversity, landscape character and enhance the experiential qualities of the area.

SEO 4: Protect and manage the nationally important geological sites and heritage features demonstrating how the interaction of natural and historical factors influenced the distinctive character of its landscape and settlement patterns, and help to promote greater understanding of the link between wildlife, heritage and geodiversity, particularly the importance of former extraction sites for both geodiversity and biodiversity.

There are significant areas of lowland raised bog, for example, Fenn's and Whixall Mosses offers wide-open landscapes. Historically, these were exploited for peat, which was drained and allowed to dry before being harvested. Since being secured for conservation purposes, careful management of water has raised water levels and the sites once again support an outstanding assemblage of plants and animals and provide an important carbon sink.

Description

Physical and functional links to other National Character Areas

The extensive Shropshire, Cheshire and Staffordshire Plain National Character Area (NCA) extends from the broad Mersey Valley NCA in the north, to the Shropshire Hills and Mid Severn Sandstone Plateau NCAs in the south. In the west, it is bounded by the hills of the Welsh borders and Wirral and Oswestry Uplands NCAs. The eastern boundary is shared with South West Peak, Potteries and Churnet Valley, Needwood and South Derbyshire Claylands, and Cannock Chase and Cank Wood NCAs. The NCA almost surrounds the small Cheshire Sandstone Ridge NCA except for its northern boundary.

The plain is visually constrained by the higher land around it. In the south, there are long views from the plain to the prominent hills of the Shropshire Hills NCA, notably the Wrekin and Wenlock Edge. The foothills of the Welsh mountains can be seen from areas in the west. In the east, the peaks of the Pennines and Peak District can be seen.

Although relatively flat, this NCA is a watershed for several major river systems. The River Severn and its tributaries, such as the rivers Perry, Roden and Tern, meander south through wide valleys of the plain and on through the neighbouring NCAs before discharging to sea via the Severn Estuary. The rivers Dane, Weaver and Gowy and their tributaries, such as the Duckow, meander north, flowing through the Mersey Valley NCA before discharging to Liverpool Bay via the River Mersey. The River Dee meanders northwards along the western boundary, through Chester, then north-westwards, through Wirral

A marina on the Macclesfield Canal, just one of the many canals that cross the Plain. Once important trade routes, canals now provide an important recreational asset for pleasure craft and walkers alike. The towpath forms part of the Cheshire Ring Canal Walk.

NCA before discharging to sea via the Dee Estuary. The rivers Penk and Sow rise in Staffordshire and flow eastwards joining the River Trent before discharging to the North Sea. These rivers contribute to their relative catchments to provide water for domestic, agriculture and industrial uses to the city of Chester and large towns within this and the neighbouring NCAs.

There are a number of reservoirs throughout the area. Almost all are canal-feeder reservoirs that maintain water levels in the many kilometres of canals that flow through the NCA. Areas of the south and west of the NCA are underlain by the Sherwood Sandstone aquifer that provides an essential source of base-flow to maintain river levels, and supplements supplies of drinking water to Warrington, in the Mersey Valley NCA. In the north, surrounding Northwich, there are numerous small lakes (meres), for example Rostherne Mere and Tatton Mere. There are several lakes directly east of Ellesmere, including The Mere which is the largest lake in Shropshire. Collectively, the meres and mosses form part of the Midland Meres and Mosses – a characteristic shared with the Mid Cheshire Sandstone Ridge NCA.

Woodland is virtually absent from the plain, being confined to the area around Northwich and to estates, cloughs and wind-swept ridges that extend into the Cheshire Sandstone Ridge NCA. The Mersey Forest Partnership is developing a network of community woodlands and green spaces that extends across Cheshire and Merseyside and covers a significant area of the NCA in the north, extending from Chester in the west, across the Cheshire Sandstone Ridge NCA, to Middlewich in the east.

An extensive transport network crosses the plain: the M6, M54 and M56, and a web of railway lines which emanate from Crewe, an important node in the national rail network. A number of National Cycle Routes cross the plain and there are nearly 5,000 km of public rights of way including the Sandstone Trail, a long-distance footpath stretching for 55 km from Whitchurch in the south, across the Cheshire Sandstone Ridge NCA, offering elevated views across the plain, before ending in Frodsham in the Mersey Valley. An extensive canal network includes the Shropshire Union Canal, the longest watercourse in the NCA which runs for 150 km through the NCA before cutting across the Mid Severn Sandstone Plateau NCA.

Species-rich fen vegetation including tufted sedge, marsh cinquefoil, marsh bedstraw, yellow iris around the edge of Shomere Pool, a dystrophic waterbody which is surrounded by bog and alder carr communities.

Key characteristics

- Extensive, gently undulating plain, dominated by thick glacial till from the late Pleistocene Period, producing productive, clay soils and exemplifying characteristic glacial landforms including eskers, glacial fans, kettle holes, moraines and a landscape of meres and mosses.
- Prominent discontinuous sandstone ridges of Triassic age, characterised by steep sides and freely draining, generally infertile soil that supports broadleaved and mixed woodland.
- Few woodlands, confined to the area around Northwich and to estates, cloughs and deciduous and mixed woods on the steeper slopes of the wind-swept sandstone ridges. Locally extensive tracts of coniferous woodland and locally distinctive orchards scattered throughout.
- Strong field patterns with generally well-maintained boundaries, predominantly hedgerows, with dense, mature hedgerow trees. Sandstone walls occur on the ridges and estate walls and Cheshire-style (curved topped) metal railing fences occur locally on estates in Cheshire.
- Dairy farming dominates on the plain, with patches of mixed farming and arable in the north and large areas in the south-east.
- Diversity of wetland habitats includes internationally important meres and mosses comprising lowland raised bog, fen, wet woodland, reedbed and standing water, supporting populations of a host of rare wildlife, including some species of national and international importance.

Kettleholes at Aqualate Mere, known as 'the spectacles'. The plain is covered by thick glacial till from the late Pleistocene Period, producing productive, clay soils and exemplifying characteristic glacial landforms including, eskers, glacial fans, kettleholes and moraines.

- Extensive peat flood plains where flood plain grazing marsh habitats support regionally important populations of breeding waders in areas such as Baggy Moor, Weald Moor and Doxey Marshes.

- Many main rivers and their flood plains lie in this area, including the Dee, Dane, Severn, Penk and Sow. Significant areas of grazing marsh, alluvial flood meadows and hay meadows associated with the rivers Dee, Sow, Gowy and Severn. The area has the highest density of field ponds in western Europe.

Eastgate Street, Chester. The original entrance to the Roman settlement and forms part of the city wall. The main part of the gateway is constructed from Triassic sandstone from the Helsby Sandstone Formation, which was also used to face the city wall.

- Rich archaeological evidence of iron-age hill forts concentrated on the sandstone ridges and the Weald Moors. Remnant ridge and furrow and moated houses are features of the plain. The Roman road, Watling Street, crosses the plain linking London to Wales via Wroxeter. Chester was an important Roman settlement.

- Regularly spaced, large farmsteads, dispersed hamlets, market towns and many other settlements including Macclesfield and Telford. Timber-frame buildings are a distinctive feature of the plain, often highly decorated in Cheshire, for example, the moated Little Moreton Hall. The historic towns including Stafford, Shrewsbury and the city of Chester have a wealth of 17th- and 18th-century half-timber, brick and red sandstone buildings.

- Parklands and gardens associated with estates such as Chillington, Trentham, Tatton and Attingham; country houses such as Gawsworth Hall, Arley Hall and Adlington Hall; and fortified manor houses and castles such as at Shrewsbury, Stafford, Beeston, Acton Burnell and Cholmondeley.

- Nationally important reserves of silica sand and salt. Active extraction of salt has developed a locally distinctive landscape of subsidence flashes, particularly around the area of Sandbach. Adjacent to these saline flashes are areas of salt marsh rarely found at inland sites.

- The numerous canals are important for recreation as well as habitat. Several National Cycle Routes and nearly 5,000 km of public rights of way cross the plain. Six National Nature Reserves (NNRs) are scattered throughout, close to large population centres and well used for recreation.

Shropshire, Cheshire and Staffordshire Plain today

Much of the plain is gently rolling, with only minor changes in elevation between 20 and 50 m. The series of small sandstone ridges, while only reaching elevations of between 150 and 230 m, are very prominent features within this open landscape and provide a locally rare sight of exposed solid rock comprising striking bluffs of reddish-pink Triassic sandstone. They are characterised by having steep slopes which are generally wooded although there are a low number of dry heathlands and some fine examples of unimproved grassland. In the south, Precambrian sedimentary rocks of hard shales and greywacke give rise to a ridge and series of small hills around Shrewsbury. The lower slopes of the ridges and the plain are covered by a considerable thickness of glacial till and provide insights into Quaternary environments, for example the nationally rare group of landforms associated with esker systems and related fan and kettle holes, found at Aqualate Mere, are important for research into glacial geomorphology.

Woodland is virtually absent from the plain, where agriculture dominates. Where it occurs, woodland is confined to the north around Northwich and to clusters of ancient woodland associated with estates, cloughs and wind-swept ridges. The woodland on the ridges is frequently ancient in origin and predominantly oak with some birch and rowan. The clough woodlands comprise oak on the valley tops with ash, sycamore, wild cherry and elm on the lower slopes. In a few woods, the uncommon small-leaved lime and wild service tree occur. Hazel is sometimes abundant as derelict coppice in the understorey, while in the valley bottoms and associated with the meres and mosses, willow, crack willow, birch and alder are prevalent. The cloughs, which sit below the level of the plain, evoke a sense of enclosure and tranquillity in contrast to the wind-swept sandstone ridges. In the north, the Mersey

Sandstone ridges formed by a series of small hills, for example at Hawkstone, provide a strong contrast in landscape character and topography between the ridges and the surrounding plain. The ridges provide expansive views across the plain and a locally rare sight of exposed solid rock comprising striking bluffs of sandstones and conglomerate of the Triassic Period.

Forest Partnership is developing a network of community woodlands that is strengthening the woodland character close to population centres.

Field sizes vary in scale as a result of historical farming practice, with large fields reorganised from the enclosure of medieval strip fields in some areas (particularly in the south), in contrast to the 17th- to 19th-century fields reorganised from medieval irregular enclosures across much of Cheshire.

Generally well-maintained boundaries, predominantly hedgerows, surround pastures with large, usually over-mature, specimen trees. The hedgerows are generally dense, with large, mature, hedgerow trees, mainly oak with occasional ash and sycamore, particularly in Cheshire, giving the appearance of a well-wooded landscape, even though woodland is relatively scarce on the plain. Hedgerows give way to sandstone walls on the ridges and around estates. There are historic parkland estates scattered throughout the plain, often bounded by Cheshire-style (curved topped) painted, metal railing fences that give the appearance of a well-ordered and maintained landscape.

A well-camouflaged brimstone butterfly on its larval food-plant, alder buckthorn, which is a plant of wet fen woodlands.

Throughout, the water retention and fertility of the clay soils support lush pastures for grazing dairy cattle or for growing silage or hay. There are a number of dairy processors in the NCA that produce a range of dairy products, including ice cream and a range of Cheshire cheeses. Traditional orchards were once an important component of the landscape, but are now local features. Some older farms, estates, smallholdings and cottages still have remains of orchard trees either in the garden hedgerow or in grassy paddocks set close to the house. A number of fragmented orchards survive, for example in the area around Attingham Park in Shropshire and notably the pear orchards at Acton Bridge, Cheshire.

In contrast to the plain, the soils on some of the gentle, free-draining side slopes of the sandstone ridges are used to grow fodder crops such as maize, with potatoes grown in rotation on some of the lighter, sandier soils in Shropshire. In Staffordshire, livestock rearing is combined with dairying and significant areas of arable on the lighter soils, presenting a less pastoral landscape.

The lower slopes of the ridges and surrounding plain have been modified by ice sheets that have left a considerable thickness of glacial till (sands and boulder clays) which is punctuated by numerous field ponds, meres and mosses. The meres and mosses of the north-west Midlands form a geographically discrete series of nationally important lowland open water and peatland sites; some are designated as Sites of Special Scientific Interest (SSSI) and Special Areas of Conservation (SAC). The finest examples have developed a mature schwingmoor comprising floating bog moss, often with common cotton grass and cranberry, and are considered to be of international importance (Ramsar). There are significant areas of lowland raised bog – for example, Fenn's, Whixall, Bettisfield, Wem and Cadney mosses offer wide-open landscapes and the suite of sites support an outstanding assemblage of plants and animals.

The mosaic of open water and peatland habitats, together with fringing heathland and woodland, provide habitats for locally and nationally rare species of aquatic plants and invertebrates, for example planktonic algae, stands of shoreweed and narrow small-reed, a host of invertebrates (including damselflies and dragonflies, for example the nationally rare white-faced dragonfly), and a diversity of beetles and spiders (including a number of nationally rare species). Drier areas typically support heathland relics; areas of purple moor-grass and open semi-natural woodland are important for *Lepidoptera*, for example the argent and sable moth and small pearl-bordered fritillary. Lowland heathland at Prees Heath SSSI hosts the nationally scarce silver-studded blue butterfly.

Wet woodland, reedbed and eutrophic or mesotrophic standing waters are significant and there are areas of grazing marsh on the flood plains of the rivers; for example, Baggy Moor and Weald Moor hold regionally important populations of wet grassland breeding waders.

Open water includes a group of seven large meres – some fringed with woodland and contained within the hummocky hills of the moraine – which create a distinctive local landscape known as the 'Shropshire Lakeland'. Some meres support a diverse fish population, in particular pike and bream, and large numbers of wintering and breeding wildfowl; for example, Aqualate Mere hosts up to 3,000 overwintering ducks, including mallard, teal, wigeon, pochard, tufted duck, goldeneye, gadwall and wintering shoveler. The reedbeds support a large heronry and also support reed warbler, sedge warbler and reed bunting with visiting marsh harrier and osprey. The site also sees large murmurations of starlings at dusk in the winter months.

Abundant small ponds are scattered throughout the plain but some are rarely seen. A number are generally indicated by clumps of trees, sometimes with scrub and rushes, which punctuate the pattern of hedged pastures. There are some fine examples of traditional hay meadows and pastures; some are of great botanical diversity, for example Mottey Meadows.

The NCA contains several significant flood plains. Its flat, low-lying basins carry meandering stages of ten main rivers including the Dee, Dane, Severn and Sow. The first three have sections notified as SSSI for their geomorphological features, while the marshes on the flood plain of the River Sow provide wetland habitats for birds and insects in particular. A section of the River Dee SAC is

Open water transition fen, with bog bean and slender sedge, characteristic of low nutrient (mesotrophic) pools which, are now very uncommon in England.

protected for its vegetation communities and populations of Atlantic salmon, lamprey species, bullhead and otter, and meanders northwards along the western boundary before flowing through Chester.

There are a number of reservoirs throughout the NCA; almost all are canal-feeder reservoirs that retain water levels in the area's many canals, the longest being the Shropshire Union Canal that is well used by pleasure craft. Areas in the south and west of the NCA are underlain by the Sherwood Sandstone aquifer that provides an essential source of base-flow to maintain river levels and also supplements supplies of high-quality drinking water. Subsidence

On the flat plain, the 76 meter diameter Lovell radio telescope at Jodrell Bank can be clearly seen and is a distinctive feature in the local landscape, viewed from the surrounding higher ground of Mow Cop in the Potteries and Churnet Valley National Character Area.

flashes in the north-east, around Sandbach, Northwich and Middlewich, form a mosaic of wetland habitat important for biodiversity and recreation.

The NCA has a rich history. Hill forts, associated with the Iron Age, were constructed on the ridges, and connected by a trackway following the higher land; today, sections of this form part of the Sandstone Trail. There are fine examples of historic land use on the plain, where remnants of ridge and furrow, indicating former infield and outfield systems, are still legible and often associated with the historic field pattern. A medieval dispersed settlement pattern characterises most of the plain, including moated houses, reflecting status and developed in relationship to an inherited network of Roman roads.

There is ample evidence for Roman activity within the plain. Watling Street crosses the plain leading to Wroxeter and on into Wales. A number of forts and associated settlements were located along the road at intervals, notably the site known as Pennocrucium, located at the end of a sandstone ridge on the eastern bank of the River Penk, upon which the modern town of Penkridge now lies. The former hunting chases of the forests of Macclesfield and Delamere and fine country houses, historic parks and gardens, such as Tatton Park and Attingham Park, designed by eminent landscape designers are now important recreational assets close to population centres.

Large farmsteads, typically a brick or sandstone farmhouse surrounded by several large barns for storing fodder and overwintering stock, are frequent and are spread throughout the area. Market towns are widely spread across the NCA; other settlements, small villages and hamlets are few and dispersed. The hamlets tend to be loosely clustered, with houses spread out along the network of hedged lanes in the open countryside. Occurring throughout the plain, in open countryside as well as in towns and villages, are occasional

older, distinctive, timber-frame houses. Building materials are predominantly brick ranging in colour from orange and red in the south, to reds, browns and purples in the north and east. The latter produces an attractive mottled-effect brick. Sandstone churches and occasional very distinctive black-and-white half-timbered buildings, most notably in Chester, are also seen.

The NCA has nationally important reserves of silica sand around the areas of Congleton, Chelford and Eaton Hall in Macclesfield, extending into the neighbouring Cheshire Sandstone Ridge NCA around Delamere. Other minerals extracted include building sand, aggregates and hard rock for road stone and in the east there are widespread deposits of halite (salt) that have been exploited since Roman times. Associated with these deposits, the flow of low temperature brines through the sandstone has precipitated minerals such as copper, lead, cobalt and vanadium, for example at Alderley Edge SSSI. Brick clay extracted from the glacial till has also been exploited since Roman times and red Triassic sandstones have been used widely as a building stone – for example, for Chester Cathedral, which was built in 1093 from red sandstone, also used by the Romans to face the city wall. Active extraction of sandstone continues, for example, at Grinshill.

The pastoral landscape and historic towns have inspired a number of authors. Izaak Walton's *The Compleat Angler*, first published in 1653, is one of the earliest works to be inspired by country life and a love for the natural world and is also an influential piece of pastoral writing. Lewis Carroll was born in Daresbury, Cheshire, and used the 'Cheshire Cat' in his novel *Alice's Adventures in Wonderland*. In folklore, the term 'grinning like a Cheshire cat' is thought to be derived from the fact that Cheshire has an abundance of milk and cream.

The globally threatened floating water-plantain. The floating water-plantain has been lost from the majority of its recorded sites in England and only a small number of sites are not in canals and are in what may be considered natural habitats, shown here at Bomere.

The landscape through time

The oldest rocks in the area are the sediments from the Precambrian Period that underlie a series of hills, such as Bayston Hill and Haughmond Hill near Shrewsbury. They were originally deposited circa 550 million years ago as mudstones, sandstones and conglomerates in a shallow sea. The sediments have been deformed by pressure and heat over millions of years, resulting in the hard shales and greywacke stone that are now valued for use as road stone.

From the 16th century the wool and cloth trades brought increasing prosperity to the area. The distinctive black and white merchants' and farmers' dwellings date from this time and moated sites were further developed and enhanced during the medieval period. Little Moreton Hall is a fine example.

Active quarries in the hills are well hidden in the landscape because they follow the strike of the almost vertically dipping rocks through the crests of the hills.

The solid geology that underlies the majority of the area comprises red mudstones and sandstones of the Triassic Period. These rocks were deposited under arid, desert conditions circa 248–205 million years ago. The Lower Triassic sandstones of the Sherwood Sandstone Group emerge as a series of ridges from beneath the thick glacial deposits of North Shropshire and Cheshire and form an important aquifer and recharge areas. In the east, mudstones of the overlying Triassic Mercia Mudstone Group comprise beds of halite, or rock salt. Their origin is likely wind-blown dust that settled in shallow salt lakes and sun-baked mudflats on the extensive desert plain. The arid conditions led to the occurrence of numerous layers of halite, which have been exploited since Roman times and remain a nationally important reserve to the chemical industry and for use as rock salt.

The lower slopes of the ridges and surrounding plain are covered by a thick deposit of glacial till (sands and boulder clays) that was deposited during the last glacial advance about 18,000 years ago and is punctuated by numerous ponds and meres. Meres have developed in natural depressions in the glacial till caused by moraines as the ice sheet waned about 15,000 years ago. The subsequent development of swamp and carr caused the accumulation of peat which, in some cases, has led to the complete in-filling of the depressions. Eventually the vegetation growing on the peat surface became raised above the surrounding groundwater and, supplied only by rainwater, became nutrient poor (oligotrophic) and acidic, thus allowing species such as the bog mosses *Sphagnum* spp. to colonise it. Hence, over many thousands of years, some meres have developed into mosses, and an invaluable record of the detail of this process is preserved in the layers of peat and mineral sediments. In a

few unusual cases, where the water surface becomes directly colonised by floating vegetation and then sphagnum mosses, a quaking bog known as a 'schwingmoor' is formed.

Glacial deposits also occur widely in the major river valleys. Glacial outwash channels formed the Congleton and Chelford sands, a nationally important reserve of silica sand. One of the best examples of an esker system in England occurs at Aqualate Mere, which provides a rare example in the Midlands of an esker system formed by glacial meltwaters during the late Devensian glaciation. The site is also significant in demonstrating the close association of the esker with fan deposits formed in a proglacial lake, a nationally rare group of landforms. Glaciation also led to a fundamental change in the drainage of the area. The ice sheet extended across the plain and blocked the upper reaches of the River Severn that originally flowed north to the developing Dee Estuary. Melting resulted in the catastrophic release of water that cut a subglacial meltwater channel that we see today in the neighbouring NCA as the Ironbridge Gorge, allowing the River Severn to drain to the Bristol Channel.

There is currently little evidence for early prehistoric activity and the archaeological evidence suggests that woodland clearance began in earnest from the late Neolithic onwards. Settlements were concentrated on the drier sandstone ridges where iron-age hill forts were constructed and connected by a trackway following the higher land. There is also evidence of small settlements of a similar date on the higher, drier ground of the Weald Moors. Evidence of the area's prehistory, including mammoth bones and preserved human bodies, are occasionally uncovered by extractive industries. A number of artefacts have been found, including several dug-out canoes and items of jewellery from the peats around the meres, indicating the human value of such lakes through the ages.

Where appropriate, meres offer opportunities for water sports.

Chester was the most significant Roman settlement and the clearance of woodlands for agriculture continued during the period of Roman occupation. The influence of the Romans can also be seen through the notable roads built to cross the plain, particularly Watling Street which linked London to mid-Wales via the site of Viroconium Cornoviorum (Wroxeter in modern-day Shropshire). Wroxeter probably began as a temporary marching camp; however, in 58 ad the Emperor Nero ordered the invasion of Wales and the site became a permanent fortress. A line of forts were constructed along Watling Street, which encouraged the development of adjacent roadside settlements such as Pennocrucium (Water Eaton in modern-day Staffordshire).

By the time of the Domesday survey, much of the Shropshire part of the plain was cleared of woodland except for isolated patches. Settlements were generally dispersed as indicated by the high number of moated sites. The increase in wealth from the 12th century onwards led to the growth of markets, including around the salt towns of Nantwich, Middlewich and Northwich in Cheshire and the establishment of many small towns across the plain, as well as the construction of churches and monasteries.

From the 16th century, the wool and cloth trades brought increasing prosperity to the area. The distinctive black-and-white merchants' and farmers' dwellings date from this time and moated sites were further developed and enhanced during the medieval period. Little Moreton Hall is a fine example. This prosperity continued into the 18th century when the towns were enlarged with elegant brick Georgian buildings.

Many of these settlements are located on slight elevations of sandstone. Two of the largest settlements of the plain, Chester and Shrewsbury, are strikingly located in defensive positions on sandstone bluffs above tight meanders on the rivers Dee and Severn respectively. Stafford, while low-lying, is similarly located in a defensive position within a tight bend of the River Sow.

Chester and Shrewsbury, as major market centres, continued to develop and expand but still retain the tight-knit narrow streets in their centres. These are lined with buildings, notably from the 17th and 18th centuries, an intricate and attractive mix of half-timbered, brick and red sandstone. The centres of small market towns such as Market Drayton and Wem comprise narrow lanes lined by brick-built buildings from the 18th century.

The county town of Stafford has 18th-century housing and fine 19th-century municipal buildings dominating the town centre. In the countryside, too, Staffordshire has mostly Georgian and Victorian farm and country houses which had replaced less substantial dwellings. A number of estates were established or expanded on the plain. Some of these originate from the medieval period, for example Chillington. Some have extensive parklands and eminent landscape and garden designers – including Lancelot 'Capability' Brown, William Shenstone and Humphry Repton – were involved in their layout. Brown had a major influence at Chillington, while Repton was responsible for the park at Aqualate in 1800.

The towns of the north expanded through industrial activity, from salt around Northwich, to silk in Macclesfield and tend to be larger, sprawling settlements. Crewe is an important junction in the rail network and the town developed as a result of the expanding network of railways. On the flat plain, infrastructure tends to be prominent. For example, the 87-metre diameter radio telescope at Jodrell Bank constructed in 1957 is a locally distinctive, prominent feature in the landscape.

More recent development has resulted in the expansion of towns such as Winsford, and Telford on the edge of the area which was planned in the mid-1960s and built as a new town in the early 1970s.

Ecosystem services

The Shropshire, Cheshire and Staffordshire Plain NCA provides a wide range of benefits to society. Each is derived from the attributes and processes (both natural and cultural features) within the area. These benefits are known collectively as 'ecosystem services'. The predominant services are summarised below. Further information on ecosystem services provided in the Shropshire, Cheshire and Staffordshire Plain NCA is contained in the 'Analysis' section of this document.

Provisioning services (food, fibre and water supply)

- **Food provision:** Food production is important to the region. Seventy per cent of the soils are classified as Grade 3 and 17 per cent Grade 2 in terms of their production, and this is reflected in their use. Throughout the plain, the water retention and fertility of the clay soils support lush pastures for grazing dairy cattle or for growing silage or hay. Significant numbers of dairy herds supply milk to dairy processors in the NCA that produce a range of dairy products, including ice cream and a range of Cheshire cheeses.

  In contrast to the plain, the soils on some of the gentle, freer-draining side slopes of the sandstone ridges are used to grow fodder crops such as maize for winter feed. Potatoes are grown in rotation on some of the lighter, sandier soils in Shropshire. In Staffordshire, there are mixed farms and significant areas of arable, including potatoes and combinable crops.

  There are degraded traditional orchards throughout the NCA, particularly in Cheshire.

- **Timber provision:** The greatest concentration of woodland is in the north and north-east where commercial forest plantations and community woodlands are grown on the thin gravelly soils. Community woodland initiatives, for example the Mersey Forest Partnership, are planting sustainably managed community woodlands that include timber provision.

- **Water availability:** The NCA has ten main rivers: the River Severn and its tributaries (Perry, Roden and Tern), the River Weaver and River Dane, the River Bollin and its tributary the River Dean in the north-east of the area, and the River Sow and River Penk. There are several reservoirs throughout including the Knighton Reservoir (near Eccleshall) and the Hurleston Reservoir (near Nantwich) which store water for public, agricultural and industrial uses. Other canal-feeder reservoirs are at various locations. There is 'water available' along the River Severn; however, its tributaries (the Perry, Roden and Tern) are 'over-licensed'. In the north of the NCA, the River Weaver and River Dane have 'water available' for further abstraction. The River Bollin has 'no water available' where it flows north of Macclesfield.

  Where it is accessible, water is abstracted from the Sherwood Sandstone aquifer via boreholes that supplement surface water supplies. This major sandstone aquifer extends north from Shrewsbury and west around Oswestry and Chester. Groundwater resources, located in the south and west of the NCA, are 'over-licensed' according to data obtained from the Environment Agency.

Regulating services (water purification, air quality maintenance and climate regulation)

- **Climate regulation:** The majority of this NCA has low soil carbon content. However, significant wetland areas and extensive areas of peat soils provide an important carbon storage function in this NCA. Extensive woodland is restricted to the east where there are commercial woodland plantations, and fragmented areas of heathland exist on the poorer soils associated with the sandstone ridges.

- **Regulating soil erosion:** The West Midlands Meres' Priority Catchment has identified that soil loss is causing sedimentation in a number of meres and watercourses across the NCA. The lighter, freely draining soils have an enhanced risk of soil erosion on sloping land where cultivated or bare soil is exposed, exacerbated where organic matter levels are low after continuous arable cultivation or where soils are compacted. These soils are also at risk of wind erosion, particularly where left bare, as are the fen peat soils. They are also susceptible to rapid run-off during storm events.

- **Regulating water quality:** Extensive areas fall within priority catchments of the Catchment Sensitive Farming Programme[4] including several sites within the West Midlands meres, emphasising the importance of water quality to the NCA's habitats.

  According to the Water Framework Directive assessment, the ecological status of rivers in the NCA is generally 'poor' or 'moderate'. The chemical status of the majority of rivers and lakes in the NCA 'does not require assessment'; however, two river lengths in the north of the NCA are 'failing to achieve good' chemical status, and two tributaries in the same area are of 'good' chemical status. The chemical status of groundwater throughout the NCA is 'poor'.[5,6]

  Outcrops of Triassic sandstone provide recharge areas to the underlying aquifer; it is vital that land management over these areas maintains good soil structure to maximise water infiltration and that measures are taken to prevent diffuse pollution from entering groundwater.

[4] www.naturalengland.org.uk/ourwork/farming/csf/default.aspx

[5] *River Basin Management Plan: Severn River Basin District, Annex A: Current state of waters*, Environment Agency (December 2009)

[6] *River Basin Management Plan: North West River Basin District, Annex A: Current state of waters*, Environment Agency (December 2009)

Cultural services (inspiration, education and wellbeing)

- **Sense of place/inspiration:** In the north, a sense of place is provided by an extensive, rolling lowland landscape of lush pastures dominated by dairy farming, interrupted by sandstone ridges with rivers and tributaries with wooded cloughs. Sense of place is further supported by the area's numerous estates, estate buildings and historic parklands and black-and-white moated houses. Feelings of inspiration and escapism are likely to be associated with the ridges that rise above the plain with long-distance views of prominent hills outside the NCA, such as the Wrekin and Wenlock Edge, the foothills of the Welsh mountains in the west and the Pennines and Peak District to the east. Numerous meres and extensive mosses – for example, Fenn's, Whixall, Bettisfield, Wem and Cadney mosses – are distinctive wide open landscapes.

- **Sense of history:** The history of the landscape is evident in the iron-age hill forts, linked by sections of the Sandstone Trail and Wat's Dyke – an Anglo-Saxon boundary earthwork. The former hunting chases of the forests of Macclesfield and Delamere are still evident in the landscape. Moated manor houses still exist, for example at Little Moreton Hall. Roman roads such as Watling Street linking London to mid-Wales via Wroxeter are still evident today. Areas of ridge and furrow on the plain indicate former infield and outfield systems. The historic character is further reinforced by a settlement pattern of dispersed market towns and large farmsteads, typically of brick or sandstone spread throughout. Other settlements, small villages and hamlets are few and dispersed. The hamlets tend to be loosely clustered, with houses spread out along the network of hedged lanes, in the open countryside.

- **Tranquillity:** Statistics from the Campaign to Protect Rural England show that the NCA has experienced a substantial decline in tranquillity. Undisturbed areas have decreased from 69 per cent in the 1960s to 44 per cent in 2007 with loss of tranquillity associated with increased traffic levels on the major

roads of the NCA including the M6, M54 and extensive network of major roads. Nevertheless, the NCA offers the experience of wide open spaces and enclosed woodland to visitors from the nearby conurbations.

- **Recreation:** The NCA offers a wealth of recreational assets. There is an extensive network of rights of way including the Sandstone Trail and short sections of the Wat's Dyke Heritage Trail that are of iron-age origin.

  There are 35 Registered Parks and Gardens, some owned and run by the National Trust, and six NNRs; all but one, Mottey Meadows, are related to the Midland Meres and Mosses Ramsar sites. Additional sites include seven Country Parks and fourteen Local Nature Reserves. There is public access along the Shropshire Union, Llangollen and Trent and Mersey canals as well as access to some of the large meres such as Ellesmere and Cole mere and mosses throughout the NCA. Jodrell Bank is the location of the Lovell radio telescope which dominates the open landscape near Goostrey in Cheshire. It is also the location of an arboretum and popular visitor centre.

- **Biodiversity:** There are 83 SSSI either wholly or partly within the NCA, totalling 1 per cent of the NCA's area. There are numerous lakes ('meres') throughout the NCA and Europe's greatest concentration of ponds. Three per cent of the NCA is priority habitat, including significant areas of wet woodland, flood plain grazing marsh and fens. Extensive flood plain grazing marsh habitats support regionally important populations of breeding waders, for example lapwing, snipe and curlew in areas such as Baggy Moor, Weald Moor and Doxey Marshes.

  Other priority habitats include raised bog, lowland grassland and lowland mixed beech and yew woodland. There are eight internationally designated sites in the NCA – five SAC and three Ramsar sites totalling approximately 0.4 per cent of the area. The meres and mosses form the largest and most ecologically diverse cluster of natural wetlands in lowland England comprising a geographically discrete series of nationally important lowland open water and peatland sites designated as SSSI and SAC. The finest examples are considered to be of international importance (Ramsar). These include one of the largest and most southerly raised bogs in the UK – Fenn's, Whixall, Bettisfield, Wem and Cadney mosses – which support over 1,700 invertebrate species[7] and 29 nationally rare species, for example Desmoulin's

Jodrell Bank visitor centre offers visitors a different and relatively rare experience of the study of astronomy and astrophysics.

[7] www.jncc.gov.uk/protectedsites/sacselection/sac.asp?EUCode=UK0012912

whorl snail. The finest sites have developed a mature schwingmoor comprising floating bog mosses *Sphagnum* spp. often with common cotton-grass and cranberry. Open water provides habitats for locally and nationally rare species of aquatic plants – for example, planktonic algae, stands of shoreweed and narrow small-reed – and Cole Mere is the only English site for least water lily. Some meres support a diverse fish population, in particular pike and bream, and large numbers of wintering and breeding wildfowl; for example, Aqualate Mere SSSI hosts up to 3,000 overwintering ducks, including mallard, teal, wigeon, pochard, tufted duck, goldeneye, gadwall and wintering shoveler.

The mosaic of open water and peatland habitats, together with fringing heathland and woodland, host an outstanding diversity of invertebrates including damselflies and dragonflies, for example the nationally rare white-faced dragonfly, and a diversity of beetles and spiders including a number of nationally rare species.

Drier areas which typically support heathland relics, areas of purple moor-grass and open semi-natural woodland are important for *Lepidoptera*, for example, the argent and sable moth and small pearl-bordered fritillary. Lowland heathland at Prees Heath SSSI hosts the nationally scarce silver-studded blue butterfly.

- **Geodiversity:** There are a significant number of geological SSSIs (15) and 97 Local Geological Sites. The Triassic outcrops of the ridges and hills provide a rare glimpse of exposed solid rock, enabling the depositional environment to be interpreted, thus contributing to the understanding of climate during the Triassic Period.

  The interpretation of glacial deposits has contributed to our understanding of climate circa 20,000 years ago and present-day landscapes; for example, the formation of peat mosses provides a well-documented pollen record and opportunities for radiocarbon dating.

One of the best examples of an esker system in England occurs at Aqualate Mere SSSI, which provides a rare example in the Midlands of an esker system formed by glacial meltwaters during the late Devensian glaciation. The site is also significant in demonstrating the close association of the esker with fan deposits formed in a proglacial lake, a nationally rare group of landforms. The present-day complex geomorphology of the rivers Dane, Dee, and Severn is also contributing to our understanding of modern fluvial processes – erosion and deposition.

Road, rail and canal cuttings also provide valuable exposures, for example Tyrley Canal Cutting SSSI.

Silica sand is extracted from the nationally important reserves in the areas around Congleton, Chelford and Eaton Hall in Macclesfield. Nationally important halite (salt) deposits occur around the areas of Middlewich, Winsford, Northwich and Sandbach. Active extraction of salt has led to a series of subsidence flashes and salt karst features are also visible – depressions associated with dissolution and collapse of underlying salt. The flow of low temperature brines through the sandstone has precipitated minerals such as copper, lead, cobalt and vanadium, for example at Alderley Edge SSSI.

Greywacke stone is extracted from the Precambrian hills around Shrewsbury for use as a road stone. Sand and gravel is extracted throughout the NCA.

Brick clay extracted from the glacial till has also been exploited since Roman times and red Triassic sandstones have been used widely as a building stone – for example, for Chester Cathedral, which built in 1093 from red sandstone, also used by the Romans to face the city wall.

Statements of Environmental Opportunity

SEO 1: Restore, manage and protect from diffuse pollution the rivers, streams, lakes, ponds and wetland habitats (including flood plain grazing marsh and wet woodland) and support partnerships to maintain the integrity and unique conditions for the preservation of the internationally important meres and mosses and River Dee, to benefit water availability, water quality, landscape character, biodiversity and climate regulation.

For example by:

- Working at catchment scale, supporting landscape-scale partnerships with the management and enhancement of the landscape in a holistic way for the benefit of riverine and wetland character, biodiversity, climate regulation and recreation.
- Addressing the reasons for the unfavourable status of the meres and mosses Special Areas of Conservation (SAC) and Ramsar sites, ensuring that these are effectively and sustainably managed to achieve favourable status within an appropriately managed wider landscape.
- Encouraging the adoption of management techniques supported by the Catchment Sensitive Farming Programme, to benefit water quality and water availability, for example by encouraging rainwater harvesting and overwintering storage of water and reducing the incidence of: foul run-off from outdoor feeding areas, silage clamps, yards and cattle tracks; stock entering streams; stock poaching stream banks; and poaching of fields by cattle movement.
- Addressing the reasons for poor ecological condition, as identified by the Water Framework Directive assessment of rivers and other waterbodies in the catchments: by preventing deterioration of water quality caused by high nutrient levels and siltation caused by soil erosion.
- Naturalising channel modifications, removing obstacles to aquatic species and buffering from adjoining land uses to reduce pollution.
- Restoring degraded peatland and fen habitats and protecting peat substrates for benefits to biodiversity and climate change.
- Protecting soils, especially on elevated sites, by encouraging appropriate cropping regimes and the restoration of hedgerows with typical species, by gapping up and planting their accompanying hedgerow trees, adopting appropriate cutting regimes and tagging to extend the age range and species diversity to benefit biodiversity and sense of place.
- Managing and restoring wetland sites, including regulating water levels and managing transitional habitats, for example in the meres and mosses, and improving the coherence of wetland habitats to benefit water flow, biodiversity and climate regulation.
- Encouraging the retention of in-field glacial ponds and marl pits and where possible creating more ponds through the uptake of agri-environment scheme options, to provide greater ecological connectivity to benefit biodiversity, sense of place and history, especially in arable areas where the threat of in-filling is greatest.
- Avoiding uniform pollarding to conserve and manage mature and over-mature trees within clough woodland and riparian environments, where it does not increase the risk of flooding, thus ensuring a supply of coarse woody debris to watercourses, important for aquatic and invertebrate species.

Continued over...

SEO 1 continued.

- Carefully managing clough woodland and riparian woodland, for example along sections of the River Dee SAC, to provide adequate shade which can significantly reduce peak summer temperatures, thus maintaining water temperatures within a favourable range for fish and other sensitive freshwater fauna.
- Maximising water infiltration where outcrops of Triassic sandstone provide recharge areas to the underlying aquifer, by maintaining good soil structure and preventing diffuse pollution from entering groundwater.
- Incorporating the principles of sustainable urban drainage schemes (SUDS), for example encouraging rainwater harvesting, incorporating green space and areas of unsealed soil into urban and rural development to allow water infiltration. Supporting projects that identify and address point and diffuse pollution caused by misconnection of domestic waste, illegal discharges from industry and diffuse run-off from the road network.
- Training volunteers to assist with the surveillance of key habitats and species, carrying out monitoring programmes to gauge any further degradation or improvement in the distribution and population sizes of species as an indication of habitat quality.

Wet woodland virtually surrounds the pool at Shomere, part of a group of pools that include Bomere and Betton pools that are particularly important for their differing water chemistry, and hence flora and fauna, which they support. It is for these reasons that they form part of the suite of Midland Meres and Mosses Ramsar sites. Shown here is tufted sedge under alder carr.

SEO 2: Protect the landscape of the plain, recognising its importance to food production and incorporating well-maintained hedgerows, ponds and lowland grassland margins within agricultural systems, to secure resource protection and maintain productivity, while reducing fragmentation of semi-natural habitats to benefit a wide range of services, such as landscape character, sense of place, water quality and biodiversity.

For example by:

- Encouraging the retention of pasture on the plain to preserve the pastoral character, particularly in east Cheshire, parts of Staffordshire and Shropshire where arable areas are increasing, by promoting local dairy produce.
- Encouraging the restoration of hedgerows with typical species, by gapping up and planting their accompanying hedgerow trees, adopting appropriate cutting regimes and tagging to extend the age range and species diversity to benefit biodiversity and soil resource protection, thus maintaining soil productivity.
- Integrating semi-natural habitats into arable systems, through field margins and buffer strips adjacent to watercourses, and providing habitat for farmland birds, retaining in-field ponds and riparian woodland to benefit pest regulation, biodiversity, water availability and water quality.
- Reducing fertiliser and pesticide inputs by better targeting, especially along the field margins and adjacent to semi-natural habitats.
- Encouraging appropriate farm diversification where it sustains traditional agricultural systems, for example the conversion of redundant buildings to other uses.
- Ensuring that new development is informed by and sympathetic to landscape character and quality and contributes, as appropriate, to the conservation of the landscape, having regard to visual impact and local vernacular.

Food production is important to the region and the Plain supports lush pasture for dairying. Remnant fen, including, greater-tussock sedge, yellow iris, water violet and common valerian survive in a number of drainage ditches that cross a series of damp, peaty, pasture fields which support species-rich rushy grassland at Norbury Meres SSSI.

SEO 3: Manage and restore lowland heathland and ancient and plantation woodland, support partnerships to plan appropriately scaled new woodland cover, particularly where this will link and extend existing woodlands, restore and reinstate traditional orchards and increase biomass provision to mitigate the impact of climate change, where this will benefit biodiversity, landscape character and enhance the experiential qualities of the area.

For example by:

- Supporting landscape-scale partnerships to increase tree cover, for example community forest initiatives such as the Mersey Forest Partnership, which are enhancing woodlands to benefit landscape character, biodiversity and recreation.
- Managing existing woodland to benefit woodland flora and retaining ancient and veteran trees to ensure a supply of deadwood to benefit woodland fauna and invertebrates.
- Creating new small-scale, field-sized coverts, following existing patterns to strengthen landscape character and benefit biodiversity. In urban areas, planting blocks of trees and street trees to contribute to green infrastructure and provide shade, thus mitigating the effect of the urban heat island, increasing water infiltration rates and purifying the air.
- Reversing fragmentation of woodland by restoring typical zones of woodland types from alder, crack willow, hazel and grey willow in valleys, to oak birch woodland on higher slopes; developing and managing transitional scrub communities between woodland and adjoining habitats to create a coherent, robust habitat network.
- Reinstating native woodland on Plantations on Ancient Woodland Sites, for example in east Cheshire and Staffordshire, and removing coniferous woodland from wetland sites.
- Restoring lowland heathland from conifer plantations and expanding and buffering isolated patches of heathland, for example Trentham Park and Maer Hills in Staffordshire, Whorton in Cheshire, and Prees Heath and Haughmond Hill in Shropshire.
- Restoring degraded heathland throughout, through the removal of bracken and the thinning out of young trees to benefit sense of place and biodiversity and to protect the late source of nectar.
- Supporting partnerships to retain and reinstate traditional orchards throughout the NCA, creating community orchards to promote greater awareness of their benefits to biodiversity, landscape character and genetic diversity, through the conservation of local, heritage varieties.
- Where appropriate in the landscape, increase plantations of poplar, willow and miscanthus as biomass, developing supply chains and encouraging demand.
- Finding a financially sustainable solution to woodland management by seeking an economic return on the by-products of woodland management; developing supply chains and encouraging demand for wood fuel in urban areas and encouraging the installation of wood fuel boilers in local amenity buildings.
- Planting trees around settlements, along motorways and major highway corridors to screen the visually intrusive urban areas from the surrounding landscape.

SEO 4: Protect and manage the nationally important geological sites and heritage features demonstrating how the interaction of natural and historical factors influenced the distinctive character of its landscape and settlement patterns, and help to promote greater understanding of the link between wildlife, heritage and geodiversity, particularly the importance of former extraction sites for both geodiversity and biodiversity.

For example by:

- Working in partnership to protect and interpret the core designated sites, for example Alderley Edge Site of Special Scientific Interest (SSSI) and River Dane SSSI and the suite of Local Geological Sites, managing them to improve their accessibility and condition.
- Support partnerships in their endeavours to reconnect people with the environment, demonstrating how the natural and historical features contribute to the wider landscape character and ensuring long-term sustainability through a vibrant network of community groups.
- Increasing the provision of information and interpretation of geological and historic sites, thus helping landowners and land managers to understand and appreciate more the assets in their care.
- Conserving, managing and interpreting historic parklands, including establishment of new generations of trees that are sensitive to their historic character.
- Resisting the introduction of urban features into the rural/village landscape, for example unnecessary lighting and signage and the use of inappropriate building materials, to maintain the sense of history.
- Providing teaching materials and aids that assist local schools and other educational groups to use geological and historic sites for environmental and heritage education that includes industrial development and settlement patterns.
- Raising awareness, through the Geodiversity Action Plans and the planning system, of the increasing importance of post-industrial and extractive sites to our understanding of industrial heritage and to the unique habitats they provide, for example subsidence flashes around Sandbach.
- Encouraging people to volunteer and get involved in geoconservation and assisting with the surveillance and ongoing management of sites.
- Raise awareness of other geological and historic assets, for example collections at local museums and the use of local stone in buildings.
- Increasing the protection of buried archaeological sites, earthworks and areas of ridge and furrow from pasture improvement and drainage to benefit sense of history and biodiversity.
- Planning and managing sympathetically the restoration of mineral extraction sites to ensure their integration into the pastoral landscape to maintain the sense of place and to provide opportunities for semi-natural habitats, for example the significant subsidence flashes around Sandbach, to benefit biodiversity, recreation and sense of history.
- Using understanding of the traditional and historic architecture and its distinct patterns of settlement to inform appropriate conservation and use of historic buildings and to plan for and inspire any environmentally beneficial new development which makes a positive contribution to local character.

Additional opportunity

1: Find sustainable solutions to manage visitor pressure at popular attractions, for example the Sandstone Trail, woodlands, canals and National Nature Reserves, while encouraging a high level of public access to enjoy the wealth of recreational experience on offer.

For example by:

- Supporting landscape-scale partnerships in developing opportunities for agriculture, woodland creation, biodiversity, public access, sport, recreation and tourism development.
- Managing the impact of visitors on popular sites by ensuring that paths are adequately signposted and surfaced to prevent erosion and to divert public access away from sensitive habitats, and providing sustainable transport solutions to alleviate potential traffic congestion; developing an integrated transport network between visitor attractions, which link with public rights of way, canal towpaths and cycle routes.
- Increasing visitors' contact with nature by providing better access, circular routes and all-ability trails, away from sensitive and over-used sites, thus improving understanding and changing attitudes, as well as improving health and wellbeing.
- Encouraging a wide variety of individual and group participation, promoting health and wellbeing and lifelong learning through volunteering in specific conservation, access and interpretation initiatives.
- Providing opportunities for heritage and rural skills training to meet rural skills shortages.
- Capturing and sharing skills and good practice in heritage and access management, interpretation and community engagement.
- Managing the extensive canal network and its associated assets that include feeder reservoirs, hedgerows and towpaths, to maximise the benefits to biodiversity, landscape character, sense of history and recreational value that will support the visitor economy.

Interpretation and clear signage for public access at Fenn's and Whixall Mosses. Signage is crucial in ensuring visitors' safety, providing safe routes away from hazards and sensitive habitats and can help in the control of erosion, as well as being informative and raising awareness of the importance of such sites.

Supporting document 1: Key facts and data

Total area: 366,247 ha

1. Landscape and nature conservation designations

At its southern edge near Pontesbury a very small part of the Shropshire Hills Area of Outstanding Natural Beauty (AONB) falls within the Shropshire, Cheshire and Staffordshire Plain NCA.

Source: Natural England (2011)

1.1 Designated nature conservation sites

The NCA includes the following statutory nature conservation de1signations:

Tier	Designation	Name	Area (ha)	% of NCA
International	Ramsar	Midlands Meres and Mosses Phase 1, Midlands Meres and Mosses Phase 2, Rostherne Mere	1,153	<1
European	Special Protection Area (SPA)	n/a	0	0
	Special Area of Conservation (SAC)	Fenn's, Whixall, Bettisfield, Wem and Cadney Mosses SAC, River Dee and Bala Lake SAC, Mottey Meadows SAC, West Midlands Mosses SAC, Brown Moss SAC	517	<1
National	National Nature Reserve (NNR)	Aqualate Mere NNR, Rostherne Mere NNR, Fenn's, Whixall and Bettisfield Mosses NNR, Mottey Meadows NNR, Wem Moss NNR, Wybunbury Moss NNR	586	<1
National	Site of Special Scientific Interest (SSSI)	A total of 83 sites wholly or partly within the NCA	3,411	1

Source: Natural England (2011)

Please note: (i) Designated areas may overlap (ii) all figures are cut to Mean High Water Line, designations that span coastal areas/views below this line will not be included.

The Midlands Meres and Mosses Ramsar Phase 1 and Phase 2 sites encompass a high proportion of SSSI in the meres and mosses series, and these overlap with all the National Nature Reserves and SAC except Mottey Meadows NNR and River Dee and Bala SAC respectively.

Source: Natural England (2011)

- Details of individual Sites of Special Scientific Interest can be searched at: http://www.sssi.naturalengland.org.uk/Special/sssi/search.cfm
- Details of Local Nature Reserves (LNR) can be searched: http://www.lnr.naturalengland.org.uk/Special/lnr/lnr_search.asp
- Maps showing locations of Statutory sites can be found at: http://magic.defra.gov.uk/website/magic/ – select 'Rural Designations Statutory'.

1.1.1 Condition of designated sites

SSSI condition category	Area (ha)	% of SSSI land in category condition
Unfavourable declining	97	3
Favourable	1,639	48
Unfavourable no change	688	20
Unfavourable recovering	975	29

Source: Natural England (March 2011)

Details of SSSI condition can be searched at:
http://www.sssi.naturalengland.org.uk/Special/sssi/reportIndex.cfm

2. Landform, geology and soils

2.1 Elevation

The NCA is lowland in character with the lowest point at around 20 m. The highest elevation at 324 m is located at one of the small sandstone ridges.

Source: Meres and Mosses Natural Area Profile; Shropshire, Cheshire and Staffordshire Countryside Character Area Description

2.2 Landform and process

The landform owes much to its glacial origins and for the most part comprises of a gently rolling plain with only gentle changes in elevation of between 20 m and 50 m. Glacial landform features include eskers, moraines and the apparent clustered distribution of mere and moss basins. The larger rivers, such as the Severn, meander through wide valleys of flatter and lower land than the surrounding plain. A prominent feature of the area is a series of small sandstone ridges which reach elevations 150 m to 230 m. Subsidence of the glacial sediments has occurred locally caused by the solution of the underlying salt deposits.

Source: Meres and Mosses Natural Area Profile; Shropshire, Cheshire and Staffordshire Countryside Character Area Description

2.3 Bedrock geology

The underlying bedrock geology is almost entirely formed of red and brown Triassic sandstones, silts and muds, from the influx of a major river system from the south. Upper Triassic siltstones and mudstones accumulated in a lagoon or shallow gulf and evaporation of this lagoon lead to the extensive salt deposits found today. A series of sandstone ridges occur at Nesscliffe, Grinshill and Hawkstone. Less abrupt ridges occur north and west of Macclesfield, such as at Alderley Edge and at Ashley to Gnosall and Albrighton. The Triassic sandstones of Alderley Edge are particularly important for copper ore mineralisation caused by the flow of low temperature brines through the sandstone and precipitation of associated minerals. Sandstones of the Carboniferous Coal Measures run south-west from Newcastle towards Shrewsbury and give rise to small scale ridges and valleys at Maer. There are three Precambrian outcrops around Shrewsbury at Haughmond Hill, Lyth Hill and Sharpstones Hill.

Source: Meres and Mosses Natural Area Profile; Shropshire, Cheshire and Staffordshire Countryside Character Area Description

2.4 Superficial deposits

Glacial activity has affected the whole plain by rounding off hard outcrops of sandstone, creating meltwater channels and lake beds and depositing a variety of materials from boulder clay to marls, sands and gravels. These deposits have in places caused the formation of a number of shallow meres and some peat-filled mosses.

Source: Meres and Mosses Natural Area Profile; Shropshire, Cheshire and Staffordshire Countryside Character Area Description

2.5 Designated geological sites

Designation	Number of sites
Geological Site of Special Scientific Interest (SSSI)	9
Mixed interest SSSI	6

There are 97 Local Geological Sites within the NCA.

Source: Natural England (2011)

- Details of individual Sites of Special Scientific Interest can be searched at: http://www.sssi.naturalengland.org.uk/Special/sssi/search.cfm

2.6 Soils and Agricultural Land Classification

Widespread fertile and productive clay soils are generally characteristic; however, in places the soils are thin, sandy and gravelly. In addition peat covers 3 per cent of the area.

Source: Shropshire, Cheshire and Staffordshire Plain Character Area Description

The main grades of agricultural land in the NCA are broken down as follows (as a proportion of total land area):

Agricultural Land Classification	Area (ha)	% of NCA
Grade 1	490	<1
Grade 2	62,282	17
Grade 3	257,007	70
Grade 4	28,482	7
Grade 5	399	<1
Non-agricultural	2,078	<1
Urban	15,505	4

Source: Natural England (2010)

Maps showing locations of Statutory sites can be found at: http://magic.defra.gov.uk/website/magic/ – select 'Landscape' (shows ALC and 27 types of soils).

3. Key water bodies and catchments

3.1 Major rivers/canals

The following major rivers/canals (by length) have been identified in this NCA.

Name	Length (km)
River Weaver	56
River Dane	46
River Dee	34
River Bollin	22
River Severn	54
River Tern	39
River Roden	29
River Perry	13
River Sow	12
River Penk	23

Source: Natural England (2010)

Please note: other significant rivers (by volume) may also occur. These are not listed where the length within the NCA is short.

Although relatively low-lying, the NCA forms a watershed for several major river systems. The Whitchurch Moraine creates a sub-division between north and south of the plain. The area's significant river floodplains are the Weaver, Dane, and Dee which drain north to the Mersey Valley and the Tern, Roden, and Perry which drain into the Severn to the south. On the east side the rivers Sow and Penk flow towards Stafford and are part of the Trent catchment to the south-east.

The rivers Weaver, Dane, Dee and Bollin flow north to the Mersey and Dee Estuaries. The rivers Severn, Tern, Roden and Perry flow south to the River Severn. The rivers Penk and Sow flow to the east to the River Trent.

Canals are prominent with a 157 km stretch of the Shropshire Union Canal crossing south-east to north to provide a link between the West Midlands canal network and the River Mersey. A 51 km stretch of the Trent and Mersey Canal which links the two named river systems extends southwards from Nantwich on the eastern side of the NCA.

3.2 Water quality

The total area of Nitrate Vulnerable Zone is 322,926 ha, which is 88 per cent of the NCA.

Source: Source: Natural England (2010)

3.3 Water Framework Directive

Maps are available from the Environment Agency showing current and projected future status of water bodies http://maps.environment-agency.gov.uk/wiyby/wiybyController?ep=maptopics&lang=_e

4. Trees and woodlands

4.1 Total woodland cover

The NCA contains 20,743 ha of woodland (6 per cent of the total area), of which 4,006 ha is ancient woodland. The Mersey Forest, Forest of Mercia and Red Rose Community Forests, represent three of twelve Community Forests established to demonstrate the contribution of environmental improvement to economic and social regeneration. They cover 18,258 ha of this NCA, which is 5 per cent of the NCA.

Source: Natural England (2010), Forestry Commission (2011)

4.2 Distribution and size of woodland and trees in the landscape

Woodland cover is generally low, only about 6 per cent and is restricted to small broadleaved or mixed woodlands on the steeper slopes of the sandstone ridges or along the sides of watercourses. Steep stream and river valley sides support areas of clough woodlands which are often ancient in origin. The rivers Bollin, Dane and Weaver and their tributaries are notable for this feature. Small copses and clumps of trees, mainly oak, ash, willow, alder and scrub occur around meres and ponds. Oak, sycamore and beech are commonly found within the estates and parklands. Strong field patterns are defined by hedgerows, often with dense, mature hedgerow trees.

Source: Meres and Mosses Natural Area Profile, Shropshire, Cheshire and Staffordshire Character Area Description

4.3 Woodland types

A statistical breakdown of the area and type of woodland found across the NCA is detailed below.

Area and proportion of different woodland types in the NCA (over 2 ha)

Woodland type	Area (ha)	% of NCA
Broadleaved	14,271	4
Coniferous	3,097	1
Mixed	1,960	1
Other	1,415	<1

Source: Forestry Commission (2011)

Area and proportion of Ancient Woodland and Planted Ancient Woodland within the NCA.

Woodland type	Area (ha)	% of NCA
Ancient semi-natural woodland	1,980	<1
Ancient re-planted woodland (PAWS)	2,025	<1

Source: Natural England (2004)

5. Boundary features and patterns

5.1 Boundary features

Field boundaries are predominantly defined by full well-maintained hedgerows. The hedges are predominately of hawthorn. Blackthorn and other shrubby species are less frequently found. Hedgerow trees are mainly oak, generally mature or over-mature with some ash and sycamore as well as willow in damper conditions.

Source: Shropshire, Cheshire and Staffordshire Countryside Character Area Description; Countryside Quality Counts (2003)

5.2 Field patterns

Field sizes range from small to medium, in irregular field patterns and are bounded by full maintained hedges. Hedgerow trees are plentiful and mature.

Source: Shropshire, Cheshire and Staffordshire Countryside Character Area Description; Countryside Quality Counts (2003)

6. Agriculture

The following data has been taken from the Agricultural Census linked to this NCA.

6.1 Farm type

Farm holdings were predominantly based on livestock (51 per cent of holdings in 2009). There was a substantial move away from dairying (20 per cent of holdings in 2009) over the 10 years between 2000 and 2009, with increases in arable and other types of holdings over the same period.

Source: Agricultural Census, Defra (2010)

6.2 Farm size

Farms of size 5 to 20 ha were the most common, accounting for 26 per cent of holdings in 2009; followed by farms of size 20 to 50 ha and 50 to 100 ha, each accounting for 20 per cent of holdings. Trends between 2000 and 2009 showed a small decrease in the numbers of all farm sizes except for holdings over 100 ha. This category totals 924 and made up 19 per cent of the total, up from 15 per cent in 2000.

Source: Agricultural Census, Defra (2010)

6.3 Farm ownership

Owned farm holdings accounted for 65 per cent of the total with the remainder being tenanted.

2009: Total farm area = 293,255 ha; owned land = 190,034 ha
2000: Total farm area = 279,711 ha; owned land = 193,951 ha

Source: Agricultural Census, Defra (2010)

6.4 Land use

The dominant land use was grassland, accounting for 180,272 ha (61 per cent of farmed area) in 2009. This was followed by cereals (64,194 ha or 22 per cent) and other arable crops (19,140 ha or 7 per cent). Between 2000 and 2009 there was a slight increase in the area of oilseeds and other arable crops and a slight decrease in the area of cereals and cash root crops.

Source: Agricultural Census, Defra (2010)

6.5 Livestock numbers

Numbers of livestock remained relatively high although they had dropped significantly since 2000. In 2009 there were 390,100 cattle (422,000 in 2000), 252,300 sheep (313,500 in 2000) and 89,500 pigs (123,400 in 2000). Cattle were the most numerous livestock type followed by sheep and pigs.

Source: Agricultural Census, Defra (2010)

6.6 Farm labour

The majority of holdings were run by dedicated farmers. These comprised some 60 per cent of the total work force. The overall total workforce had decreased by 12 per cent between 2000 (13,758) and 2009 (12,073). This decrease was accounted for by a reduction in the number of full-time workers and, to a lesser degree, casual/gang workers, by 27 per cent and 15 per cent respectively. Other numbers remained similar, but there were also fewer farmers and managers.

Source: Agricultural Census, Defra (2010)

Please note: (i) Some of the Census data is estimated by Defra so will not be accurate for every holding (ii) Data refers to Commercial Holdings only (iii) Data includes land outside of the NCA belonging to holdings whose centre point is within the NCA listed.

7. Key habitats and species

7.1 Habitat distribution/coverage

Widespread across this landscape is a series of hundreds of wetlands associated with the peatland and water filled glacial hollows. Locally they are known as meres and mosses and are of international conservation significance. A diverse range of wetlands habitats occur at these sites including lowland raised bog, fen, wet woodland, reedbed, and eutrophic or mesotrophic standing waters. Important wetland clusters are found between Ellesmere and Whitchurch, the Delamere sandsheet and on the eastern fringes of the NCA between Stafford and Macclesfield.

Significant areas of grazing marsh habitat are found in the floodplains of the rivers Dee, Sow, Gowy and Severn. Nearly 10 to 15 per cent of all ponds in England and Wales are found in this NCA.

A low number of small lowland heathlands are present, but some fine examples of unimproved grassland survive such as at Mottey Meadows and at Melverley.

Ancient woodland is almost entirely restricted to steep valley sides and streams and the best examples are found in the north including along the River Dane and River Weaver.

In addition the NCA contains important arable habitats. These support nationally important assemblages of arable birds.

Source: Meres and Mosses Natural Area Profile

7.2 Priority habitats

The Government's new strategy for biodiversity in England, Biodiversity 2020, replaces the previous Biodiversity Action Plan (BAP) led approach. Priority habitats and species are identified in Biodiversity 2020, but references to BAP priority habitats and species, and previous national targets have been removed. Biodiversity Action Plans remain a useful source of guidance and information. More information about Biodiversity 2020 can be found at; www.naturalengland.org.uk/ourwork/conservation/biodiversity/protectandmanage/englandsbiodiversitystrategy2011.aspx.

The NCA contains the following areas of mapped priority habitats (as mapped by National Inventories). Footnotes denote local/expert interpretation. This will be used to inform future national inventory updates.

Priority habitat	Area (ha)	% of NCA
Broadleaved mixed and yew woodland (broad habitat)	7,486	2
Coastal and flood plain grazing marsh	1,842	1
Lowland raised bog	717	<1
Lowland meadows	315	<1
Purple moor grass and rush pasture	165	<1
Lowland calcareous grassland	88	<1
Lowland dry acid grassland	57	<1
Upland heathland	14	<1
Fens	5	<1
Reedbeds	3	<1

Source: Natural England (2011)

The table does not include information on eutrophic standing water or wet woodland habitat and is considered to under represent some habitats including fen and lowland heathland

Maps showing locations of priority habitats are available at

- http://magic.defra.gov.uk/website/magic/ select 'Habitat Inventories'

7.3 Key species and assemblages of species

- Maps showing locations of Priority Habitats are available at: http://magic.defra.gov.uk/website/magic/
- Maps showing locations of S41 species are available at http://data.nbn.org.uk/

8. Settlement and development patterns

8.1 Settlement pattern

Large farmsteads surrounded by large barns for storing fodder and overwintering stock are frequent and spread throughout the area. Market towns are scattered across the plain. Other settlements, small villages and hamlets are few and dispersed. The hamlets tend to be loosely clustered with houses spread out along the network of hedged lanes in the open countryside.

Source: Shropshire, Staffordshire and Cheshire Countryside Character Area Description; Countryside Quality Counts (2003)

8.2 Main settlements

The county towns of Stafford, Chester and Shrewsbury and railway town at Crewe form the largest urban areas in the NCA. A series of smaller market towns occur dispersed across the area including at Northwich, Middlewich, Nantwich, Macclesfield, Market Drayton, Congleton, Whitchurch, Wem and Ellesmere. The total estimated population for this NCA (derived from ONS 2001 census data) is 908,921.

Source: Shropshire, Cheshire and Staffordshire Countryside Character Area Description; Countryside Quality Counts (2003), Natural England (2012)

8.3 Local vernacular and building materials

Buildings are predominantly red brick, with sandstone churches and occasionally very distinctive black and white half-timbered buildings.

Source: Shropshire, Cheshire and Staffordshire Countryside Character Area Description; Countryside Quality Counts (2003)

9. Key historic sites and features

9.1 Origin of historic features

There are a number of iron-age hillforts concentrated on the drier lands of the Pennine Fringe, the Sandstone Ridges and the Weald Moors. Trackways and settlements extended further into the plain, where salt was being extracted and exported during the late Iron Age and the Roman period (notably at Nantwich and Middlewich).

Of the major Roman settlements at Chester and Wroxeter (south-east of Shrewsbury), the latter was abandoned and Chester was reoccupied as a monastic site and developed as a port from the 10th century.

Colonisation of hunting chases (Forests of Delamere and Macclesfield) increased from the 15th century.

The survival today of extensive areas of ridge and furrow indicates the former widespread occurrence of strip farming.

Around the 15th century saw the concerted drainage and colonisation of some wetlands areas, however, most were left for large-scale and estate driven enclosure from the late 18th century onwards, for example, Whixall Mosses, Weald Moors. Around the same time thousands of marl pits began to be created to win clay for land improvement and today they now form the widespread network of ponds.

Prosperity from the production of cheese, which became a major aspect of the rural economy by the late 16th century, gave rise to many of the distinctive decorated farmhouses of that period.

Estates and parklands are common across the area developed in the main from the 16th century onwards, such as Tatton, Grosvenor and Attingham Park. Many are located beside scenic meres.

The Shropshire Union, Llangollen and Trent and Mersey canals, including the extraordinary Anderton Boat Lift, were opened in the 18th and 19th centuries.

Source: Countryside Quality Counts Draft Historic Profile, Countryside Character Area description.

9.2 Designated historic assets

This NCA has the following historic designations:

- 35 Registered Parks and Gardens covering 5,739 ha.
- 4 Registered Battlefields covering 487 ha.
- 360 Scheduled Monuments.
- 8,551 Listed Buildings.

Source: Natural England (2010)

More information is available at the following address:

- http://www.english-heritage.org.uk/caring/heritage-at-risk/
- http://www.english-heritage.org.uk/professional/protection/process/national-heritage-list-for-england/

10. Recreation and access

10.1 Public access

- 1 per cent of the NCA 3,766 ha is classified as being publically accessible.
- There are 4,985 km of public rights of way at a density of 1.4 km per km2.
- There are no National Trails within the NCA.

Sources: Natural England (2010)

The table below shows the breakdown of land which is publically accessible in perpetuity:

Access designation	Area (ha)	% of NCA
National Trust (accessible all year)	1	<1
Common Land	461	<1
Country Parks	1,011	<1
CROW Access Land (Section 4 and 16)	1,165	<1
CROW Section 15	454	<1
Village Greens	24	<1
Doorstep Greens	2	<1
Forestry Commission Walkers Welcome Grants	605	<1
Local Nature Reserves (LNR)	228	<1
Millennium Greens	10	<1
Accessible National Nature Reserves (NNR)	435	<1
Agri-environment Scheme Access	13	<1
Woods for People	1,766	<1

Sources: Natural England (2011)

Please note: Common Land refers to land included in the 1965 commons register; CROW = Countryside and Rights of Way Act 2000; OC and RCL = Open Country and Registered Common Land.

11. Experiential qualities

11.1 Tranquillity

Based on the CPRE map of tranquillity (2006) the highest tranquillity values are associated with south-west Cheshire and north-west Shropshire, whilst the lowest values occurred in north and east Cheshire and west Staffordshire.

A breakdown of tranquillity values for this NCA is detailed in the table below:

Tranquillity	Tranquillity Score
Highest value within NCA	43
Lowest value within NCA	-103
Mean value within NCA	-12

Sources: CPRE (2006)

More information is available at the following address:
http://www.cpre.org.uk/what-we-do/countryside/tranquil-places/in-depth/item/1688-how-we-mapped-tranquillity

The 2007 Intrusion Map (CPRE) shows the extent to which rural landscapes are 'intruded on' from urban development, noise (primarily traffic noise), and other sources of visual and auditory intrusion. This shows that approximately 44 per cent of the area is considered to remain 'undisturbed' provided by large areas of rural landscape. However, about half of the area, mainly urban in nature, in north and east Cheshire and west Staffordshire are considered disturbed. A breakdown of intrusion values for this NCA is detailed in the following table.

A breakdown of intrusion values for this NCA is detailed in the following table.

Intrusion category	1960s (%)	1990s (%)	2007 (%)	Percentage change (1960s-2007)
Disturbed	27	44	49	22
Undisturbed	69	52	44	-25
Urban	3	3	6	3

Sources: CPRE (2007)

Notable trends from the 1960s to 2007 are an approximate doubling in the area considered 'disturbed' and a doubling of the area classified as 'urban'.

More information is available at the following address:
http://www.cpre.org.uk/resources/countryside/tranquil-places

12 Data sources

- British Geological Survey (2006)
- Natural Area Profiles, Natural England (published by English Nature 1993-1998)
- Countryside Character Descriptions, Natural England (regional volumes published by Countryside Commission/Countryside Agency 1998/1999)
- Joint Character Area GIS boundaries, Natural England (data created 2001)
- National Parks and AONBs GIS boundaries, Natural England (2006)
- Heritage Coast Boundaries, Natural England (2006)
- Agricultural Census June Survey, Defra (2000,2009)
- National Inventory of Woodland & Trees, Forestry Commission (2003)
- Countryside Quality Counts Draft Historic Profiles, English Heritage (2004)*
- Ancient Woodland Inventory, Natural England (2003)
- Priority Habitats GIS data, Natural England (March 2011)
- Special Areas of Conservation data, Natural England (data accessed in March 2011)
- Special Protection Areas data, Natural England (data accessed in March 2011)
- Ramsar sites data, Natural England (data accessed in March 2011)
- Sites of Special Scientific Interest, Natural England (data accessed in March 2011)
- Detailed River Network, Environment Agency (2008)
- Source protection zones, Environment Agency (2005)
- Registered Common Land GIS data, Natural England (2004)
- Open Country GIS data, Natural England (2004)
- Public Rights of Way Density, Defra (2011)
- National Trails, Natural England (2006)
- National Tranquillity Mapping data, CPRE (2007)
- Intrusion map data, CPRE (2007)
- Registered Battlefields, English Heritage (2005)
- Record of Scheduled Monuments, English Heritage (2006)
- Registered Parks and Gardens, English Heritage (2006)
- World Heritage Sites, English Heritage (2006)
- Incorporates Historic Landscape Characterisation and work for preliminary Historic Farmstead Character Statements (English Heritage/Countryside Agency 2006)Detailed River Network, Environment Agency (2008)

Please note all figures contained within the report have been rounded to the nearest unit. For this reason proportion figures will not (in all) cases add up to 100%. The convention <1 has been used to denote values less than a whole unit.

Supporting document 2: Landscape change

Recent changes and trends

Trees and woodlands

- At the end of 1998 young trees approved for planting under a Woodland Grant Scheme agreement accounted for about 2 per cent of the mature woodland stock. Between 1999 and 2003 an area equivalent to 3 per cent of the 1999 total stock was approved for new planting under a Woodland Grant Scheme agreement (458 ha). Much of the new planting is in the form of small, scattered blocks which suggests that it is in keeping with the overall character of the area.

- The Community Forest has made an impact in the north. In 1999 about 9 per cent of the established eligible National Inventory of Woodland and Trees woodland stock was covered by a Woodland Grant Scheme management agreement. In 2003 the proportion of established, eligible National Inventory of Woodland and Trees woodland stock was about 14 per cent. About 29 per cent of the woodland cover is on an ancient woodland site. The proportion of these sites covered by a Woodland Grant Scheme agreement has changed since 1999 from 10 per cent to 18 per cent.

- Many woodlands and the majority of hedgerow trees, are mature or over-mature.

Boundary features

- Between 1999 and 2003 Countryside Stewardship agreements for linear features included fencing (350 km), hedge management (89 km), hedge planting and restoration (240 km) and restored boundary protection (241 km). The estimated boundary length for the NCA is about 27,916 km, which reflects the size of the NCA. Total length of field boundaries under management agreements between 1999 and 2003 is equivalent to about 4 per cent of this total.

- Statistics from the end of March 2011 show the following boundary features have been restored under environmental stewardship: hedgerow (7,392 km), stone wall (10 km) and stone-faced hedge bank (1 km).

Agriculture

- The mix of farm type has remained stable and since the mid-1990s there has been a shift in emphasis from dairy to lowland cattle and sheep. There is some evidence of farm amalgamation with the number of larger holdings increasing. The pastoral character, particularly that of the Cheshire plain and the Staffs lowlands, has been reduced through the introduction of fodder crops such as maize to provide winter feed. Associated with this is improved drainage and encroachment has resulted in the loss of some field ponds, bogs, and mosses.

- Throughout the NCA an increase in farm size, and diversification of farm activities, are leading to conversion of farmsteads to non-farming uses, and a significant number of redundant farm buildings converted to non-agricultural uses.

Settlement and development

- The NCA has a large share of the national build outside urban and fringe areas, as might be expected given the size of the area. However, the spread of development is not evenly distributed – most occurs in the north-east.

- There has been a significant increase in the number of barn conversions since 1999 (339 in the period 1990–2003, compared with 174 between 1990 and 1998). The concentration of conversions is again mainly in the north-east. There is some evidence of expansion of urban fringe around Market Drayton, Hadley and Crewe.

- Apart from Telford, on the fringe of the area, development has largely been confined to the few major towns and there have been a number of developments in the open countryside in response to the increase in tourism and the demand for recreational facilities.

Semi-natural habitat

- Over recent decades, there has been a steady process of grassland improvement, resulting in the loss of herb-rich hay meadows and pastures and wet grassland. Heathlands, once widely distributed, particularly in the south, are now limited to a few isolated fragments.

- There has been significant uptake of Countryside Stewardship agreements for managing habitats associated with the farmed landscape and since 2000 rate of uptake has been above the national average.

- The largest areas of semi-natural habitat managed under Countryside Stewardship in 2003 were lowland pastures on neutral/acid soils (2,736 ha) and restoration of grassland/semi-natural vegetation (1,433 ha).

- In 2003 Countryside Stewardship agreements in the NCA included 30 ha of heathland recreation and 60 ha of heathland maintenance.

- In 2003 Countryside Stewardship management agreements included 4 ha of managed reedbed, 9 ha of managed old orchard and the creation and restoration of ponds.

- Local evidence indicates that between 2008 and 2012 the Cheshire County Council worked in partnership to deliver a wide range of outputs including: 40 ha of new/restored habitats; restore 1,300 m of hedgerows and 700 m of sandstone walls.

Historic features

- In 1918 about 4 per cent of the NCA was historic parkland. By 1995 it is estimated that 44 per cent of the 1918 area had been lost. About 38 per cent of the remaining parkland is covered by a Historic Parkland Grant, and 35 per cent is included in an agri-environment scheme.

- About 65 per cent of historic farm buildings remain unconverted, but about 91 per cent are intact structurally.

Rivers

- According to the Water Framework Directive assessment, the ecological status of rivers in the NCA is generally 'poor' or 'moderate'.

- The chemical status of the majority of rivers and lakes in the NCA 'does not require assessment'; however, two river lengths in the north of the NCA are 'failing to achieve good' chemical status, and two tributaries in the same area are of 'good' chemical status.

- The chemical status of groundwater throughout the NCA is 'poor'.[8,9]

[8] *River Basin Management Plan: Severn River Basin District, Annex A: Current state of waters*, Environment Agency (December 2009)

[9] *River Basin Management Plan: North West River Basin District, Annex A: Current state of waters*, Environment Agency (December 2009)

Minerals

- Cheshire possesses mineral resources of regional and national importance in the form of silica sand and building sand. The major extraction areas are located in the centre of the county towards the eastern margins in the vicinity of Congleton and Macclesfield.

- There are few locations in the UK where silica sand occurs in enough quantities to be economically viable to extract. As reserves are used, ways of preserving the supply of silica sand are becoming increasingly important. One way is to increase the amount of recycled glass.

- Cheshire also possesses nationally important reserves of halite (salt) that are mined underground by solution pumping. The major extraction areas are in the central NCA around Northwich and Sandbach.

- Associated with the deposits of halite, the flow of low temperature saline solution through the sandstone has precipitated Copper, Lead, Cobalt and Vanadium that can be seen at Alderley Edge SSSI.

- The hills around Shrewsbury are formed of Precambrian greywacke stone which, is in much in demand for road stone, with large quarries in the Sharpstones ridge (Bayston Hill) and Haughmond Hill.

- Glacial deposits of sand and gravel are widely distributed over the area, resulting in a number of extractions sites.

- The high density of in-field ponds is a result of glacial processes and the historical extraction of marl as a soil improver.

- The active extraction of sandstone for use as a building stone continues, for example, at Grinshill.

Drivers of change

Climate change

- Projected climate change trends suggest increased rainfall, periods of drought and more frequent storm events. Impacts are expected to increase as the magnitude of climate change increases.

- Climate change exacerbates the risk that many non-native species, insect pests and pathogens may establish and spread. For example, ash die-back, a disease caused by the fungus Chalara fraxinea, and acute oak decline (AOD) which poses a threat to the oaks throughout the NCA. If unchecked, these and other diseases and pests, for example, the oak processionary moth, have the potential to fundamentally change the landscape. In the aquatic environment, crayfish plague, a fungal disease, is a particular threat to native white-clawed crayfish in the wider Weaver/Gowy catchment. The plague is carried by the signal crayfish, itself an invasive species.

- Projected climate change trends suggest an increase to summer temperatures leading to warmer water temperatures and greater incidences of algal bloom on waterbodies, for example, the lakes, reservoirs, meres and ponds throughout the NCA. Increased summer temperatures further emphasises the importance of riparian woodland in providing shade for aquatic species, such as populations of salmonid in the River Dee.

- Veteran trees, already stressed from weather extremes will be more susceptible to wind damage on the wind-swept ridges.

- Data from the Environment Agency's flood risk map[10] indicate that there is a high risk of fluvial flooding to a number of settlements, including, the historic bridging town of Shrewsbury, around the north of Telford, Congleton and Northwich. Critical infrastructure including, electrical sub-stations are also at risk and inundation of a sewage treatment works threatens properties at Winsford and Middlewich. Flooding also occurs along the river valleys, inundating agricultural land and rural properties. There is a high risk of flooding as a result of surface water, particularly in locations proximal to meres, such as Ellesmere and Oswestry. The frequency of these events is likely to increase leading to increased damage to vernacular buildings, infrastructure and agricultural soils may be subject to scour and soil erosion. In addition, higher water tables may mobilise pollutants and nutrients that could threaten sensitive habitats.

- In contrast, extended periods of drought may change the suitability of current agricultural crops and/or methods of cultivation, particularly on the free-draining soils of the NCA.

Other key drivers

- Apart from the expansion of towns such as Winsford and Telford, on the fringe of the area, development has largely been confined to the few major towns and there have been a number of developments in the open countryside in response to the increase in tourism and the demand for recreational facilities.

- The presence of large conurbations and the dense network of roads mean that development pressures are likely to continue. Road improvements risk the urbanisation of rural villages. The demand for mineral extraction sites and in-fill sites for waste disposal from the conurbations is likely to increase and as the population increases, the demand for food will increase. These pressures have the potential to further fragment habitats and change settlement patterns and the vernacular, but can also provide opportunities to create a high quality built environment with multifunctional green space with links to the rural area.

- With their elevated topography and higher wind speeds, the ridges may become preferred areas for communication masts and wind turbines respectively.

- As the demand for housing and infrastructure increases, so will the demand for raw materials, and a likely increase to productivity from existing extraction sites, resulting in increased lorry movements. Prolonged demand may lead to an increase to planning applications for extensions to existing quarries and the development of new or 'non-operational' quarries.

- The drive towards achieving the target set for generating renewable energy presents opportunities for farmers working in collaboration with landscape-scale partnerships to increase the production of biomass, on a scale, and in appropriate areas, that will not be detrimental to the landscape character.

- Visitor numbers are likely to increase. This is both a challenge and an opportunity for developing the visitor economy, increasing environmental education and understanding of the local heritage. The challenge will be to manage the impact of visitors on sites by ensuring that paths are adequately signposted and surfaced to prevent erosion and to divert public access away from sensitive habitats and areas of high tranquillity.

- Increased visitor numbers may provide opportunities for farm diversification – redundant agricultural buildings converted for short stay and long stay accommodation and where appropriate in the landscape, sites for camping and tourist caravans, especially adjacent to the Sandstone Trail, thus sustaining historic farm buildings and increasing farm income.

[10] http://watermaps.environment-agency.gov.uk/wiyby/wiyby.aspx?topic=floodmap#x=364799&y=349833&scale=8

Supporting document 3: Analysis supporting Statements of Environmental Opportunity

The following analysis section focuses on a selection of the key provisioning, regulating and cultural ecosystem goods and services for this NCA. These are underpinned by supporting services such as photosynthesis, nutrient cycling, soil formation and evapo-transpiration. Supporting services perform an essential role in ensuring the availability of all ecosystem services.

Biodiversity and geodiversity are crucial in supporting the full range of ecosystem services provided by this landscape. Wildlife and geologically-rich landscapes are also of cultural value and are included in this section of the analysis. This analysis shows the projected impact of Statements of Environmental Opportunity on the value of nominated ecosystem services within this landscape.

A continuous fringe of lesser reedmace with white water-lily around Bomere Pool (Shropshire). Encroaching trees have been cleared to allow aquatic vegetation to re-establish in shallow water. The pool is one of the most oligotrophic (infertile) meres and has an extensive area of white and yellow water-lilies.

Statement of Environmental Opportunity	Ecosystem service: Food provision	Timber provision	Water availability	Genetic diversity	Biomass provision	Climate regulation	Regulating water quality	Regulating water flow	Regulating soil quality	Regulating soil erosion	Pollination	Pest regulation	Regulating coastal erosion	Sense of place / Inspiration	Sense of history	Tranquillity	Recreation	Biodiversity	Geodiversity
SEO 1: Restore, manage and protect from diffuse pollution the rivers, streams, lakes, ponds and wetland habitats (including flood plain grazing marsh and wet woodland) and support partnerships to maintain the integrity and unique conditions for the preservation of the internationally important meres and mosses and River Dee, to benefit water availability, water quality, landscape character, biodiversity and climate regulation.	↗ *	↔ ***	↑ ***	↔ ***	↔ ***	↗ **	↑ ***	↑ ***	↗ **	↑ ***	↗ *	↗ *	N/A	↗ *	↗ **	↔ ***	↗ **	↑ ***	↔ ***
SEO 2: Protect the landscape of the plain, recognising its importance to food production and incorporating well-maintained hedgerows, ponds and lowland grassland margins within agricultural systems, to secure resource protection and maintain productivity, while reducing fragmentation of semi-natural habitats to benefit a wide range of services, such as landscape character, sense of place, water quality and biodiversity.	↑ ***	↔ ***	↗ ***	↔ ***	↔ ***	↗ *	↑ ***	↗ **	↗ ***	↑ ***	↗ **	↗ *	N/A	↑ ***	↑ ***	↗ *	↔ *	↑ ***	↔ ***
SEO 3: Manage and restore lowland heathland and ancient and plantation woodland, support partnerships to plan appropriately scaled new woodland cover, particularly where this will link and extend existing woodlands, restore and reinstate traditional orchards and increase biomass provision to mitigate the impact of climate change, where this will benefit biodiversity, landscape character and enhance the experiential qualities of the area.	↘ **	↑ **	↗ **	↑ ***	↑ ***	↑ ***	↗ ***	↗ ***	↗ ***	↑ ***	↗ ***	↗ ***	N/A	↑ ***	↑ ***	↑ ***	↑ ***	↑ ***	↔ ***
SEO 4: Protect and manage the nationally important geological sites and heritage features demonstrating how the interaction of natural and historical factors influenced the distinctive character of its landscape and settlement patterns, and help to promote greater understanding of the link between wildlife, heritage and geodiversity, particularly the importance of former extraction sites for both geodiversity and biodiversity.	↔ **	↗ ***	↗ **	↔ ***	↗ ***	↗ ***	↗ *	↗ *	↗ ***	↗ **	↗ *	↗ *	N/A	↗ ***	↗ ***	↗ ***	↑ ***	↑ ***	↑ ***

Note: Arrows shown in the table above indicate anticipated impact on service delivery ↑=Increase ↗=Slight Increase ↔=No change ↘=Slight Decrease ↓=Decrease.
Asterisks denote confidence in projection (*low **medium***high) =symbol denotes where insufficient information on the likely impact is available .

Dark plum =National Importance; Mid plum =Regional Importance; Light plum =Local Importance

Landscape attributes

Landscape attribute	Justification for selection
Prominent Triassic sandstone ridges rise above an expansive plain covered with glacial till.	■ Sandstone ridges formed by a series of small hills, such as Maer Hills, Nesscliffe, Grinshill and Hawkestone provide a strong contrast in landscape character and topography between the ridges and the surrounding plain. The ridges provide expansive views across the plain and a locally rare sight of exposed solid rock comprising striking bluffs of reddish-pink sandstones and conglomerate of the Triassic Period. ■ Where exposed at the surface, the Triassic sandstone provides recharge areas to the Sherwood Sandstone Aquifer that extends under the majority of the area and supplements surface water supplies to public, agriculture and industry both within and outside the area. ■ One of the best examples of an esker system in England occurs at Aqualate Mere, which provides a rare example in the Midlands of an esker system formed by glacial meltwaters during the late Devensian Glaciation. The site is also significant in demonstrating the close association of the esker with fan deposits formed in a proglacial lake, a nationally rare group of landforms.
A drained landscape of rivers, flood plains, field ponds, subsidence flashes, canals and reservoirs.	■ The NCA contains several significant flood plains. Its flat, low-lying basins carry meandering stages of ten main rivers including the Dee, Dane, Severn and Sow. The first three have sections notified as SSSI for their geomorphological features while the marshes, on the flood plain of the River Sow provides many wetland habitats to birds and insects in particular. ■ The highest density of field ponds in Western Europe, most are of glacial origin, others to the historic extraction of marl for use as an agricultural soil improver. ■ Underground solution pumping to extract halite (salt) has resulted in in subsidence flashes in the north east, around Sandbach, Northwich and Middlewich. ■ A section of the River Dee SAC flows north along the western boundary of the area. The designation is shared with Lake Bala in Wales for its important habitats that support vegetation communities and populations of Atlantic salmon, lamprey species, bullhead and otter Atlantic salmon. **Continued over...**

Landscape attribute	Justification for selection
	...continued from previous. ■ A number of canals cross the NCA. Disused branches can become important in developing a succession from open water to reedswamp and fen and have important assemblages of aquatic plants. There are three sections of canal with SSSI status within the south of the NCA – parts of the Montgomery Canal, Newport Canal and Prees Branch Canal. ■ A number of canal-feeder reservoirs through-out the NCA, provide nationally important habitats, for example, Belvide reservoir SSSI, supports nationally significant populations of overwintering shoveler. Chasewater reservoir SSSI is nationally important for its wet and dry lowland heath, fens and oligotrophic (nutrient-poor) standing open water habitats, and for its populations of scarce floating water-plantain and round-leaved wintergreen.
Wooded ridges, conifer plantations, small copses in wetland areas and scattered traditional orchards.	■ Woodlands are few on the plain where agriculture dominates. Here, woodlands are restricted to some of the wetter areas. ■ Thin, sandy, free-draining and generally infertile soils over the top and sides of the ridges support a mosaic of broadleaved mixed woodland often comprise ancient woodland, with areas of heathland, in contrast with the tree-less, relatively lush pastures devoted to mixed farming and dairy on the surrounding plain. ■ There are locally extensive tracts of coniferous woodland on the thin gravelly soils in the east of the area. ■ Abundant, mature hedgerow trees, particularly in Cheshire, give the appearance of a well-wooded landscape. ■ Once a characteristic of the landscape, remnant orchards are now local features. Some older farms, estates, smallholdings and cottages still have remains of orchard trees. A significant number survive, for example, in the area around Attingham Park in Shropshire, Moston in Cheshire and the pear orchards of Acton Bridge, also Cheshire.
Predominantly pastoral land use: dairy herds with some mixed farming and arable fields.	■ Throughout the plain, the water retention and fertility of the clay soils support lush pastures for grazing dairy cattle or for growing silage or hay. ■ In contrast to the plain, the soils on some of the gentle, freer draining side slopes of the sandstone ridges are used to grow fodder crops such as maize. Potatoes are grown on some of the lighter, sandier soils in Shropshire. In Staffordshire, livestock rearing combines with dairying and significant areas of arable on the lighter soils present a less-pastoral landscape.

Landscape attribute	Justification for selection
Strong field patterns, with generally well-maintained boundary features.	■ Field sizes range from small to medium, in irregular, but strong field patterns, with generally well-maintained boundaries – predominantly hedgerows surrounding pastures ■ The hedgerows are generally dense, particularly in Cheshire, with large, mature, hedgerow trees, mainly oak with occasional ash and sycamore, giving the appearance of a well-wooded landscape. ■ Hedgerows give way to sandstone walls on the ridges. There are historic parkland estates scattered throughout the plain, often bounded by Cheshire-style (curved topped) painted, metal railing fences that give the appearance of a well ordered and maintained landscape.
Dairy herds with some mixed farming and arable fields.	■ Throughout, the plain, the water retention and fertility of the clay soils support lush pastures for grazing dairy cattle or for growing silage or hay. ■ In contrast to the plain, the soils on some of the gentle, freer draining side slopes of the sandstone ridges are used to grow fodder crops such as maize. Potatoes are grown on some of the lighter, sandier soils in Shropshire. In Staffordshire, livestock rearing combines with dairying and significant areas of arable on the lighter soils present a less-pastoral landscape.
Internationally important meres and mosses.	■ Collectively the meres and mosses in this and the neighbouring NCA have been designated SAC and Ramsar sites. Fenn's, Whixall, Bettisfield, Wem and Cadney mosses extend into neighbouring Wales. ■ Meres illustrate natural progressions of habitats from open water through swamp and fen habitats, to wet willow or alder woodland. Many types of insect and water fowl are associated with these diverse wetland habitats and examples are scattered across the plain. ■ A group of seven large meres, some fringed with woodland and contained within the hummocky hills of the moraine, create a distinctive local landscape known as the 'Shropshire Lakeland'. ■ Mosses develop where peat forms, producing very acidic conditions. A number of 'moss' types have developed, over extensive areas, as a shallow dome, or in smaller basins. Their relationship with the meres can be seen where a floating raft of mosses covers a remnant lens of water. Such 'schwingmoors' are rare internationally, but several fine examples occur in the area, for example, Oak Mere. ■ The Weald Moors are characterised by a network of rush-filled drainage dykes between damp pastures and wet woodland.

Landscape attribute	Justification for selection
Historic sites, settlements and tracks/roads.	■ The topography of the ridges has been exploited for defence over centuries, evidenced by the remains of defensive fortifications, for example, Wat's Dyke, an Anglo Saxon boundary earthworks and artefacts from the Iron Age, Saxon and Roman periods. ■ The fortifications along the ridge top were linked by an ancient track. The Sandstone Trail, long distance footpath now follows this line. There is evidence of small settlements of Iron Age on the higher, drier ground of the Weald Moors, for example, at Wall Camp, where a rare, low-lying iron-age hill fort survives. ■ Ancient trackways extended further into the plain, where salt was being extracted and exported during the late Iron Age and the Roman period, notably at Nantwich and Middlewich. ■ Areas of ridge and furrow on the plain indicate the former widespread occurrence of strip farming. ■ A number of Roman roads, the most notable being Watling Street, which linked London to mid-Wales via the site of, Viroconium Cornoviorum – Wroxeter in modern-day Shropshire. The walled city of Chester was the most significant Roman settlement and the clearance of woodlands for agriculture continued during the period of Roman occupation. ■ Moated houses, timber-frame buildings and very distinctive black and white half-timbered buildings, most notably in Chester. ■ Parklands and gardens associated with estates such as, Chillington, Trentham, Tatton and Attingham; Country houses such as Gawsworth, Arley and Adlington Halls; fortified manor houses and castles such as at Shrewsbury, Stafford, Beeston, Acton Burnell and Cholmondeley.
Mineral extraction sites.	■ The extraction of silica sand has produced a complex of wetlands around Delamere, while the underground extraction of salt particularly around the area of Sandbach has led to a series of subsidence flashes that provide important saline habitats, which are relatively rare inland. ■ Sand and gravel extraction is widespread exploiting the deposits of glacial till. ■ Precambrian greywacke stone is extracted from the hills around Shrewsbury for road stone although the quarries are hidden from view as they follow the dip of the strata.
Extensive road and rail network, communication masts and locally distinctive features.	■ Extensive transport network. The M6 runs north to south through the area, the M54 crosses east to west and the M56 skirts the northern boundary before crossing north of Chester, while the M53 starts its journey north at Chester. There is also a dense network of major roads. ■ A web of railway lines cross the area emanating from Crewe in the centre of the plain. ■ Communication masts are visible on the tops of some hills. On the flat plain, locally distinct features are prominent, for example, the radio telescope at Jodrell Bank.

Landscape opportunities

- Create new woodland, in urban areas in accordance with local plans, for example, The Mersey Forest Plan, contributing to green infrastructure; planting blocks of trees to screen settlements and roads from the surrounding landscape and plant street trees to provide shade, thus mitigating the effect of the urban heat island, increasing water infiltration rates and purifying the air.

- Manage core nature conservation sites, for example, SAC, Ramsar, SSSI, NNRs, LNRs and Local Sites network to improve their condition and connectivity to enhance landscape character and create a more coherent and more resilient habitat network, while providing opportunities for volunteering, education and community involvement.

- Conserve and protect rock outcrops for their contribution to landscape character and educational value in studying past climate and geomorphological processes and for their cultural and historical significance.

- Maintain and buffer the areas of ancient semi-natural woodland by creating and managing transitional scrub communities between woodland and adjoining habitats to benefit biodiversity and landscape connectivity to help increase resilience to climate change.

- Manage ancient woodland and historic parkland with veteran trees, throughout the NCA. Encourage successional planting of a range of species to maintain the structural diversity, increase resilience to the effects of climate change while strengthening landscape and historic character.

- Manage and extend traditional orchards for their contribution to local landscape character, biodiversity, their heritage value and contribution to the local economy.

- Conserve and restore dry-stone boundary walls, Cheshire-style fences and appropriately manage and restore traditional hedgerows, planting with typical species and associated hedgerow trees.

- Protect the field ponds and where possible, create more, to increase the permeability of the landscape for aquatic species.

- Restore areas of degraded peat and the wetlands of the Meres and Mosses for the benefit of climate change, landscape character, people, wildlife and the historic environment.

- Enhance the visual and ecological continuity and character of river corridors and their tributaries through positive management, for example, facilitating natural regeneration and where appropriate, planting of riparian trees and vegetation that can provide water-regulating woody debris, and shade for wildlife and people.

- Protect from further loss and degradation the remaining fragments of heathland, where appropriate creating new heath habitat, thus reducing fragmentation and enhancing the habitat mosaic within the landscape to benefit biodiversity and climate regulation.

- Conserve, enhance and improve interpretation of historic assets in the wider landscape including, above and below ground archaeology and historic sites and buildings, for their educational, cultural and historic significance.

- Create new or extend public rights of way and permissive access and circular routes to improve the connectivity between settlements and core sites, to encourage physical activity and wellbeing and enhance semi-natural habitats along rights of way and towpaths thus creating corridors for wildlife.

- Create new access to woodland as part of woodland management, thus increasing the opportunities for quiet recreation and to experience tranquillity, ensuring this does not compromise sensitive habitats and bio-security and encouraging visitors away from over-popular sites.

- Protect the vernacular by ensuring that the grouping and design of new developments reflect the juxtaposition, scale and materials of traditional local buildings characteristic of the area; manage small-scale extraction of local building stone to this end.

Active sand and gravel extraction at Wood Lane, just south of Ellesmere. As well as extracting economically important deposits of sand and gravel, the site also has landfill and waste recycling facilities. Working closely with Shropshire Wildlife Trust, the operator has also established part of the area as a nature reserve.

Ecosystem service analysis

The following section shows the analysis used to determine key Ecosystem Service opportunities within the area. These opportunities have been combined with the analysis of landscape opportunities to create Statements of Environmental Opportunity.

Please note that the following analysis is based upon available data and current understanding of ecosystem services. It does not represent a comprehensive local assessment. Quality and quantity of data for each service is variable locally and many of the services listed are not yet fully researched or understood. Therefore analysis and opportunities may change upon publication of further evidence and better understanding of the inter-relationship between services at a local level.

Service	Assets/attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Food provision	Dairying Sheep and cattle rearing Some arable Traditional orchards	Food production is important to the region. Seventy per cent of the soils are classified as Grade 3 and 17 per cent Grade 2 in terms of their production and this is reflected in their use. Throughout the plain, the water retention and fertility of the clay soils support lush pastures for grazing dairy cattle or for growing silage or hay. Significant numbers of dairy-herds supply milk to dairy processors in the NCA that produce a range of dairy products including cheese producers making a range of Cheshire cheese and ice cream. In contrast to the plain, the soils on some of the gentle, freer draining side slopes of the sandstone ridges are used to grow fodder crops such as maize for winter feed. Potatoes are grown on some of the lighter, sandier soils in Shropshire. In Staffordshire, there are mixed farms and significant areas of arable, including potatoes and combinable crops. There is a number of degraded traditional orchards through-out the NCA, particularly in Cheshire.	Regional	The area is important for food production and food distribution, being proximal to roads and large urban settlements, markets and processing plants. The increasing demand for food is likely to continue leading to a high demand for improved grassland that could result in the loss of semi-natural habitats and erosion of the pastoral character through the introduction of fodder crops such as maize to provide winter feed. These could lead to larger field sizes, increased fertiliser and pesticide inputs and improved drainage which could threaten field ponds and characteristic meres and mosses. However, opportunities exist to incorporate measures to mitigate such consequences, such as the incorporation of semi-natural habitats in to agricultural systems that can protect habitats and the soil resource. As well as providing a local supply of fruit for local markets, orchards are hotspots for biodiversity, supporting a wide range of heritage crops and wildlife	Work in collaboration with farmers to safeguard food production while incorporating measures that support the essential natural services that underpin this production. For example, protecting soils, water and biodiversity by incorporating species-rich field margins, buffering watercourses, managing hedgerows and incorporating habitats in arable areas for farmland birds. Encourage the management and planting of traditional orchards for the benefits to biodiversity, heritage and local markets. For example, orchard planting with communities through The Mersey Forest Plan.[11]	**Food provision** **Regulating water quality** **Regulating soil erosion** **Regulating soil quality** **Sense of history** **Sense of place/ inspiration** **Genetic diversity**

[11] www.merseyforest.org.uk/plan/

Service	Assets/attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Timber provision	Conifer plantations Native woodland community woodland Valley or 'clough' woodland	The greatest concentration of woodland is in the north and north-east where commercial forest plantations and community woodlands are grown on the thin gravelly soils. Community woodland initiatives, for example, The Mersey Forest Partnership[12] are planting sustainably managed community woodlands that include timber provision.	Regional	Timber was historically an essential product of the area. It was used for charcoal in the salt industry and for iron smelting in the south-east before the widespread use of coal. Timber was also the prime construction material and Shropshire oak, in particular, was sought after for shipbuilding. Delamere Forest was a Royal Forest until 1812 and in 1919 the remaining Crown woodlands were passed to the (then) Forestry Commission to be managed for timber production. Woodland is virtually absent from the plain, except in the north around Northwich, being restricted to the poorer soils on the crests and slopes of ridges and in clumps in wetland areas and as clough woodland on valley sides. Timber provision could be increased, as a by-product of woodland management through coppicing and pollarding.	Support partnerships in Seeking opportunities to stimulate the wood product and wood fuel markets in nearby urban areas in order to sustain the management of native woodlands, for example, The Mersey Forest Partnership. Seek to bring more woodland into active management for timber where this will be beneficial for a number of services, including regulating soil erosion and water flow, biodiversity and recreation. Ensure that new conifer plantations are sensitively sited and do not fragment areas of semi-natural woodland or undermine local landscape character. Seek opportunities to replace conifer plantations on ancient woodland sites with native species. The Mersey Forest Plan identifies potential areas for woodland planting in the north.	**Timber provision** **Biodiversity** **Sense of place/ inspiration** **Sense of history** **Climate regulation** **Water availability** **Regulating water flow** **Recreation**

[12] www.merseyforest.org.uk/

Service	Assets/attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Water availability	Rivers Aquifer Reservoirs	The NCA has ten main rivers. River Severn and its tributaries (Perry, Roden and Tern), the River Weaver, River Dane, and the River Bollin and its tributary the River Dean in the north east of the NCA, and the River Sow and River Penk. There are several reservoirs throughout the NCA, including the Knighton Reservoir (near Eccleshall) and the Hurleston Reservoir (near Nantwich) that store water for public, agricultural and industrial uses. Other canal-feeder reservoirs are at various locations. There is 'water available' along the River Severn;[13] however, its tributaries Perry, Roden, and Tern are over licensed[14]. In the north of the NCA, the River Weaver and River Dane have 'water available' for further abstraction.[15] The River Bollin has 'no water available' within the NCA as it runs north of Macclesfield.[16] Where it is accessible, water is abstracted from the aquifer via boreholes that supplement surface water supplies. An area of the NCA overlays a major sandstone aquifer extending north from Shrewsbury and west around Oswestry and Chester. Groundwater resources, located in the south and west of the NCA are over licensed.[17]	Regional	Major rivers and their tributaries are important sources of water for domestic, agricultural and industrial use. In addition, there are large numbers of designated conservation areas in the catchment, with SSSI, Ramsar and SAC designations, for example, the Midland Meres and Mosses and River Dee that are reliant on consistent water availability. Greater demand for water, associated with expansion to the settlements that rely on these catchments, will lead to increased abstraction and a potential fall in water levels. Areas where the Sherwood sandstone is exposed at the surface provide recharge areas to the underlying aquifer and require careful maintenance of good soil structure to maximise water infiltration. Trees and woodland reduce both the volume and speed of rainwater run-off through interception. Tree roots break up the ground allowing greater infiltration and riparian trees slow flow rates.	Promote the sustainable use of water in domestic, industrial and agricultural sectors to reduce demand. Where appropriate, encourage rainwater harvesting and the adoption of sustainable urban drainage schemes in urban areas to improve rates of water infiltration. Encourage the construction of winter water storage reservoirs in agricultural areas (as part of the Catchment Sensitive Farming Priority Catchment), particularly where these can also make a positive contribution to wetland habitat networks and local landscape character. Identify and enhance areas for natural water storage, for example, expanding areas of flood plain grazing marshes and lowland meadows along the river valleys, and creating ponds and scrapes. Maintain and extend riparian woodland along the river valleys to increase interception rates and slow the flow of surface water. Using support available through initiatives such as CSF and agri-environment scheme options, encourage good soils management, particularly in aquifer recharge areas.	**Water availability** **Regulating soil quality** **Regulating water flow** **Sense of place/ inspiration** **Recreation** **Biodiversity** **Climate regulation**

[13] *Severn Corridor Catchment Abstraction Management Strategy*, Environment Agency (March 2003)

[14] *Shropshire Middle Severn Catchment Abstraction Management Strategy*, Environment Agency (September 2007)

[15] *Weaver and Dane Catchment Abstraction Management Strategy*, Environment Agency

[16] *Mersey and Bollin Catchment Abstraction Management Strategy*, Environment Agency (August 2005)

[17] *Shropshire Middle Severn Catchment Abstraction Management Strategy*, Environment Agency (September 2007)

Service	Assets/attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Genetic diversity	Traditional orchards	Traditional orchards were once an important part of the landscape. Some older farms, estates, smallholdings and cottages still have remains of orchard trees either in the garden hedgerow or in grassy paddocks set close to the house. A number of fragmented orchards survive, for example, in the area around Attingham Park in Shropshire and notably, the pear orchards at Acton Bridge in Cheshire.	Local	Local evidence shows that there are over 30 varieties of apples specific to Cheshire. A number were developed in the 18th century, for example, Ecclestone Pippin, Lord Derby and Gooseberry Pippin. The genetic diversity preserved in old fruit varieties may be important to future food security by retaining genes for future crop propagation. In addition to being a heritage asset to the area, orchards are hotspots for biodiversity, supporting a wide range of wildlife and containing priority habitats and species including populations of pollinators.	Using support available through agri-environment schemes and landscape partnerships, encourage the expansion of existing orchards and the re-instatement of old orchards to preserve heritage varieties and fruit tree suppliers.	**Genetic diversity** **Food provision** **Biodiversity** **Pollination** **Sense of place/ inspiration** **Sense of history** **Recreation**
Biomass energy	Miscanthus Existing woodland cover Community woodland	Miscanthus is grown in Shropshire. The main cluster of sites are south of Market Drayton and around the area of Newport and around Eccleshall in Staffordshire. There is a high potential yield[18] for miscanthus in the north and west of NCA, with a medium potential yield in the south (between Shrewsbury and Stoke-on-Trent). For short rotation coppice there is considerable variability between medium and high potential yield throughout the NCA. The Mersey Forest Partnership are planting sustainably managed community woodlands that include timber provision to local communities who harvest logs from identified trees and in return the woodland is thinned to improve its structure and biodiversity.	Local	A biomass plant at Eccleshall utilises miscanthus to provide electricity to 2,600 properties in Eccleshall, making the town virtually carbon-neutral. The plant has stimulated the local growing of miscanthus and developed a supply chain local to the plant. Existing woodland cover offers some potential for the provision of biomass, by bringing unmanaged woodland under management and as a by-product of commercial timber production. Away from the lush pastures of the plain, the gently undulating landscape may provide opportunities for planting miscanthus without detriment to landscape character. Strong field patterns, defined by hedgerows, often with dense, mature hedgerow trees are unlikely to be adversely impacted by miscanthus. This may provide opportunities for farm diversification and stimulate more markets and supply chains for more biomass plants.	Seek opportunities to expand miscanthus in appropriate locations where this can be accommodated within local landscapes and contribute to local biodiversity. Seek opportunities to bring existing woodland into active management where this can make a positive contribution to woodland biodiversity and support provision of other services such as regulating soil erosion, water flow and recreational provision. Support community woodland partnerships, for example, The Mersey Forest, in managing existing woodland, developing supply chains and establishing markets for wood fuel.	**Biomass energy** **Climate regulation** **Regulating water flow** **Regulating soil erosion** **Sense of place/ inspiration** **Biodiversity**

[18] www.naturalengland.org.uk/ourwork/farming/funding/ecs/sitings/areas/061.asp

Service	Assets/attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Climate regulation	Peat/fen soils/ mosses Wetland habitats Heathland and woodland Permanent grasslands Biomass – fuel and generation	The majority of this NCA has low soil carbon content. However, significant wetland areas and extensive areas of peat soils and permanent grasslands provide an important carbon storage function in this NCA. Extensive woodland is restricted to the east, where there are commercial woodland plantations and fragmented areas of heathland exist on the poorer soils associated with the sandstone ridges. The NCA has significant areas of miscanthus and a biomass plant.	Regional	Peat soils are likely to be the most significant contributor to climate regulation. However, historic peat extraction and the lowering of the water table have reduced the effectiveness with which peatlands in this NCA contribute to carbon storage. Therefore, the conservation and management of meres and mosses is extremely important for climate regulation in addition to benefits to biodiversity and sense of place. Good management of existing woodland can ensure their role in sequestering and storing carbon is optimised and will benefit other services, for example, biodiversity. Heathlands are characterised by a cover of 25 per cent dwarf shrubs of the botanical family Ericaceae. Woody shrub species play an important role in carbon sequestration in grassland ecosystems. Retaining soils under permanent pasture also contributes to the carbon storage within the NCA.	Working in partnership with the Environment Agency, Landowners and landscape-scale partnerships, seek opportunities to reverse the degradation of peat mosses, for example, by careful water management, blocking drainage ditches and damming to raise the water level as used effectively on Fenn's, Whixall and Bettisfield Mosses. Create new or extend areas of heathland to halt further fragmentation and to increase their connectivity to benefit biodiversity and climate regulation. Protect permanent grassland from ploughing or conversion to arable. Encouraging the installation of small-scale biomass plants in local civic buildings.	**Climate regulation** **Biodiversity** **Regulating soil erosion** **Regulating water quality** **Recreation** **Sense of place/ inspiration** **Sense of history**

Service	Assets/attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Regulating water quality	Rivers and their tributaries Meres/lakes Aquifer Sustainable land management	Extensive areas fall within Priority Catchments, of the Catchment Sensitive Farming (CSF) Programme[19] including several sites within the West Midlands Meres emphasising the importance of water quality to the NCA's habitats. According to the Water Framework Directive assessment, the ecological status of rivers in the NCA is generally 'poor' or 'moderate'. The chemical status of the majority of rivers and lakes in the NCA 'does not require assessment'; however, two river lengths in the north of the NCA are 'failing to achieve good' chemical status, and two tributaries in the same area are of 'good' chemical status. The chemical status of groundwater throughout the NCA is 'poor'[20, 21] Outcrops of Triassic sandstone provide recharge areas to the underlying aquifer; it is vital that land management over these areas maintains good soil structure to maximise water infiltration and that measures are taken to prevent diffuse pollution from entering groundwaters.	Regional	The key problems in this Priority Catchment are nutrient enrichment from agricultural run-off and soil loss causing sedimentation[22] which is a particular threat to the Meres and Mosses SAC and Ramsar and the River Dee and Aqualate Mere SAC. The reasons for failing ecological status[23] of the watercourses are diffuse pollution from pesticides and discharges from septic tanks. The aquatic ecology suffers from current and past industrial discharges. Higher salinities are found in areas adjacent to the Mersey Estuary at Stanlow, Ellesmere Port, Runcorn and the Wirral, largely attributed to saline intrusion following unsustainable abstraction of salt. Outcrops of Triassic sandstone provide recharge areas to the underlying aquifer, requiring the careful management of fertilisers and pesticides to prevent pollution from entering groundwaters. Although the aquifer is protected by glacial drift on the plain, in areas where the drift is absent, nitrate concentrations are increasing in water supply boreholes. This has led to the designation of a groundwater nitrate vulnerable zone across the NCA, for example, around the areas of Newport, Market Drayton and to the east of Chester. In addition, there are areas of eutrophic nitrate vulnerable zones around the meres of Ellesmere and Whitchurch.	In partnership with farmers and landowners, pursue measures, supported through the CSF scheme and other initiatives, to reduce nutrient and sediment input to watercourses: reduce foul run-off from outdoor feeding areas, silage clamps, yards and cattle tracks; prevent stock from entering streams and poaching stream banks and manage cattle movements to avoid poaching of fields; restore semi-natural buffer water courses from nutrient run-off. Physical barriers around arable fields, for example, permanent grassland margins, well-maintained hedgerows and boundary walls can reduce wind erosion of soil, a source of sedimentation. These measures support the Environment Agency's protection zones and can have a positive effect on ground and surface waters benefiting biodiversity.	**Regulating water quality** **Regulating water flow** **Regulating soil erosion** **Biodiversity** **Sense of place/ inspiration**

[19] www.naturalengland.org.uk/ourwork/farming/csf/default.aspx

[20] *River Basin Management Plan: Severn River Basin District, Annex A: Current state of waters*, Environment Agency (December 2009)

[21] *River Basin Management Plan: North West River Basin District, Annex A: Current state of waters*, Environment Agency (December 2009)

[22] *Catchment Priorities*, Defra (June 2007)

[23] *River Basin Management Plan: North West River Basin District*, Environment Agency

Service	Assets/attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Regulating water flow	Flood plains, rivers and watercourses Semi-natural vegetation Riparian woodland	Data from the Environment Agency's flood risk map[24] indicate that there is a high risk of fluvial flooding to a number of settlements, including, the historic bridging town of Shrewsbury, and properties around the north of Telford, Congleton and Northwich. Critical infrastructures including electrical sub-stations are also at risk, including a sewage treatment works near properties at Winsford and Middlewich. There is a greater risk of flooding associated with surface water, particularly in locations proximal to meres such as Ellesmere and Oswestry.	Local	Flooding in Shrewsbury is potentially exacerbated by the loss of flood plain in the area of the Severn–Vyrnwy confluence on the western boundary of the NCA. The flood plain of the River Weaver is relatively small, resulting in rural properties and agricultural land flooding quickly with little warning. In rural areas in the middle and north of the NCA, there are few properties at fluvial flood risk. However, the River Dane and Wheelock catchments are sensitive to land management change and poor maintenance of watercourses can increase the risk of localised flooding to agricultural land. River maintenance pilot initiatives are allowing farmers to maintain their own watercourses, without the need for prior consent, for example, the River Duckow, pilot area in Market Drayton. This can be a benefit to water management and a challenge to maintain the integrity of habitats both within the pilot area and downstream.	Identify and create natural areas for flood water storage to reduce the reliance upon hard engineering solutions to flooding in settlements. Reinstating flood plain grazing marsh and other wetland habitats within the flood plain, ensuring that the flood plain function is not reduced by inappropriate development. Remove constrictions to river flow, such as weirs, which will also benefit migratory fish. Create and manage riparian habitat, for example, wet woodland and reedbeds that can reduce the rate of run-off and filter water. In urban areas promote multiple use riparian open spaces, for example flood compatible playing fields and parks. Ensure that new developments take into account the principles of SUDS by including greenspaces and areas of unsealed surfaces. Work with farmers and Environment Agency to monitor the outcomes of the river maintenance pilot, assessing methods and feasibility of expanding to other areas without damaging habitats.	**Regulating water flow** **Regulating soil erosion** **Regulating soil quality** **Sense of place/ inspiration** **Biodiversity**

[24] http://watermaps.environment-agency.gov.uk/wiyby/wiyby.aspx?topic=floodmap#x=364799&y=349833&scale=8

Service	Assets/attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Regulating soil quality	Mineral soils derived from the Triassic sandstone Soils derived from glacial till Fen peat soils	Arable systems predominate on the freely draining soils on the lower, less steep slopes of the ridges and areas of Shropshire and Staffordshire. Over a prolonged period of cultivation, this can damage the soil structure. The slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils and the fen peat soils may suffer compaction and/or capping as they are easily damaged when wet.	Local	The soil structure of the freely draining sandy soils can be easily damaged where organic matter levels are low after continuous arable cultivation or where soils are compacted. This may be improved by careful addition of organic matter. Soils over the aquifer are valuable for aquifer recharge; this requires maintenance of good soil structure to aid water infiltration. Compaction and/or capping of slowly permeable soils may reduce water infiltration and increase diffuse pollution as a result of surface water run-off, increasing siltation in water courses and meres. Carefully increasing organic matter content of soils can help reduce these problems. Where peaty soils and wetland habitats predominate, retaining water levels will maintain the soil structure.	Encourage the adoption of techniques promoted through the CSF and other initiatives, to manage arable and livestock systems sustainably to protect the soil structure, for example adopting sustainable stocking levels and preventing poaching, and carefully managing vehicle movements in wet conditions to avoid soil compaction Continue to work in partnership to restore degraded areas of peat and manage wetland habitats to safeguard the carbon-rich soil and reintroduce peat forming vegetation.	**Regulating soil quality** **Food provision** **Water availability** **Climate regulation** **Regulating soil erosion** **Regulating water quality** **Regulating water flow** **Biodiversity** **Sense of place/ inspiration**

Service	Assets/attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Regulating soil erosion	Soils Semi-natural habitat Field boundary features	The West Midlands Meres' Priority Catchment, has identified that soil loss is causing sedimentation in a number of meres and watercourses across the NCA. The lighter freely draining soils have an enhanced risk of soil erosion on sloping land where cultivated or bare soil is exposed, exacerbated where organic matter levels are low after continuous arable cultivation or where soils are compacted. These soils are also at risk of wind erosion, particularly where left bare, as are the fen peat soils. They are also susceptible to rapid run-off during storm events.	Regional	Regulating soil erosion is an important service in this NCA as it supports food production, water quality and the integrity of the meres and mosses. Maintaining organic matter levels in cultivated soils will reduce their susceptibility to erosion. Permanent vegetation cover, for example, pasture alongside river valleys and watercourses, stabilises soils and traps sediment, helping to slow water flow. In arable fields, permanent grassland around field boundaries, well-maintained hedgerows and boundary walls can help to alleviate wind erosion of soil. Riparian woodland and lowland meadow along watercourses offer protection against run-off. Conversely, invasive non-native species, for example stands of Himalayan balsam, create denuded river banks in the winter months, which are markedly more prone to soil erosion. The restoration of hedgerows may constrain food productivity, but in the longer-term maintain the productivity of the land by protecting the soil resource and is likely to lead to an improvement to water quality and a reduction in soil loss.	Encourage the adoption of techniques promoted through CSF and other initiatives, to manage arable and livestock systems sustainably to protect the soil resource, for example by buffering watercourses and encouraging the uptake of agri-environment options to establish permanent grassland or conservation field margins and maintaining hedgerows and dry-stone walls on the ridges. Encourage the planting of trees and areas of transitional scrub on areas at risk of erosion, for example on slopes.	**Regulating soil erosion** **Regulating water quality** **Regulating soil quality** **Food provision** **Regulating water quality** **Biodiversity** **Sense of place/ inspiration.**

Service	Assets/attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Pollination	Upland heathland Lowland meadows Lowland grassland Traditional orchards Hedgerows	With arable crops limited to specific areas and few, scattered, traditional orchards, this service is of very localised importance to food production in the NCA. Areas of upland heath, lowland meadow, hedgerows and grassland habitats provide sources of nectar for pollinating insects, but collectively represent less than 0.2 per cent of the NCA. Late flowering nectar sources, such as heather, are important in providing supply of nectar over an extended period of time. Residential gardens provide important sources of nectar in settlements and often have more diverse sources of nectar than occurs in agricultural monocultures.	Local	Crops that are currently grown in the NCA do not rely on pollinators therefore their value is to biodiversity and the scattered orchards that remain. This could be a limiting factor to future changes in cropping regimes. An increase to the populations of pollinators may facilitate an increase to the number of orchards, fruit farms and types of crops that could be grown in the future thus expanding the range of food provision and increasing the resilience to the effects of climate change. Expanding areas of upland heath and meadow, planting a network of species-rich hedgerows, creating flower-rich field margins in agricultural areas and species rich roadside verges would all reduce habitat fragmentation thus providing a more robust ecological network for pollinators.	Seek opportunities to increase nectar provision within the agricultural landscape, using mechanisms such as agri-environment scheme options, to expand semi-natural habitat, particularly in proximity to orchards or pollinated crops. Expanded heathland in particular will provide late sources of nectar, benefitting a number of services and strengthen historic landscape character. This would also provide habitat and food source for potential pest regulators, for example, birds. Encourage local authorities, highways and road maintenance contractors to diversify the species mix of roadside verges.	**Pollination** **Food production** **Climate regulation** **Regulating soil erosion** **Regulating water quality** **Biodiversity** **Sense of place/ inspiration** **Pest regulation** **Sense of history**
Pest regulation	Semi-natural habitat Hedgerows Arable margins	The contribution to pest regulation services is limited to semi-natural habitat and hedgerows.	Local	Semi-natural habitats and hedges proximal to areas of commercial arable agriculture may support species of beneficial predators that can regulate populations of pests that adversely affect crop yields, hence food provision.	In agricultural areas, expand or create new areas of semi-natural habitat, for example beetle banks, headlands and hedgerows, to provide a mosaic of supporting habitat for beneficial pollinators in areas of arable monoculture, supporting a more robust ecosystem that will benefit food production and biodiversity.	**Pest regulation** **Pollination** **Biodiversity** **Food production** **Sense of place/ inspiration**

Service	Assets/attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Sense of place/ inspiration	Sandstone ridge Extensive lush pastures Meres and Mosses Rivers, streams and canals and field ponds Woodland and boundary features Historic features Lowland heathland Local vernacular building style Local landmark of Jodrell Bank Local greenspace	In the north, a sense of place is provided by an extensive, rolling lowland landscape of lush pastures dominated by dairy farming, interrupted by sandstone ridges with rivers and tributaries with wooded cloughs. Sense of place is further supported by the area's numerous estates, estate buildings and historic parklands and black and white moated houses. Feelings of inspiration and escapism are likely to be associated with the ridges that rise above the plain with long distance views of prominent hills outside the NCA, such as, the Wrekin and Wenlock Edge, the foothills of the Welsh mountains in the west and the Pennines and Peak District to the east. In the north, a sense of place is provided by an extensive, rolling lowland landscape of lush pastures dominated by dairy farming, interrupted by sandstone ridges with rivers and tributaries with wooded cloughs. . Numerous meres and extensive mosses, for example, Fenn's, Whixall, Bettisfield, Wem and Cadney mosses create distinctive wide-open landscapes. Communities value their local greenspace as places of local distinctiveness that provides opportunities to engage with nature close to where they live and work and encourages a sense of community.	Regional	The area comprises a number of contrasting landscapes owing their origin to the underlying geology. The most notable contrast is in topography between the wind-swept sandstone ridges which rise steeply up from the relatively flat rolling plain. The geology and pastoral character of the NCA should be maintained and enhanced through careful management. Woodland occurs on the slopes of the ridges and in valley cloughs. There are extensive blocks in the north and east of the NCA, for example, fragments of, the former Royal Forest of Mara. A sense of enclosure is evoked by lush, dense vegetation is further reinforced by country lanes between high hedges or valley bottoms below wooded ridge lines. The NCA has inspired many authors: the early 17th-century Izaak Walton's The Compleat Angler is an important work for both literary and environmental reasons. It is one of the earliest works to be inspired by country life and a love for the natural world and also an influential piece of pastoral writing. P.G. Wodehouse described Shropshire as "the nearest earthly place to paradise". Most famously, Lewis Carroll, was born and raised in Daresbury, Cheshire and included the Cheshire Cat in his novel Alice's Adventures in Wonderland – "grinning like a Cheshire cat". Folklore draws the conclusion that a Cheshire cat grins because of the abundance of milk and cream.	There are opportunities to increase interpretation and understanding of the historic assets, geology and landforms illustrating how geology influences settlement patterns, human activity and innovation and relate this to the landscape for visitors to the ridge and those walking the Sandstone Trail. Work with farmers to maintain food production while maintaining the pastoral character of the plain. Growing arable crops in appropriate areas, restoring hedgerows with typical species, by gapping-up and planting their accompanying hedgerow trees; adopting appropriate cutting regimes and tagging to extend the age range and species diversity. Maintaining dry-stone walls on the ridge in preference to using stock-proof fencing thus optimising their value to resource protection and sense of place and history. Through landscape partnerships, support projects that seek to reverse the fragmentation of upland heathland, lowland grassland and conserve and protect the Meres and Mosses for future generations and for the benefits to biodiversity and climate regulation. Encourage the inclusion of greenspace in new developments to provide opportunities for engaging with nature and fostering community spirit.	**Sense of place/ inspiration** **Sense of history** **Recreation** **Biodiversity** **Climate regulation**

Service	Assets/attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Sense of history	Iron-age hill forts Roman roads and settlements Country houses moated houses and castles Market towns Settlement patterns Historic parkland Traditional orchards Areas of ridge and furrow Local vernacular building style Railways and canals	The history of the landscape is evident in the iron-age hill forts, linked by sections of The Sandstone Trail, and Wat's Dyke – an Anglo Saxon boundary earthwork. The former hunting chases of the Forests of Macclesfield and Delamere are still evident in the landscape. Moated manor houses still exist, for example at Little Moreton Hall. Roman roads such as Watling Street linking London to mid-Wales, via Wroxeter are still evident today. Areas of ridge and furrow on the plain indicate former infield and outfield systems and often relate to historic field pattern which will in many cases, be of post medieval origin. The historic character is further reinforced by a settlement pattern of dispersed market towns and large farmsteads, typically of brick or sandstone spread throughout. Other settlements, small villages and hamlets are few and dispersed. The hamlets tend to be loosely clustered, with houses spread out along the network of hedged lanes, in the open countryside.	Regional	A number of historic sites in this NCA are popular visitor destinations: the extensive parklands and gardens including Tatton and Attingham that are owned and run by the National Trust; Country houses such as Gawsworth, Arley and Adlington Halls; fortified manor houses and castles reflecting cross border tensions such as at Beeston, Acton Burnell and Cholmondeley Castle. Crewe was founded on the growth of the railways, and the historic towns of Shrewsbury and city of Chester have a wealth of 17th- and 18th-century half-timber, brick and red sandstone buildings. The influence of the Romans can be seen through the notable roads built to cross the plain particularly Watling Street which linked London to mid-Wales. The Sandstone Trail, a long-distance footpath stretching for 55 km from Whitchurch in the south, across the Cheshire Sandstone Ridge NCA, offering elevated views across the plain, before ending in Frodsham in the Mersey Valley.	Restore historic assets above ground. Protect assets below ground, by ensuring appropriate land management regimes, for example, protecting under permanent pasture. Encourage collaboration between landscape partnerships and English Heritage to reinstate traditional land management of parklands and estate grounds, maintain vistas, manage woodland in keeping with their designed use ensuring a supply of dead wood and over-mature trees and reinstate native woodland on plantation ancient woodland sites. Manage the impacts of recreation, providing alternative paths, appropriate for a range of abilities, away from eroded sites and sensitive habitats. Manage appropriate, small-scale extraction of traditional building materials for the repair of vernacular buildings. Manage forestry to provide access and recreation while maintaining the historic characteristics of the woodland and areas of tranquillity. Opportunities exist to improve the interpretation of the area's former and present day extractive sites, allowing visitors to understand and value these features.	**Sense of history** **Sense of place/ inspiration** **Recreation** **Tranquillity** **Sense of history** **Geodiversity**

Service	Assets/attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Tranquillity	Distinctive wetland landscape of meres and mosses River valleys Woodland	Statistics from CPRE show that the NCA has experienced a significant decline in tranquillity. Undisturbed areas have decreased from 69 per cent in the 1960s to 44 per cent in 2007 with loss of tranquillity associated with increased traffic levels on the major roads of the NCA, including the M6, M54 and extensive network of A roads. Nevertheless, the NCA offers the experience of wide-open spaces and enclosed woodland to visitors from the nearby conurbations.	Regional	Despite the reduction to 'undisturbed' areas, the NCA is important in providing to the populations of the nearby conurbations the opportunity to experience the contrast between wind-swept landscape on the ridge tops to an enclosed feel in some of the valleys and sunken lanes and the wide, lush pastoral plain. Extensive mosses, for example, Fenn's, Whixall, Bettisfield, Wem and Cadney mosses offer wide-open wind-swept landscapes.	Retain areas of open landscape, resisting urban development in to undisturbed areas. Promote the calming effect that contact with tranquil and sensory environments have on people's health and wellbeing by protecting areas of the NCA where intrusion is low; sensitively plan any expansion to settlements and transport routes, taking into account visual impact, noise and light pollution, and using multifunctional green infrastructure to mitigate impacts while contributing positively to sustainable urban drainage systems, habitat networks and local landscape character. Encourage the provision of improved access to woodland as part of woodland management to increase the opportunities to experience tranquillity. Carefully assess plans to introduce urban features into urban fringe and rural villages and hamlets for example, unnecessary lighting, road improvements and signage thus protecting where possible, the tranquil character and dark night skies.	**Tranquillity** **Sense of place/ inspiration** **Sense of history** **Biodiversity** **Recreation**

Service	Assets/attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Recreation	Public rights of way and heritage trails Iron-age hill forts connected by the Sandstone Trail National Cycle Network National Nature Reserves Country parks Local Nature Reserves Historic parks and gardens Canals Jodrell Bank	The NCA contains a wealth of recreational assets. There is an extensive network of rights of way including the Sandstone Trail and short sections of Wat's Dyke Heritage Trail that have an iron-age origin. There 35 Registered Parks and Gardens, some owned and run by the National Trust. There are six National Nature Reserves; all but one, Mottey Meadows are related to the Meres and Mosses Ramsar and SAC sites. Additional sites include, Seven Country Parks and fourteen Local Nature Reserves. There is public access along the Shropshire Union, Llangollen and Trent and Mersey canals as well as access to some of the large meres such as Ellesmere and Cole mere and mosses throughout the NCA. Jodrell Bank, the location of the Lovell radio telescope, dominates the open landscape near Goostrey in Cheshire. It is also the location of an arboretum and popular visitor centre.	Regional	The NCA offers a host of recreational sites and trails that are close to large conurbations. National Nature Reserves, Country Parks, Local Nature Reserves and visitor centres provide opportunities for visitors to experience the history and biodiversity that the NCA has to offer. This is both an opportunity – to educate and increase physical activity – and a challenge to manage visitor numbers and the impact they have on the environment, local infrastructure and tranquility. Jodrell Bank offers a different and relatively rare visitor experience of the study of astronomy and astrophysics. The 76-metre diameter radio telescope is located on the plain and is a local feature that can be seen from a considerable distance. There are opportunities to provide opportunities for recreation and outdoor education close to where people live allowing local communities to enjoy their environment, take action to improve it and to benefit from the health and social rewards it affords them.	Seek to manage the impact of increased visitor numbers on sites by ensuring that paths are adequately signposted and surfaced to prevent erosion and protect sensitive habitats. Manage sustainably, the demand for water and energy resources and provide recycling facilities at visitor centres, to minimise the impact on the environment and to raise awareness. Support initiatives by the Forestry Commission to increase the recreational resource at Delamere. Increase the number of circular, well-surfaced, routes suitable for all age ranges and physical abilities. Promote the use of the existing network of rights of way within the NCA and its links with the National Cycle Network and Sandstone Trail. Support farms to diversify into sustainable short and long stay accommodation especially adjacent to public rights of way. The maturing woodland resource of The Mersey Forest provides significant opportunities for access and recreation.	**Recreation** **Sense of history** **Sense of place/ inspiration** **Geodiversity**

Service	Assets/attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Biodiversity	Designated sites: SAC, Ramsar, SSSI, local sites Priority habitats and species: Meres and Mosses Wetland habitat Rivers Upland heathland Lowland meadow Flood plain grazing marsh Lowland grassland Woodland Ponds Country parks, Local Nature Reserves and local greenspace Hedgerows	There are 83 SSSI either wholly or partly within the NCA, totalling one per-cent of the NCA area. Numerous lakes ('meres') throughout the NCA and Europe's greatest concentration of ponds. Three per cent of the NCA area is priority habitat, including significant areas of wet woodland, flood plain grazing marsh and fens. Extensive flood plain grazing marsh habitats support regionally important populations of breeding waders, for example, lapwing, snipe and curlew in areas such as Baggy Moor, Weald Moor and Doxey Marshes. Other priority habitats include raised bog, lowland grassland, and lowland mixed beech and yew woodland. There are eight internationally designated sites in the NCA - five SAC and three Ramsar sites totalling approximately 0.4 per cent of the NCA area. The meres and mosses form the largest and most ecologically diverse cluster of natural wetlands in lowland England comprising a geographically discrete series of nationally important lowland open water and peatland sites designated as SSSI and SAC. The finest examples are considered to be of international importance (Ramsar). These include one of the largest and most southerly raised bogs in the UK – Fenn's, Whixall, Bettisfield, Wem & Cadney Mosses, which supports over 1,700 invertebrate species[25] and 29 nationally rare species, for example, Desmoulin's whorl snail. **Continued over...**	International	Persistent degradation of water quality, increased drainage and inappropriate management has degraded a number of meres and mosses. Alternative land uses have isolated core sites and mature trees shade-out marginal vegetation. 81 per cent of recorded rare plants have become extinct across 13 key sites and public awareness and understanding of their value is low. The NCA has ten main rivers that support riparian and wetland habitats that have specific water chemistry that requires careful management and protection from diffuse pollution and falling water levels. The River Dee SAC is designated for its vegetation communities and populations of Atlantic salmon, lamprey species, bullhead and otter. Ancient woodland and broadleaved mixed woodland requires management to maintain their structural integrity and species diversity. Priority upland heathland and lowland meadows require management to maintain their condition and require protection from further fragmentation. Landscape-scale partnerships are beginning to target and co-ordinate action for the preservation of priority habitats and protection of priority species of the meres and mosses. Partnership working at a landscape scale can begin to find sustainable solutions to the management of the NCA's biodiversity.	Restore and manage core nature conservation sites. For example, SAC, Ramsar, SSSI, NNRs, LNRs and Local Sites network to improve their condition and connectivity; enhance landscape character and create a more coherent and more resilient habitat network, while providing opportunities for volunteering, education and community involvement. With landscape-scale partnerships, restore and manage core nature conservation sites by working in collaboration to improve the quality of water, by finding solutions to reduce the rate of sedimentation that also protects the soil resource. Seek ways to reduce the levels of nutrients and pesticides entering watercourses and groundwater. With landscape scale partnerships, promote opportunities for landowners and local communities to develop management plans and implement these with the help of volunteers. This will also raise awareness to the importance of these sites. **Continued over...**	**Biodiversity** **Sense of place/ inspiration** **Sense of history** **Regulating soil erosion** **Regulating water flow** **Regulating water quality** **Regulating soil quality** **Geodiversity**

[25] www.jncc.gov.uk/protectedsites/sacselection/sac.asp?EUCode=UK0012912

Service	Assets/attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Biodiversity continued		**...continued from previous.** The finest sites have developed a mature schwingmoor comprising floating bog mosses Sphagnum spp often with common cotton grass and cranberry. Open water provides habitats for locally and nationally rare species of aquatic plants, for example, planktonic algae, stands of shoreweed, narrow small-reed and Cole Mere is the only English site for least water lily. Some meres support a diverse fish population, in particular pike and bream, and large numbers of wintering and breeding wildfowl for example, Aqualate Mere hosts up to 3,000 overwintering ducks, including mallard, teal, wigeon, pochard, tufted duck, goldeneye, gadwall and wintering shoveler. The mosaic of open water and peatland habitats together with fringing heathland and woodland host an outstanding diversity of invertebrates including damselflies and dragonflies, for example, the nationally rare white-faced dragonfly and a diversity of beetles and spiders including a number of nationally rare species. Drier areas which typically support heathland relics, areas of purple moor-grass and open semi-natural woodland are important for Lepidoptera, for example the argent and sable moth and small pearl-bordered fritillary. Lowland heathland at Prees Heath SSSI hosts the nationally scarce silver-studded blue butterfly.			**...continued from previous.** Encourage the retention of in-field ponds and where practicable, create more to improve the permeability of the landscape for aquatic species. Encourage the uptake of techniques promoted through CSF and other initiatives, to maintain the natural soil profile and protect the local hydrology. Address issues of water abstraction and diffuse pollution to benefit biodiversity and water quality, especially where there are sensitive habitats. Use country parks, Local Nature Reserves and local green spaces for opportunities for volunteering and training to increase the surveillance of key habitats and species by surveying to monitor the distribution and population sizes of species as an indicator of habitat quality. Encourage local communities to take part in site based conservation activities and in the future be involved in the planning and management of these sites. Encourage the inclusion of greenspace in new developments to provide opportunities for local communities to engage with nature and foster community spirit, while benefiting biodiversity.	

Service	Assets/attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Geodiversity	Designated sites: SSSI and local geological sites Natural rock outcrops Glacial and present-day geomorphological processes Geological exposures created by road, rail and canal cuttings Traditional local building stone Minerals and extractive industries	There are a significant number of geological SSSI (15) and 97 Local Geological Sites. The Triassic outcrops of the ridges and hills provide a rare glimpse of exposed solid rock, enabling the depositional environment to be interpreted, thus contributing to the understanding of climate during the Triassic Period. The interpretation of glacial deposits has contributed to our understanding of climate circa 20,000 years ago and present-day landscapes, for example, the formation of peat mosses provides a well-documented pollen record and opportunities for radiocarbon dating. One of the best examples of an esker system in England occurs at Aqualate Mere, which provides a rare example in the Midlands of an esker system formed by glacial meltwaters during the late Devensian glaciation. The site is also significant in demonstrating the close association of the esker with fan deposits formed in a proglacial lake, a nationally rare group of landforms. The present day complex geomorphology of the rivers Dane, Dee, and Severn are also contributing to our understanding of modern fluvial processes – erosion and deposition. Road, rail and canal cuttings also provide valuable exposures, for example, Tyrley Canal Cutting SSSI. **Continued over...**	National	The NCA contains nationally important geological SSSI, both natural outcrops and man-made cuttings that require the regular removal of scrub and woodland management to maintain the access, visibility and integrity of the sites. Improved and increased interpretation can raise awareness and promote a better understanding of the riverine environments and geomorphology. For example, The River Dane SSSI is designated for its meander belt. The river is known to have reverted to former routes over a 70-year cycle. The course of the River Severn was modified by the last ice sheet, diverting its courses from the developing Dee Estuary to its present course draining to the Bristol Channel. A better understanding of natural processes can assist with land use planning. The NCA has a long history of extractive industries and exemplifies the link between geology, the development of industries and biodiversity. For example, the extraction of salt can be traced back to the Roman period. Continued extraction by underground solution pumping has led to subsidence flashes that now support valuable habitats. Some are saline supporting coastal communities. The legacy of surface extraction of silica sand has left a mosaic of wetland habitats and areas for recreation. Active sandstone quarries, for example, Grinshill have yielded fossil reptiles from the Lower Triassic Period, contributing to our knowledge of Triassic environments.	Work in partnerships to enhance the condition of designated sites and manage former extraction sites and natural exposures, for the range of mutually beneficial interests including geodiversity, biodiversity, volunteering and educational purposes. Work in partnership to further the objectives and aspirations of the Local Geodiversity Action Plan that offer opportunities for volunteering and community engagement. Improve access and interpretation of past geomorphic activity at Local Sites and present-day geomorphic activity associated with the rivers Dane and Severn. Promote sensitive planning and design of quarries to replicate some of the features lost to the development and reinforce the character of the surrounding landscape. Such sites may provide new opportunities for public access and enjoyment.	**Geodiversity** **Biodiversity** **Regulating soil quality** **Recreation** **Sense of history** **Sense of place/ inspiration**

Service	Assets/attributes: main contributors to service	State	Main beneficiary	Analysis	Opportunities	Principal services offered by opportunities
Geodiversity continued		**...continued from previous** Silica sand is extracted from the nationally important reserves in the areas around Congleton, Chelford and Eaton Hall in Macclesfield. Nationally important halite (salt) deposits occur around the areas of Middlewich, Winsford, Northwich and Sandbach. Active extraction of salt has led to a series of subsidence flashes and salt karst features are also visible – depressions associated with dissolution and collapse of underlying salt. The flow of low temperature brines through the sandstone has precipitated minerals such as copper, lead, cobalt and vanadium, for example, at Alderley Edge SSSI. Greywacke stone is extracted from the Precambrian hills around Shrewsbury for use as a road stone. Sand and gravel is extracted throughout the NCA. Brick clay extracted from the glacial till has also been exploited since Roman times and red Triassic sandstones have been used widely as a building stone, for example, Chester Cathedral, built in 1093 from red sandstone, which was also used by the Romans to face the city wall.				

Photo credits

Front cover: The National Character Area comprises most of the county of Cheshire, the northern half of Shropshire and a large part of north-west Staffordshire. This is an expanse of flat or gently undulating lush pastoral farmland punctuated by numerous meres and ponds. © B. Osborne with kind permission of Shropshire Wildlife Trust

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NATURAL ENGLAND

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APPENDIX C:

Planning for Landscape Change: Supplementary Planning Guidance to the Staffordshire and Stoke on Trent Structure Plan 1996-2011 Volume 3: Landscape Descriptions: Ancient Clay Farmlands

Ancient clay farmlands

In Staffordshire this type is geographically well defined and restricted to the western side of the county. It is characterised by the irregular pattern of hedged fields with ancient hedgerows and oaks, by subtle evidence of former heathland, and by a dispersed settlement pattern with small rural towns. The major land use has been dairying, dictated by the stagnogley soils derived from boulder clay which covers Triassic mudstones, to create a rolling lowland plain; however, pockets of sandy soil have supported arable production, and this has spread to the heavier soils in recent years. There are estateland and parkland variants, but the major visual distinction between landscapes, from relatively well wooded to very open, appears only on further subdivision on the basis of landscape quality.

Visual character

This is a landscape of mixed arable and pastoral farmland, the character of which is strongly influenced by existing land use and farming practices.

In the areas of pastoral farming an intact irregular ancient pattern of hedgerows and hedgerow trees is still retained. In places this pattern is beginning to break down, with hedgerows either being allowed to grow up and become ragged, or being mechanically trimmed and becoming gappy as a result. The mature hedgerow oaks are characteristic of this countryside and still numerous enough to coalesce visually and filter views across the landscape. These trees are now predominantly mature or becoming over-mature and stag headed. In more intensively farmed, predominantly arable areas, rationalisation has resulted in considerable removal of hedgerows and inappropriate maintenance of those remaining. The accompanying decline of hedgerow tree cover has led to a generally open character where landform has become dominant over vegetation cover and trees are now often viewed as individual elements.

Throughout this landscape type, the varying tree and hedgerow density and landform give changing scales from medium to large. The gently rolling landform, with occasional high points, allows long distance views through the landscape to show up the landcover elements. Local small-scale ancient woodlands and plantations provide areas of denser visual containment. Especially important in this landscape are the many marl pits, meres and mosses, now surrounded by mature trees, and the series of small brooks. These, and canals running through the area, are picked out by lines of willow, poplar and alder, providing some structure in the more open arable areas.

Areas associated with villages are generally less intensively farmed and the scale is reduced by broadleaved linear woodlands. These divide the landscape into small discrete units and give a well-balanced interlock between the farmland and woodland elements. In these areas of smaller scale the field pattern is predominantly irregular, with dense mixed hedges and hedge banks. On areas of old common the hedgerows form a more regular pattern in the landscape.

This landscape has a very rural feel, with the small winding country lanes, large red brick farms and numerous old villages. Localised industrial and commuter development does not impact to any great extent on this general character, although a general decline, both of village character and landcover elements, could result in long-term irreversible erosion of the landscape character. Major road corridors have a significant localised effect and result in some areas being particularly well viewed.

Characteristic landscape features

Mature hedgerow oaks and strong hedgerow patterns; narrow winding lanes, often sunken; small broadleaved and conifer woodlands; well treed stream and canal corridors; hedgerow damsons; occasional native black poplars; numerous farmsteads, cottages, villages and hamlets of traditional red brick; a gently rolling landform with stronger slopes in places; dispersed settlement pattern; halls and manors; marl pits and field ponds; meres and mosses.

Incongruous landscape features

Busy main roads and motorway; powerlines; stag headed over-mature oaks; some conifer and poplar plantations; horseyculture; large modern farm buildings; industrial developments; electrified railway line; urban edge; improved and new commuter dwellings; introduction of wire fencing for stock control associated with deteriorating field pattern.

Factors critical to landscape character and quality

The critical factors which currently limit landscape quality are the loss of characteristic landscape features (especially hedgerows and hedgerow trees), the poor condition of those features that remain, and the relatively poor survival of characteristic semi-natural vegetation (i.e. ancient woodland and hedgerows, semi-natural grasslands and riparian and wetland vegetation). A significant part of the area falling within this landscape character type has been identified as a 'landscape at risk' of sudden loss of quality (see Section 7.18 *et seq*. of the Supporting Documentation) and measures to meet the BAP targets listed below will be critically important in preventing such a loss.

This landscape character type is locally very sensitive to the impacts of development and land use change.

Potential value of new woodland planting

High to very high, to maintain a structure to the landscape to offset the decline in hedgerow pattern as a result of farm intensification. The southern part of the area represented by this landscape type could benefit from the planting of large woodlands, and from the establishment of new native woodlands, strategically sited

to counter ancient woodland fragmentation. The maintenance, restoration and planting of wet woodland would be of value throughout this landscape.

Potential value of other habitat provision and management

The following Staffordshire Biodiversity Action Plan Targets are relevant at landscape scale:

Habitat type	Objective or target	Priority
Ancient/semi-natural broadleaved woodland	maintain and enhance	high
	restore degraded sites	medium
	re-create/regenerate	high
Ancient/diverse hedgerows	maintain and manage	very high
	maintain trees	very high
Hedgerows	plant species-rich hedges	lower
Arable field margins	maintain, improve and restore	medium
Canals, lakes and ponds	maintain and enhance water bodies and catchments	high
	increase the number of such features	high
Lowland calcareous grassland	safeguard remaining areas and adjoining land	high
	restore semi-improved grasslands	lower
	link fragmented sites through habitat creation	lower
Lowland wet grassland	maintain and enhance existing areas	high
	restore degraded areas	high
	create new areas	high
Lowland wood pasture and parkland	maintain and safeguard	medium
	restore degraded sites	medium
Peat bogs	maintain and enhance	very high
Reedbeds	maintain and create	high
Rivers and streams	maintain and improve the quality and quantity of water	very high
	maintain the quality of all natural existing channel features	very high
Unimproved neutral grassland	maintain and safeguard existing areas	high
	restore	high
	link adjacent sites through habitat creation	high
	create/re-create new areas	high
Wet woodland	maintain, enhance and restore	medium
	prevent further loss	medium
	increase the number of such woodlands	medium

Further details of these habitat targets can be found in the Staffordshire Biodiversity Action Plan. English Nature's Strategy for the Conservation of the Meres and Mosses of Cheshire, Shropshire and Staffordshire is also an important reference document for this landscape.

Specific guidelines

Tree and woodland planting

Increase planting of hedgerow trees and field corners to rebuild the structure of the landscape where decline is occurring.

Plant new woodlands to adhere to existing field pattern and to reflect the scale of the landscape. In the more open areas there is therefore the opportunity for large scale planting appropriate to those landscapes, provided that coalescence and views through them are considered. Consider the planting of new native woodland between ancient woodlands, to reduce fragmentation.

Respect the existing broadleaved character of the landscape in any new planting proposals, although some conifer content would be acceptable provided it was carefully integrated into the woodland design. Care is needed over the treatment of woodland edges to reflect the hedgerow character in colour and texture. Stream corridors could be reinforced with additional linear planting of waterside species.

Retain the visual interest of views from roadsides by avoiding extensive planting up to roadsides along considerable distances. In areas of stronger landform, internal design of woodlands will become important.

APPENDIX D:

Visual Impact Assessment Summary Table

VISUAL IMPACT ASSESSMENT TABLE

1. Levedale Road	**295m**	**Moderate (Road) Glimpsed**	**Slight**	**Moderate/ Minor Not Significant**	**Negligible**	**Minor Not Significant**
2. Levedale Road	**290m**	**Moderate (Road) Glimpsed**	**Slight**	**Moderate/ Minor Not Significant**	**Negligible**	**Minor Not Significant**
No 1 Holding Levedale		**High (Residential) Glimpsed**	**Slight**	**Moderate Not Significant**	**Negligible**	**Moderate/ Minor Not Significant**
3. Levedale Road	**280m**	**Moderate (Road) Glimpsed**	**Slight**	**Moderate/ Minor Not Significant**	**Negligible**	**Minor Not Significant**
Oak Barns		**High (Residential) Glimpsed**	**Slight**	**Moderate Not Significant**	**Negligible**	**Moderate/ Minor Not Significant**
4. Levedale Road	**340m**	**Moderate (Road) Glimpsed**	**Slight**	**Moderate/ Minor Not Significant**	**Negligible**	**Minor Not Significant**
Poppywell Farm		**High (Residential) Glimpsed**	**Slight**	**Moderate Not Significant**	**Negligible**	**Moderate/ Minor Not Significant**
5. Public Right of Way (ref no 13	**2km**	**High (Recreational) Obscured**	**Negligible**	**Moderate/ Minor Not Significant**	**Negligible**	**Moderate Minor Not Significant**
6. Byway Open to All Traffic Ref no 0.1045	**2.2km**	**High (Recreational) Obscured**	**Negligible**	**Moderate/ Minor Not Significant**	**Negligible**	**Moderate Minor Not Significant**
7. Whitson Road	**1.6km**	**Moderate (Road) Obscured**	**Negligible**	**Moderate/ Minor Not Significant**	**Negligible**	**Moderate Minor Not Significant**

8. Public Right of Way (ref no 41	**800m**	**High (Recreational) Obscured**	**Negligible**	**Moderate/ Minor Not Significant**	**Negligible**	**Moderate Minor Not Significant**

APPENDIX E:

Landscape Supporting Graphics

LIDAR derived ZTV analysis
Statement of Method

Faulhaber Design Ltd.
3 Fore Street, Silverton, Exeter, Devon, EX5 4HP

Introduction

A Zone of Theoretical Visibility study (ZTV) is used for assessment of the potential visual impact of a proposed development across a large study area. Reference points representing proposed development are tested across a model of the surrounding terrain and surface objects to determine where the proposal will be visible.

The availability of detailed LIDAR data and ever-increasing computer processing power make ZTVs a far more accurate and reliable tool than they have been in the past, but they remain a theoretical exercise which is dependent on the placement of reference points and the accuracy of the surface model.

While LIDAR derived ZTV analysis can depict the predicted extent of potential visibility to a very high degree of accuracy, and careful use of multiple sets of reference points could even show, for example, how many stories of a tall building might be visible at any point, a ZTV analysis on its own cannot provide a proper assessment of visual impact. Their main use is as a guide and aid to further investigation through additional analysis, site visits, landscape assessments, receptor appraisals, and Accurate Visual Representations (AVRs).

Project Specific Details

Project name	Levedale Road, Penkridge, BESS		
Date issued	22nd April 2024		
Prepared by	Sam Henderson sam@faulhaber.co.uk		
Site centre location	390075 (Easting) :: 315823 (Northing)		
Map base size & scale	Width 10500m (4200px), Height 7425m (2970px), 1:25k, 2.5m grid		
Output scale and resolution	42cm x 29.7cm = 1:25000 @ 2.5m per pixel (to print at 100 px/cm)		
LIDAR capture season	2020		
Buffer min height threshold	0.5m		
Permanent buffer shading	Red		
Vegetation buffer shading	Green		
Radius of ZTV analysis	7km (5km for 'proposed' ztv layer)		
Unobstructed views shading	Purple		
Potential filtered views shading	Green		
Observer / Viewer height	1.6m		
Reference Points:			
Number	64	Description	Placed on proposed buildings and structures, at maximum proposed height above existing ground level, according to drawings provided by others (see notes)

LIDAR data – the Environment Agency National LIDAR Programme

LIDAR (Light Detection and Ranging) is an airborne remote sensing technique which uses a laser, scanner and GPS receiver to generate precise, three-dimensional information of the terrain and surface objects.

The Environment Agency (EA) has been capturing aerial LIDAR data since 1998. In 2016 the National LIDAR Programme was announced to capture high resolution data covering all of England. As of October 2022, there is now very close to complete coverage.

The data is captured between October and April each year, to ensure as much detail as possible is captured from ground and surface objects beneath deciduous tree cover, while still enabling measurement of the canopy from laser returns which bounce and split off higher branches (a laser that splits rather than simply bouncing generates "multiple returns" rather than an "only return", with the "first return" indicating the highest obstacle struck, and the "last return" the lowest obstacle).

Bespoke algorithms are used by the EA to classify every point that is returned to the sensor as either ground or a surface object, including a distinction between vegetation and other surface objects (eg buildings).

The classified "point cloud" generated from the laser returns is then processed into various different kinds of "raster" product known as a Digital Elevation Model (DEM). DEMs are provided on a 1m grid, based on the Ordnance Survey National Grid, at an absolute vertical error of +-15cm (with a random error of no more than +-5cm) and an absolute horizontal error of +-40 cm. Three different DEMs are used in the terrain, buffer and ZTV analyses.

The **Digital Surface Model (DSM)** is generated from the last (or only) return, ensuring only the most solid surface objects are included, such as buldings, vehicles and non-permeable vegetation (dense evergreen or thicket, stumps etc). The resulting grid represents all solid and non-permeable surface objects.

The **Digital Terrain Model (DTM)** is initially generated from the last (or only) return where points have been automatically classified as ground. This terrain model is then "ground checked" to ensure that large flat roofs and other similar surface features have not been mistakenly classified as ground, and that steep embankments and other similar terrain features have not been mistakenly classified as surface objects.

The **First Return Digital Surface Model (FZDSM)** is generated from the first (or only) LIDAR pulse, which ensures it includes a close estimation of the full extent of all vegetation and tree canopies, and the fullest extent of more solid surface objects such as buildings. The resulting grid represents all surface objects, including semi-permeable deciduous vegetation.

Software

Mapping software	*QGIS 3.20 inc. plugins* – used to produce mapping layers and ZTV analysis
CAD sofware	*Vectorworks 2022* – used to align plans & models and to position reference points
Graphics software	*Photoshop 2022* – used to compile layers into final mapping outputs

Methodology

The DTM, DSM and FZDSM data layers are complied in mapping software and recalculated so that they match the extent and resolution of the base-mapping to be used in the final outputs – for example, this is usually a 1:25,000 OS Explorer map base, which works on a 2.5m grid.

If there are significant existing surface objects on the site which might affect the analysis, but which are to be cleared under the proposals being tested, these are removed from the DSM and FZDSM.

The DTM layer is block shaded in 5m intervals to create elevation shading layers, and an algorithm is applied to create “relief” effect layers, for use in terrain analysis plans.

The same algorithm is also applied to the FZDSM to create relief layers for use in buffer analysis plans.

The differences between LIDAR data layers are calculated to create a series of DEMs representing the relative heights of all surface objects within the study area (the “All Buffers” DEM, the “Permanent Buffers” DEM and the “Vegetation Buffers” DEM). These are filtered to eliminate features below a minimum threshold and the “Permanent Buffers” and “Vegetation Buffers” layers are used in buffer analysis plans, shaded to represent increasing relative height.

Reference points are positioned in CAD software, using scaled plans and/or 3D models, in a method appropriate to the proposals being analysed. For large buildings they might be placed on the outside edges and highest points, for more extensive proposals such as large housing schemes and solar arrays, one reference point might be placed on the highest point of each house or each panel. Where design proposals are at an early stage, reference points might be placed on a grid, or randomly, within proposed development areas, or according to height parameter plans. All reference points are allocated either an absolute height AOD or a relative height above existing ground level.

The reference points are imported into mapping software and tested against both the DSM and the FZDSM using a visibility analysis algorithm. In essence, this algorithm draws a line from each reference point, at its specified height above the DEM being tested, to a point at a specified height above every grid square in the DEM (usually set at 1.6m to represent an eye-level viewer). Each grid square reports as visible if the path between points is clear, or invisible if the path between points is blocked by intervening features on the DEM. The analysis is repeated for each reference point, and the separate outputs are then combined into a single output that reports how many of the reference points are reported as visible from each grid square.

The nature of the algorithm means that visibility is tested from a set height above every element of the DEM being analysed, which means that potential visibility is reported where a viewer standing on top of a building or tree canopy would be able to see a reference point. The All Buffers DEM and Permanent Buffers DEM are used to filter out all reported visibility from areas that are covered by existing surface objects.

Block shading is applied to all remaining areas where ***at least one reference point*** is reported as visible, to produce two layers showing visibility across the DSM and visibility across the FZDSM, for use in the ZTV analysis plans.

Where reference points have been placed appropriately (with some kind of demonstrably “fair” distribution, for example on a grid throughout a development area), the layer showing visibility across the FZDSM is shaded according to what percentage of the total number of reference points are visible at any one point, for use in additional ZTV analysis plans.

Outputs

While various output layers from the mapping software can be combined with base mapping in various different ways to illustrate and visualise the interaction of proposals with the surrounding terrain and surface features, certain output plans are produced as standard.

The **terrain analysis** combines black and white base mapping with elevation shading in 5m intervals and the DTM relief effect layer to illustrate the topography in the study area.

The **buffer analysis** combines black and white base mapping with the shaded Permanent Buffers and Vegetation Buffers layers and the FZDSM relief effect layer to illustrate the extent of all surface buffers in the study area. Shading of buffers increases in darkness and intensity with increased height above ground (or surface) level. This can also be combined with the elevation shading layer, to allow further interpretation of the significance of different surface buffers.

The **ZTV analysis** combines areas of predicted visibility over the two different surface models. Areas of predicted visibility over the FZDSM (which includes all vegetation) are block shaded and described as “unobstructed views” where ***at least one of the reference points may be visible without any intervening obstructions***. Any additional areas of predicted visibility across the DSM (which only includes dense and evergreen vegetation) are block shaded in a different colour and described as “potential filtered views” (of at least one reference point). As the visual impact of potential filtered views will decrease with distance from the site, these areas are faded beyond 2km from the centre of the site. The centre of the site is marked with a single site marker, which does not relate directly to the placements of individual reference points, which are shown on separate drawings. Radius lines are shown from the site marker. The analysis is produced over both black and white base mapping (which is better for precisely identifying shaded areas of predicted visibility) and colour base mapping (which is better for identifying features of the base mapping that interact with areas of predicted visibility).

If appropriate (see methodology and interpretation notes) a separate **ZTV % visibility analysis** is produced. This shows all potential unobstructed views (areas of predicted visibility across the FZDSM) shaded according to what percentage of the reference point are predicted as visible. This is produced over a black and white base map to improve legibility, sometimes combined with the surface relief effect to illustrate the interaction of predicted visibility with intervening terrain and surface buffers.

General notes on interpretation

Based on the methodology set out above, there are certain aspects of exactly what it is that the analysis represents, which are worth bearing in mind when interpreting the outputs.

The **relief shading effects** that are used in some of the outputs are created by shading all slopes in a DEM according to their aspect (which way they face) and their steepness. They are used to give a 3D effect, so that terrain and surface objects can be directly visually interpreted, without referring to contour lines, map bases, or other layers. They do not provide a representation of light cast across the DEM.

The **buffer shading** in the analysis layers used in plans roughly increases in darkness and intensity with height, but interacts with other layers when generating outputs and is only intended to be used to give an overall impression.

The **ZTV analysis shading** uses a single block colour to represent all areas where at least one reference point might be visible, but makes no distinction between a theoretical glimpsed view of the top corner of a proposal and a broad view of its full height.

The **tree canopies** that are included in the FZDSM are probably the most imprecise element of the LIDAR data, due to their nature, and the most prone to change. Transitions between areas of unobstructed views and areas of potential filtered views should be treated as hazy and changeable, not stark and defined as they are shown on the outputs. It seems safe to assume however (from the nature of the data collection) that barring all other changes they are if anything slightly underestimated.

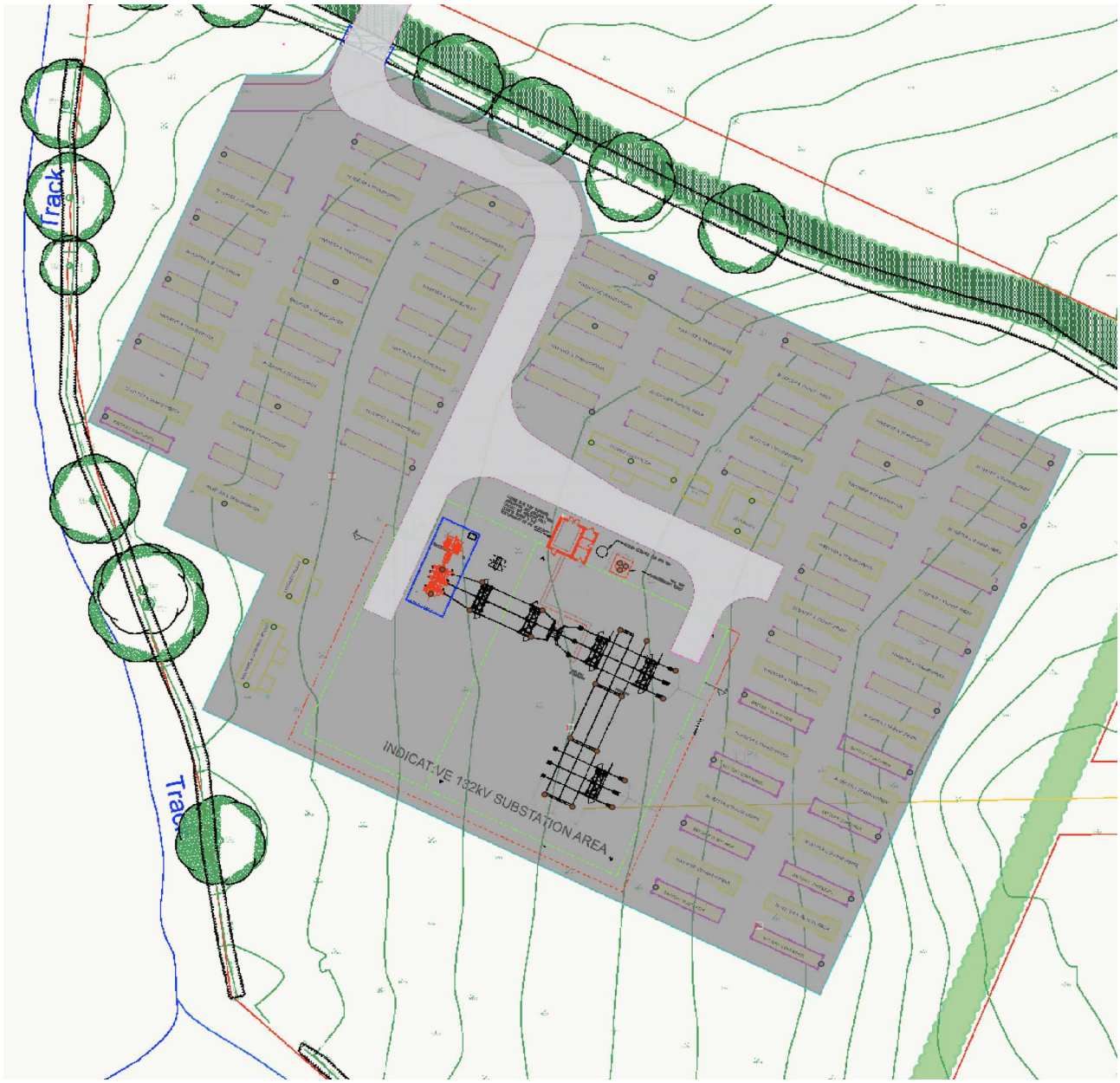
Additional interpretation and site visits are needed to analyse areas of **potential filtered views**. The deciduous vegetation buffers (present in the FZDSM but not the DSM) used to identify these areas could be anything from a street tree or scraggly hedge to a large copse or block of woodland. There is no way of indicating the depth of the intervening screening between viewer and reference point, or of determining the density of that screening, let alone seasonal changes.

Care should be taken with outputs generated using **multiple sets of reference points** to represent increasing height of development, cumulative development, etc. to be sure it is clear what is shown.

The **% visibility shading** represents another layer of precision in how the reference points and surface models interact. It doesn't take account of any visual buffering that would be provided by the proposed development itself. It can also be hard to find a 'fair' way to distribute reference points to produce a meaningful depiction of the extent to which a proposal might be visible, rather than simply whether some part of that proposal might be visible or not.

Project specific notes

reference points:



Battery containers: 34 reference points @ 3m above existing ground

Buildings: 9 reference points @ 5m above existing ground

Comms tower: 3 reference points @ 15m above existing ground

Substation: 18 reference points at varying heights (5.2m – 7.2m) above existing ground as shown in elevation drawings

Comms tower results have been removed from most recent outputs.

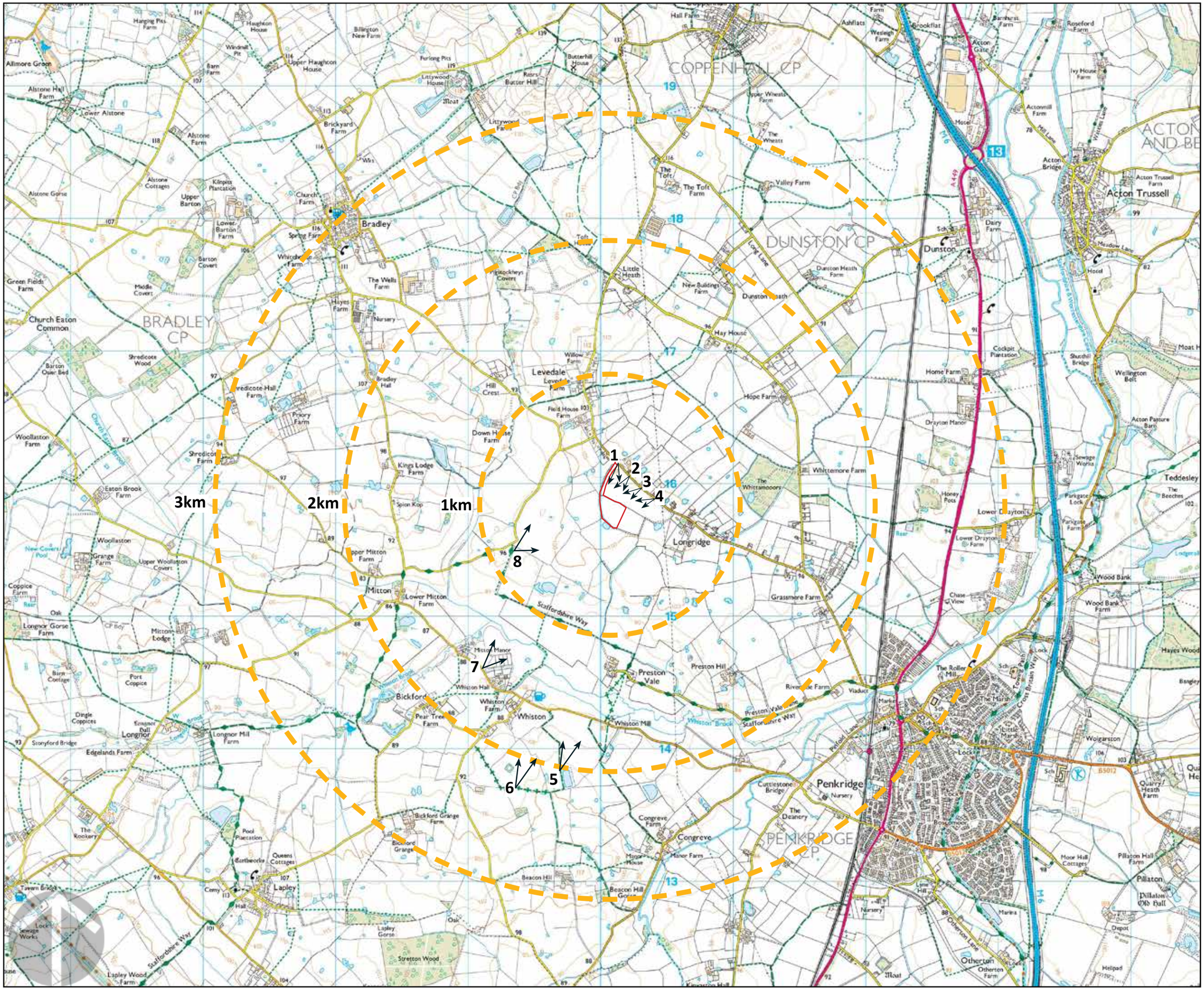
Proposed Year 15 buffered ZTV:

A new DEM was created with the anticipated year 15 vegetation added to the first return surface model (FZDSM) at 8m above ground level (considered a reasonable minimum growth) covering the areas of tree planting along the northern and eastern edge of the proposed development.

The ZTV analysis was repeated over this new DEM using all reference points for containers, buildings and the substation.

APPENDIX F:

Zone of Theoretical Visibility Methodology



KEY

- Site Boundary
- Location of Wider Viewpoint
- Kilometre line from centre of the Site
- Public Right of Way

revision	date	description	dwn	chkd

Gloucester House,
399 Silbury Boulevard
Milton Keynes
MK9 2AH

T 01908 303701
W www.enplan.net

project
05-1095
Land on the South West Side of Levedale Road, ST19

scale
1:25000 @ A3

date
Oct 2022

title
Site Context
(Location of Wider Viewpoints)

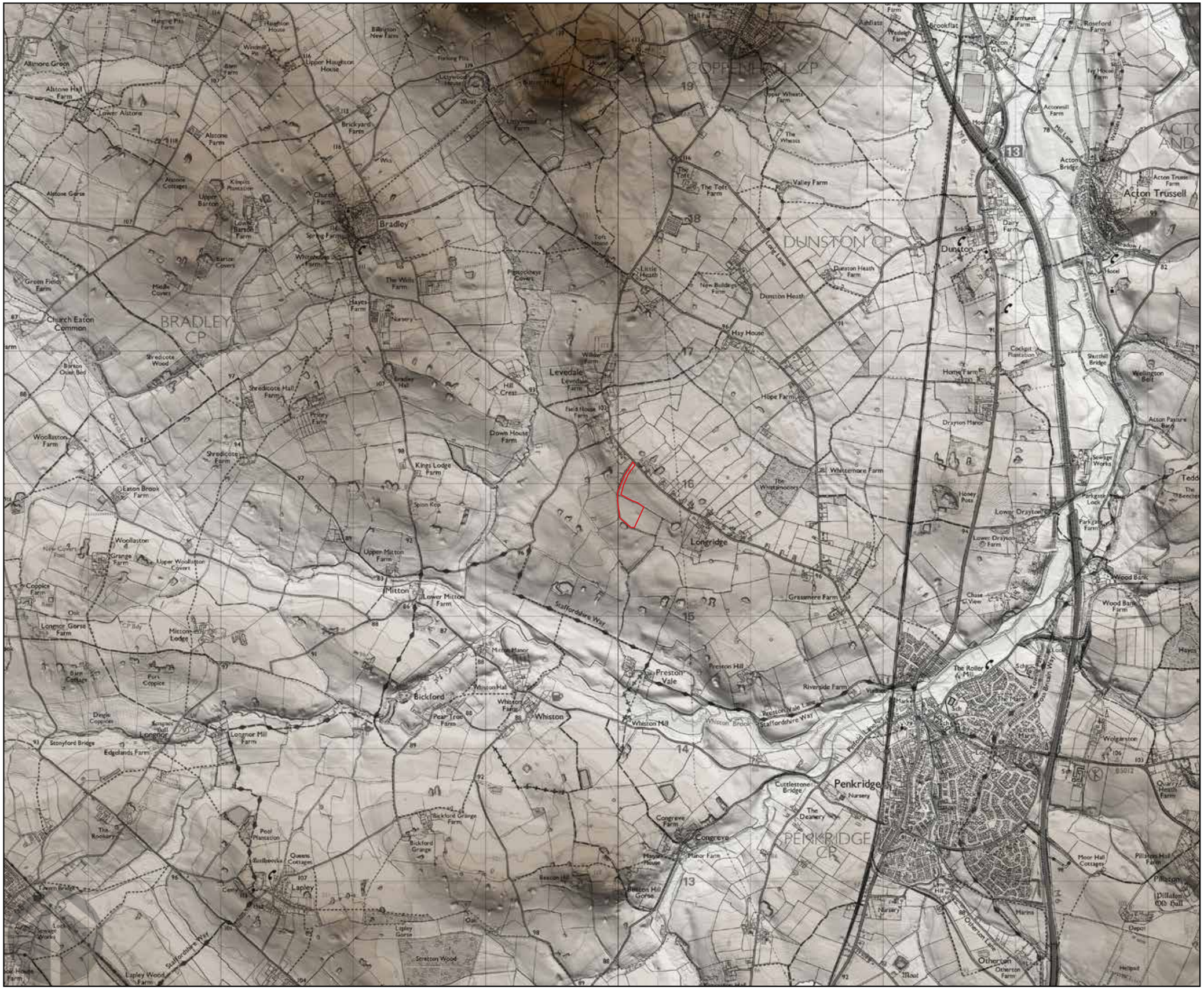
drawn by
ZX

checked
RH

drawing number

revision
P05

Figure 1



KEY

- Site Boundary
- 10-15m AOD
- 15-20m AOD
- 20-25m AOD
- 25-30m AOD
- 35-40m AOD
- 40-45m AOD
- 45-50m AOD
- 50-55m AOD
- 55-60m AOD
- 60-65m AOD
- 65-70m AOD

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Land on the South West Side of Levedale Road, ST19

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1:25000 @A3

date
Oct 2022

title
Topography Plan

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revision
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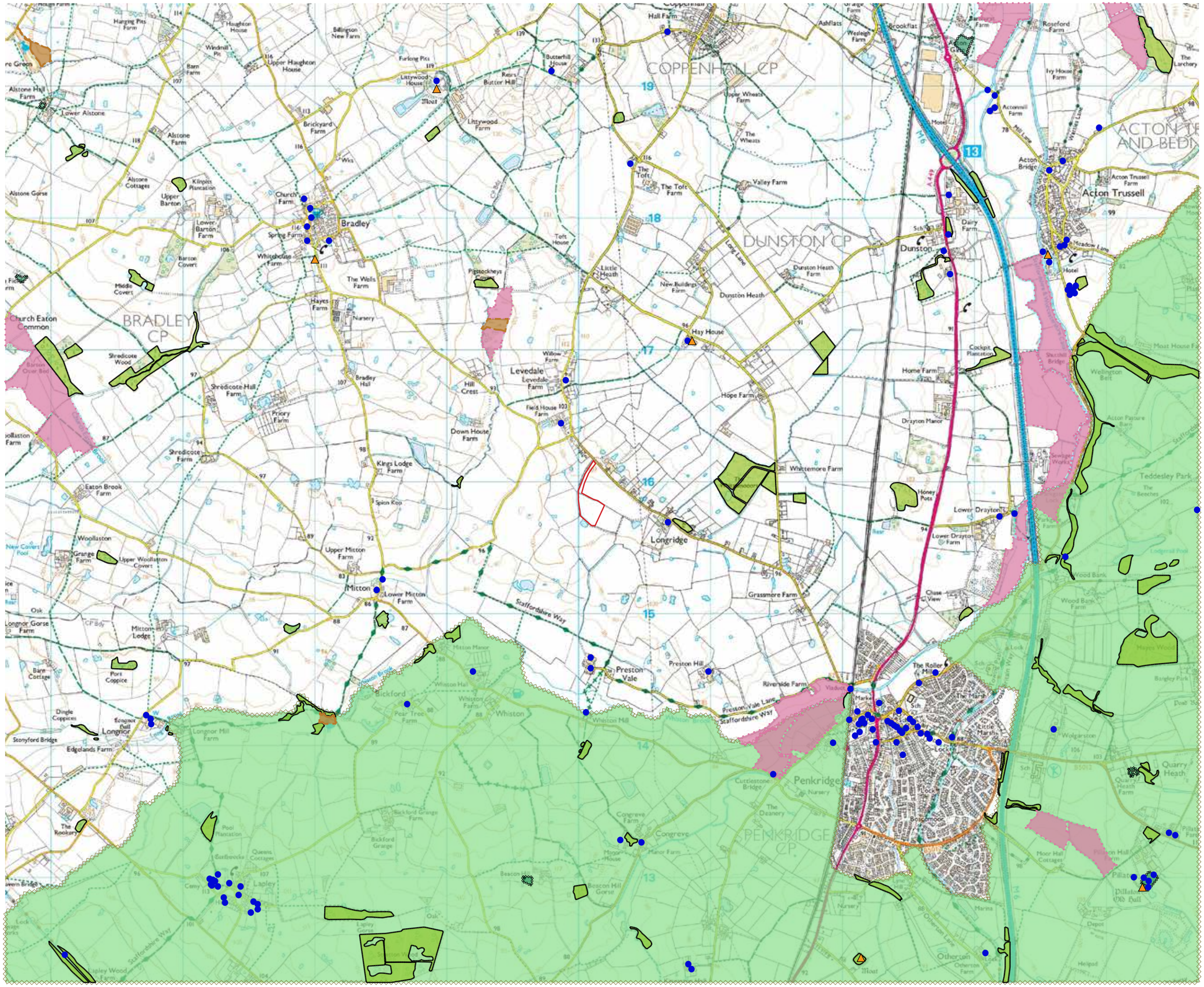
Figure 2



KEY

- Site Boundary
- Listed Buildings
- Historic Monument
- Priority Habitat Inventory - Coastal and Floodplain Grazing Marsh
- Priority Habitat Inventory - Good quality semi-improved grassland
- Priority Habitat Inventory - Traditional Orchards
- Priority Habitat Inventory - Deciduous Woodland
- Green Belt

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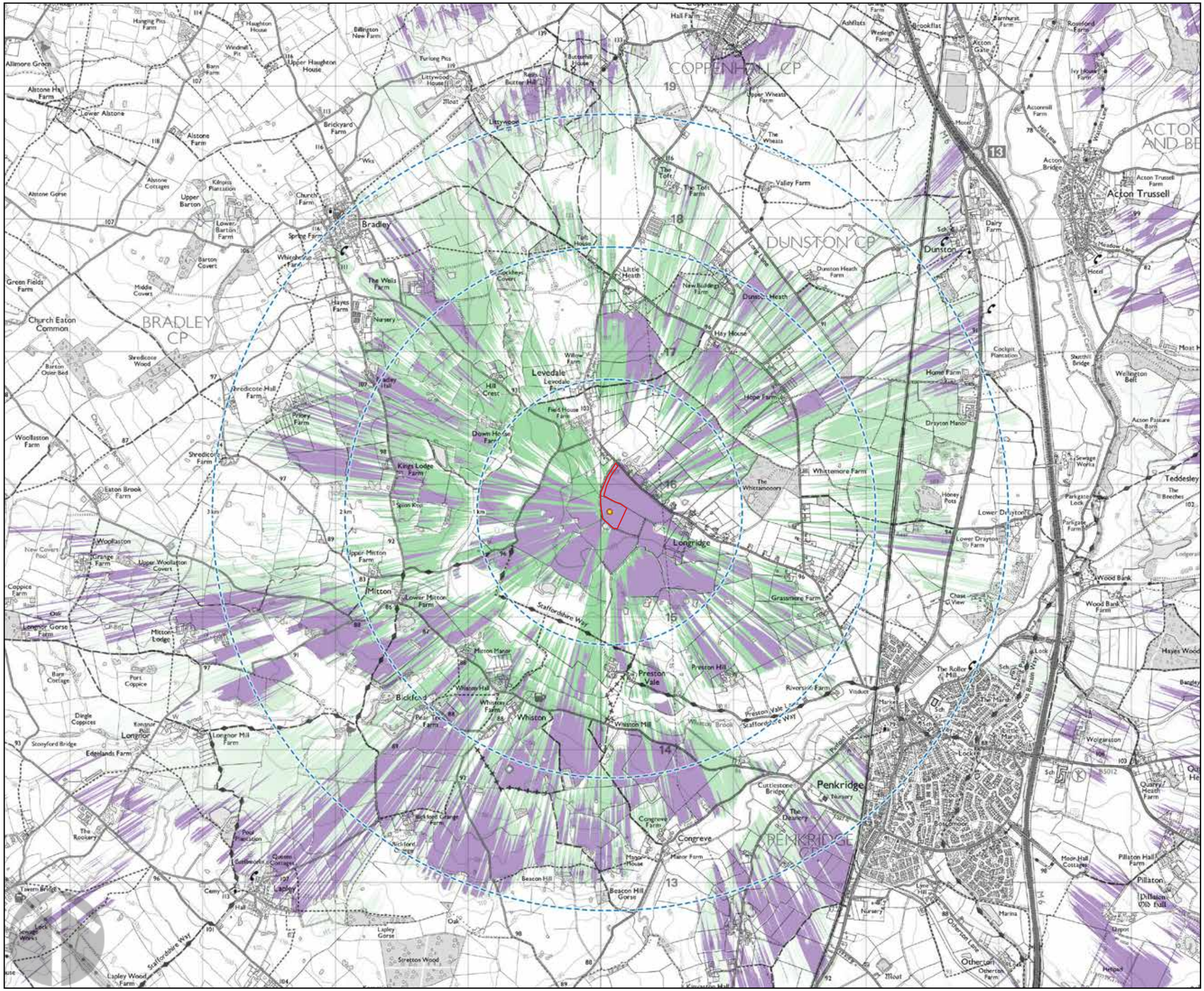
Figure 3



KEY

- Site Boundary
- Location of reference markers
- Radius lines from site centre in km
- Filtered Views
- Unfiltered Views

Zone of Theoretical Visibility (ZTV) with buffers

The reference marker is at the highest point of the proposed development above proposed ground level. In this case the highest structure is a 15m telecoms tower. A ZTV map illustrates the potential (or theoretical) visibility of an object in the landscape. The phrase “potential visibility” is used to describe the result because the analysis takes into account any landscape features such as trees, woodland or buildings, etc. The analysis is made on the basis of topography using O.S Terrain 5 data. Model resolution: Lidar data @1m grid, resampled to 2.5m grid. Map resolution: 1:25k analysis @ 2.5m per pixel (to print at 100 pixels per cm / 254 pixels per inch)
Observer Height: 1.6m
Extent of ZTV: analysis performed to 5km radius. “potential screened/filtered views” faded beyond 2km.
Reference points were positioned along the ridges and around the edge of the proposed building and were set at the proposed finished roof level.
At least one of these reference points could theoretically be seen from within the shaded areas on the ZTV analysis.
Purple shading describes potential unobstructed, year-round views (visibility across the ‘FZDSM’ surface model).
Green shading describes potential screened/ fifiltered views,especially in winter (additional visibility across the ‘DSM’model).

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	date Oct 2022
title Zone of Theoretical Visibility (ZTV) with Buffers	drawn by ZX
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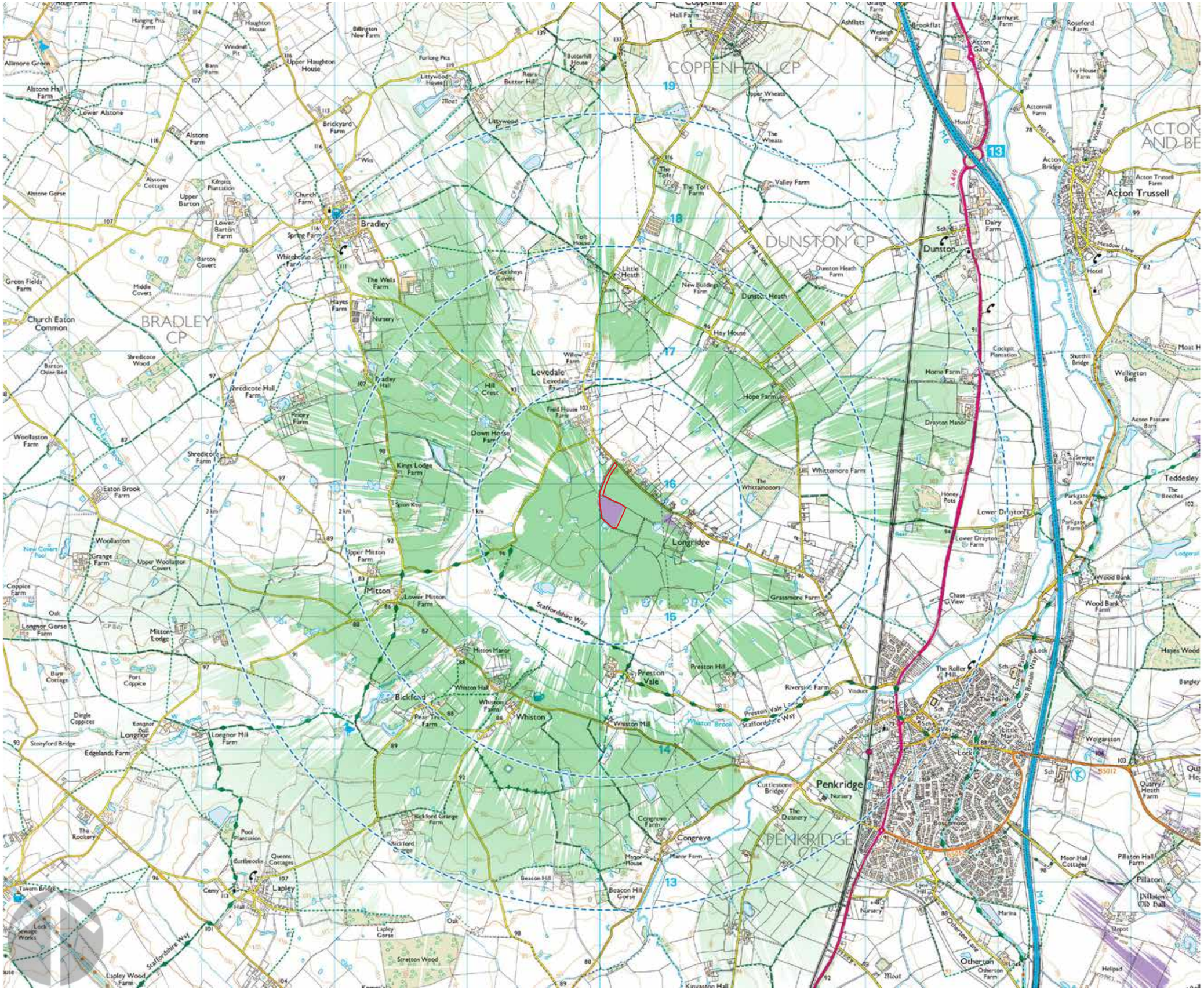
Figure 4



KEY

- Site Boundary
- Radius lines from site centre in km (1 km)
- Potential Filtered Views
- Unobstructed Views

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Zone of Theoretical Visibility (ZTV) with Buffers Year 15

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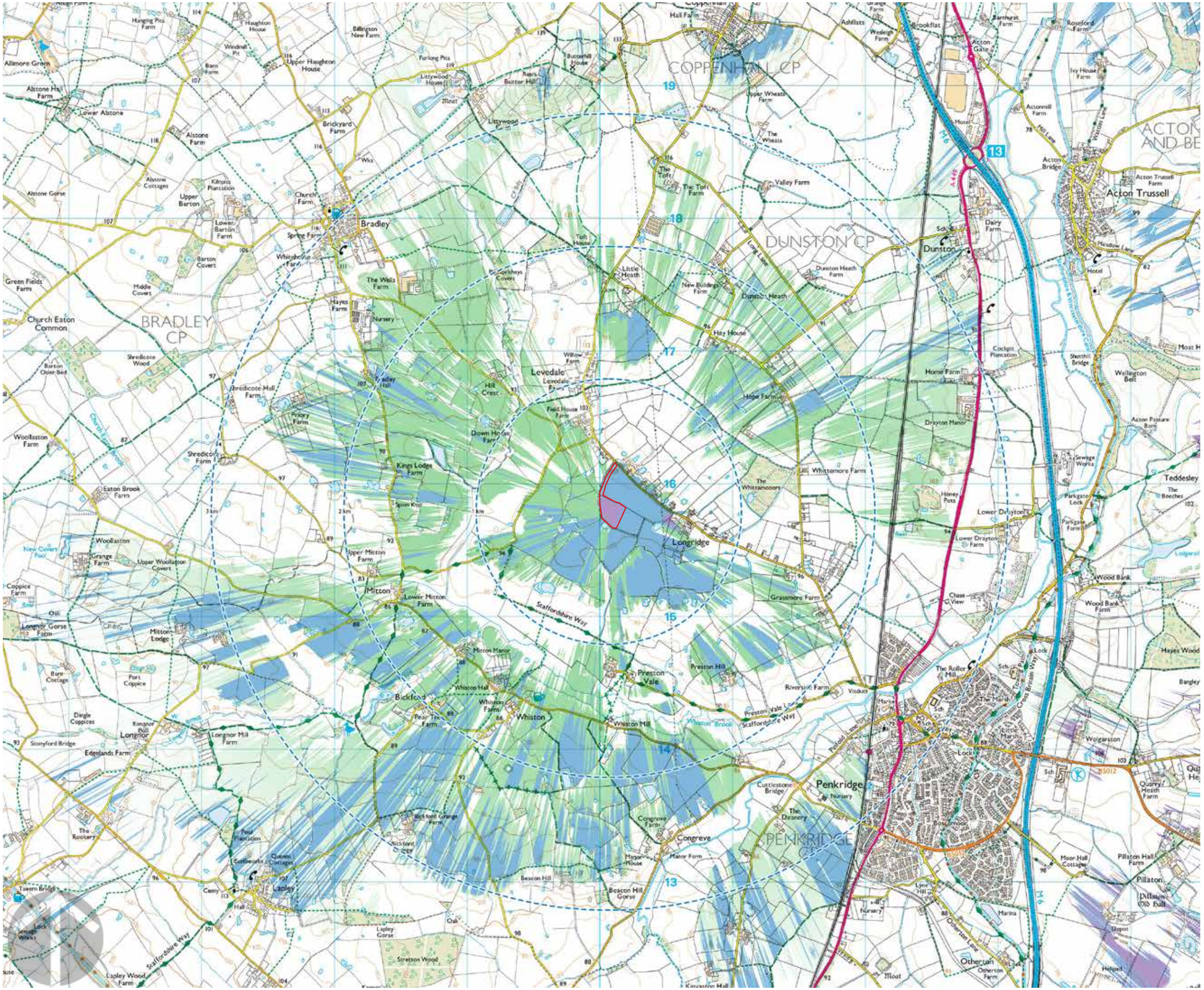
Figure 5



KEY

- Site Boundary
- Radius lines from site centre in km (1 km)
- Potential Filtered Views
- Unobstructed Views
- Visibility (Year 1)

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Zone of Theoretical Visibility (ZTV) with Buffers Years 1 and 15 combined

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revision
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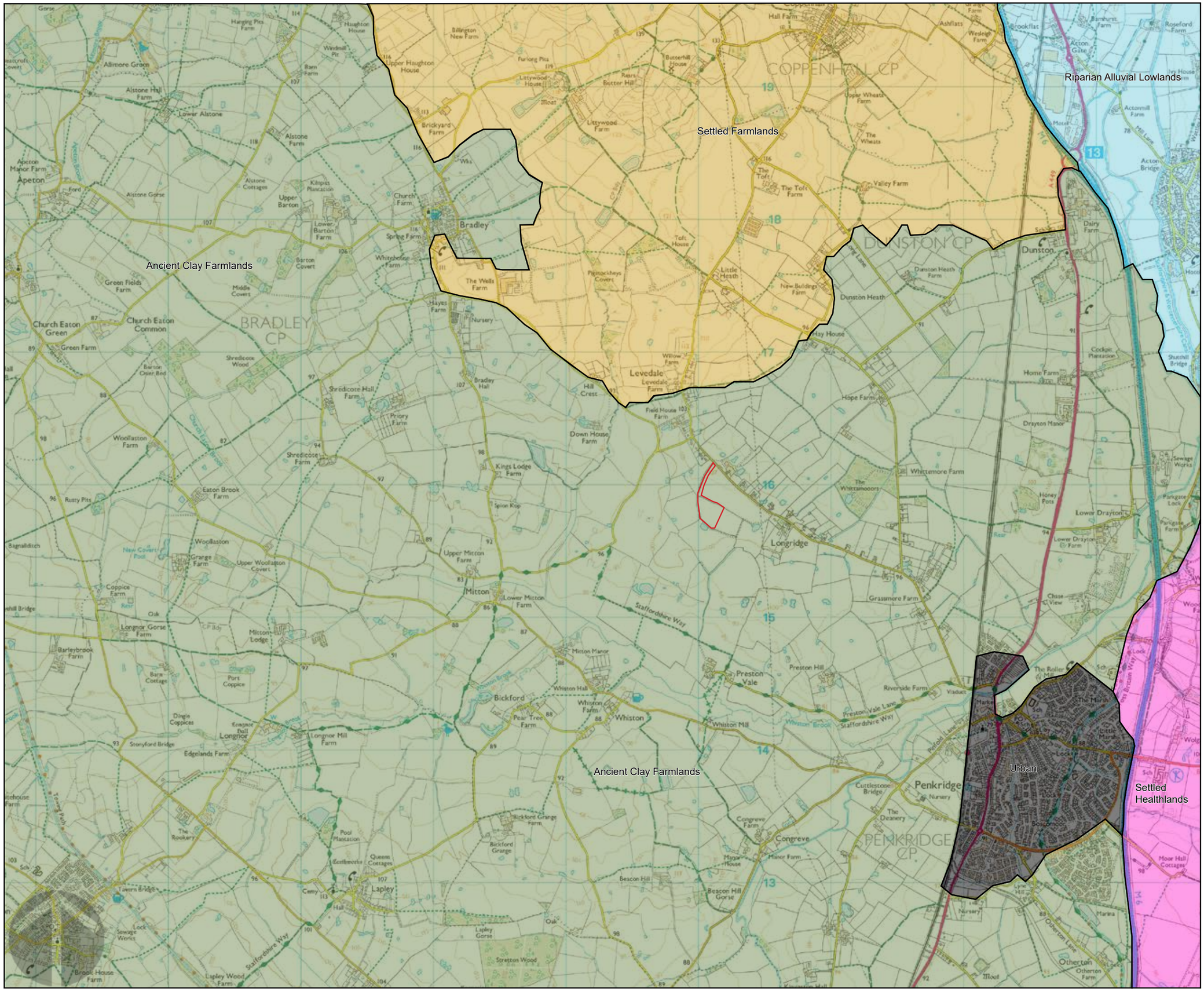
Figure 6



KEY

- Site Boundary
- Ancient Clay Farmlands
- Riparian Alluvial Lowlands
- Settled Farmlands
- Settled Healthlands
- Urban

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Landscape Character Areas

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Figure 7

KEY

Site Boundary

Location of Wider Viewpoints

Public Right of Way

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date
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Landscape and Visual
(Location of Site in Wider Context)

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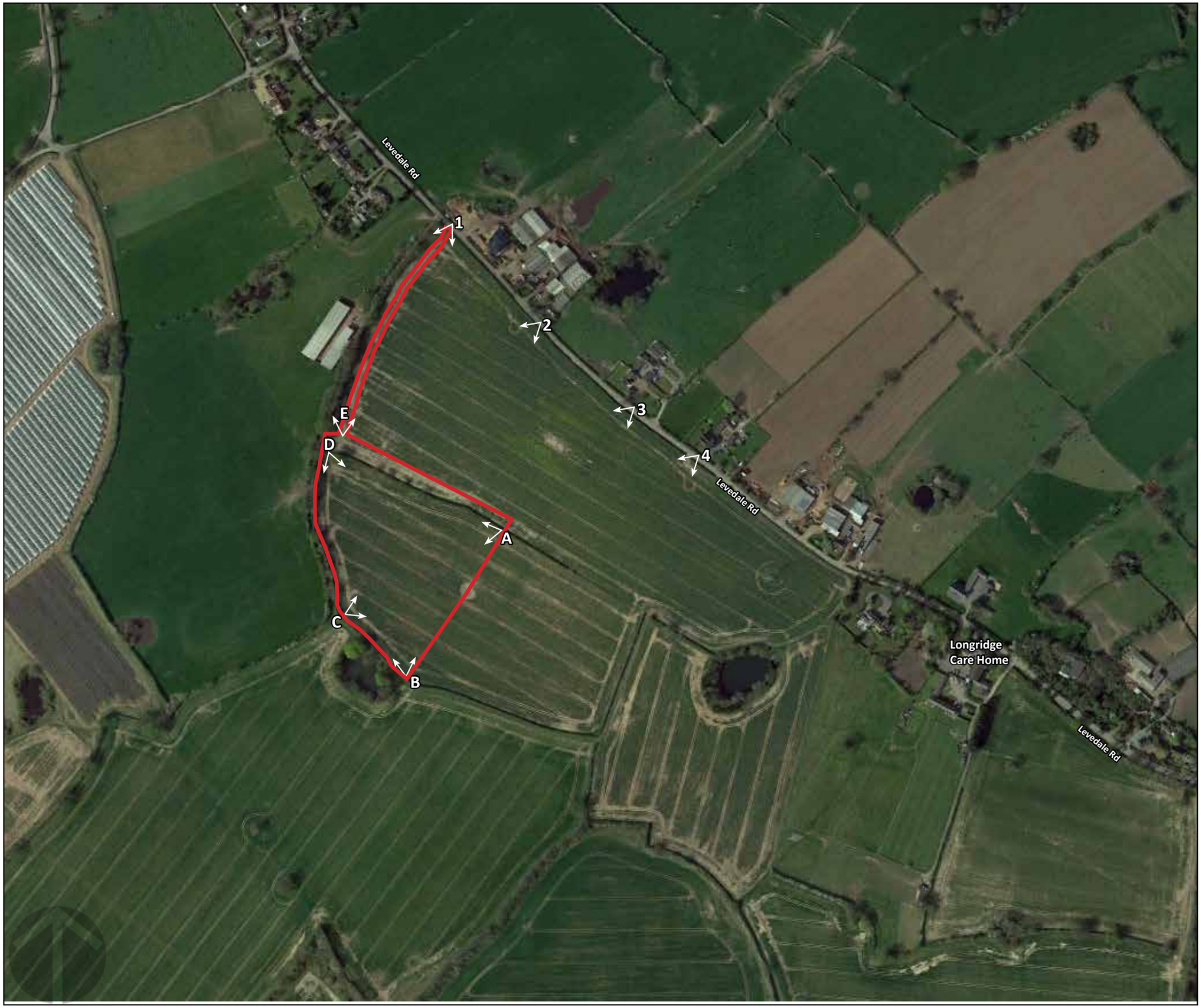
Figure 8



KEY

Site Boundary

Location of Site Views

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date
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Landscape and Visual
(Location of Viewpoints and Site Appraisal Views)

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Figure 9

View A - View looking west across the Application Site from eastern corner.

View B - View looking north west across the Application Site from southern boundary.

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date
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Views A & B

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Figure 10

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View C - View looking north east across the Application Site from in the middle of northern boundary.

View D - View looking south west across the Application Site from the north western corner.

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Views C & D

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Figure 11

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View E - View looking north east towards Levedale Road from the north western corner of the site boundary.

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date
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title
Views E

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Figure 12

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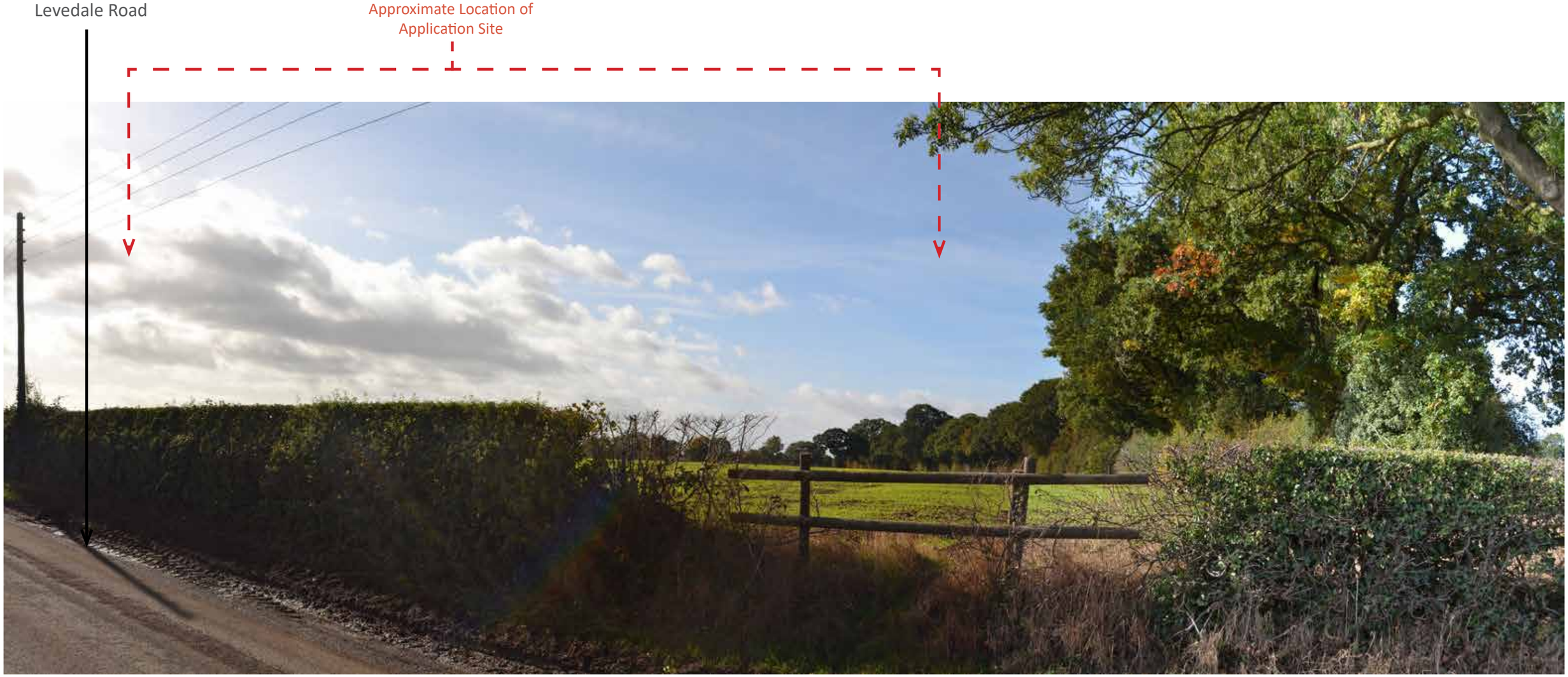
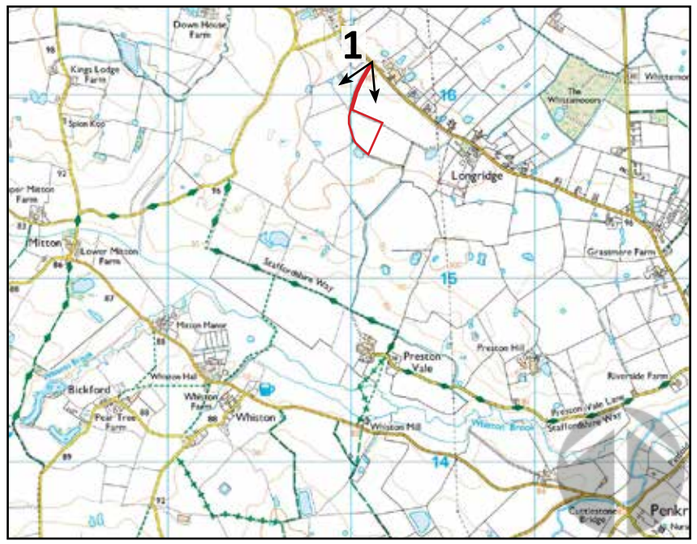
P05



Viewpoint 1	Viewpoint taken from Levedale Road looking south towards the Application Site along the proposed access route. (Movement Corridor)
Visual Sensitivity	Moderate (Users of the Public Highway)
Camera Type	Nickon D3100 with 50mm lens equivalent
Date	06.10.2022
Approx Elevation	105m AOD
Distance to Site	295m



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Viewpoint 1

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Figure 13

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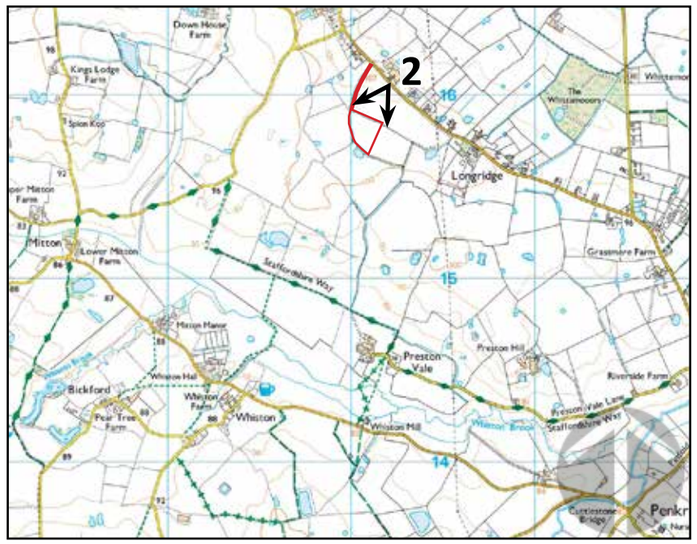
Viewpoint 2	Viewpoint taken from the Levedale Road adjacent to No 1 Holding Levedale looking south west towards the Application Site. (Movement Corridor and Residential)
Visual Sensitivity	High (Residential) Moderate (Users of the Public Highway)
Camera Type	Nikon D3100 with 35mm lens equivalent
Date	06.10.2022
Approx Elevation	105m AOD
Distance to Site	290m



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date
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Viewpoint 2
Existing

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Figure 14

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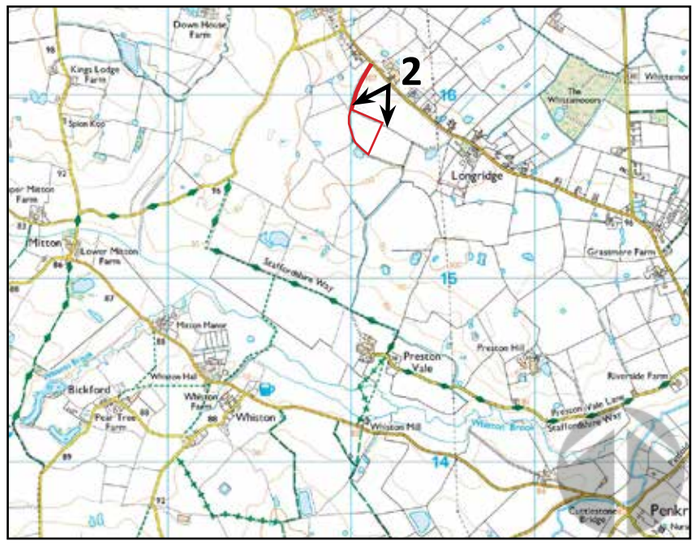
P05

Viewpoint 2 Year 1 Photomontage

Viewpoint 2	Viewpoint taken from the Levedale Road adjacent to No 1 Holding Levedale looking south west towards the Application Site. (Movement Corridor and Residential)
Visual Sensitivity	High (Residential) Moderate (Users of the Public Highway)
Camera Type	Nikon D3100 with 35mm lens equivalent
Date	06.10.2022
Approx Elevation	105m AOD
Distance to Site	290m



revision	date	description	dwn	chkd

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scale
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title
Viewpoint 2
Year 1 Photomontage

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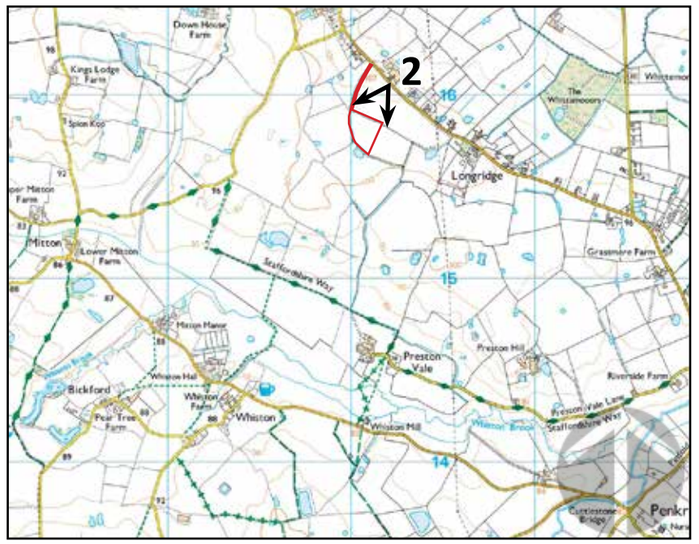
Figure 15

revision
P05

Viewpoint 2 Year 15 Photomontage

Viewpoint 2	Viewpoint taken from the Levedale Road adjacent to No 1 Holding Levedale looking south west towards the Application Site. (Movement Corridor and Residential)
Visual Sensitivity	High (Residential) Moderate (Users of the Public Highway)
Camera Type	Nikon D3100 with 35mm lens equivalent
Date	06.10.2022
Approx Elevation	105m AOD
Distance to Site	290m



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date
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title
Viewpoint 2
Year 15 Photomontage

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Figure 16

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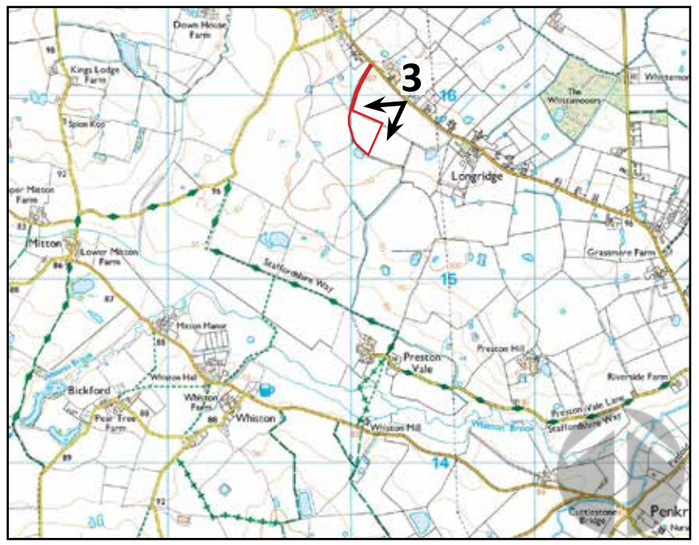
Approximate Location of Application Site

Viewpoint 3	Viewpoint taken from the Levedale Road adjacent to Oak Barns looking south west towards the Application Site. (Movement Corridor and Residential)
Visual Sensitivity	High (Residential) Moderate (Users of the Public Highway)
Camera Type	Nikon D3100 with 35mm lens equivalent
Date	06.10.2022
Approx Elevation	105m AOD
Distance to Site	280m



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date
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Viewpoint 3

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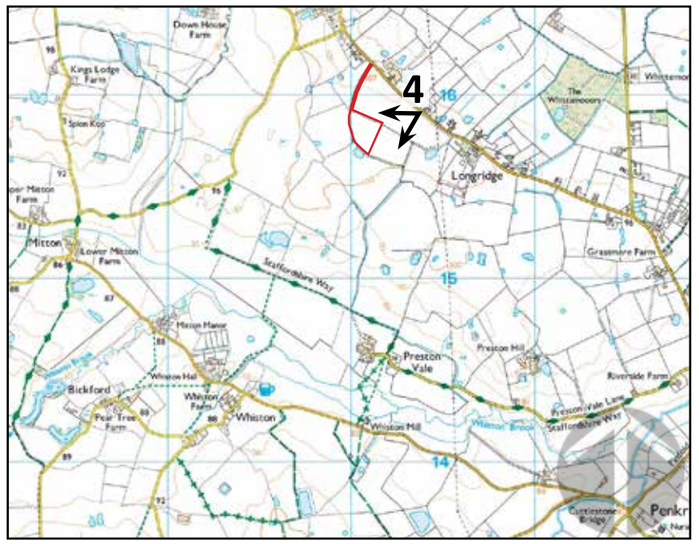
Viewpoint 4	Viewpoint taken from the Levedale Road adjacent to Poppywell Farm looking south west towards the Application Site. (Movement Corridor and Residential)
Visual Sensitivity	High (Residential) Moderate (Users of the Public Highway)
Camera Type	Nikon D3100 with 35mm lens equivalent
Date	06.10.2022
Approx Elevation	105m AOD
Distance to Site	340m



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date
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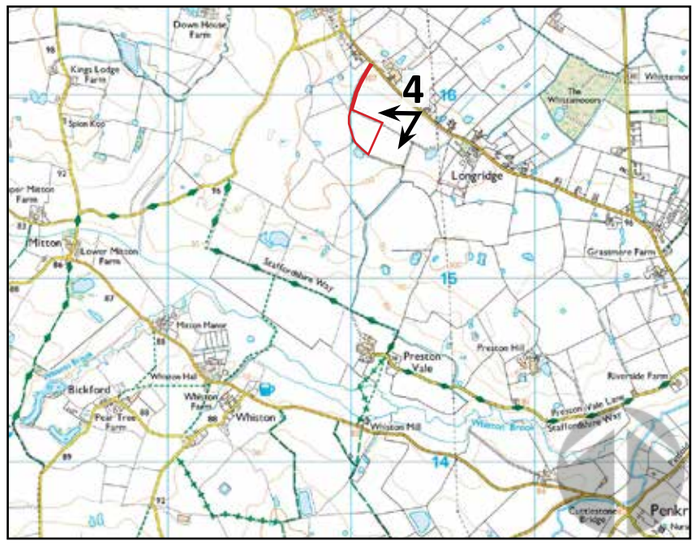
Viewpoint 4 Year 1 Photomontage

Viewpoint 4	Viewpoint taken from the Levedale Road adjacent to Poppywell Farm looking south west towards the Application Site. (Movement Corridor and Residential)
Visual Sensitivity	High (Residential) Moderate (Users of the Public Highway)
Camera Type	Nikon D3100 with 35mm lens equivalent
Date	06.10.2022
Approx Elevation	105m AOD
Distance to Site	340m



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title
Viewpoint 4
Year 1 Photomontage

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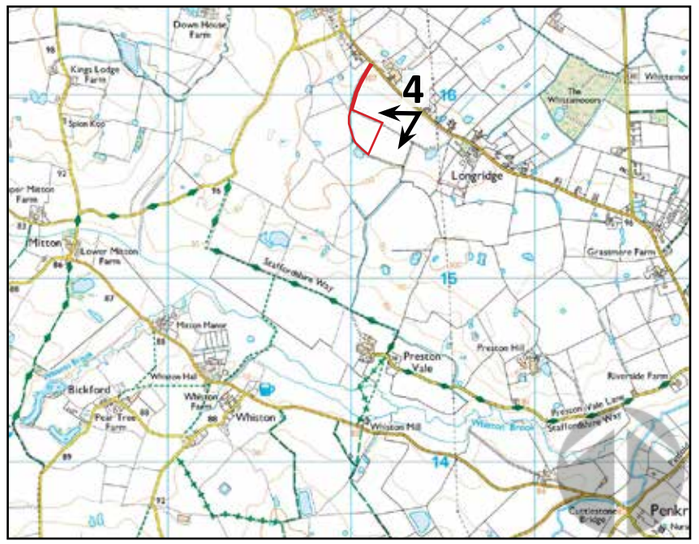
Viewpoint 4 Year 15 Photomontage

Viewpoint 4	Viewpoint taken from the Levedale Road adjacent to Poppywell Farm looking south west towards the Application Site. (Movement Corridor and Residential)
Visual Sensitivity	High (Residential) Moderate (Users of the Public Highway)
Camera Type	Nikon D3100 with 35mm lens equivalent
Date	06.10.2022
Approx Elevation	105m AOD
Distance to Site	340m



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Viewpoint 4
Year 15 Photomontage

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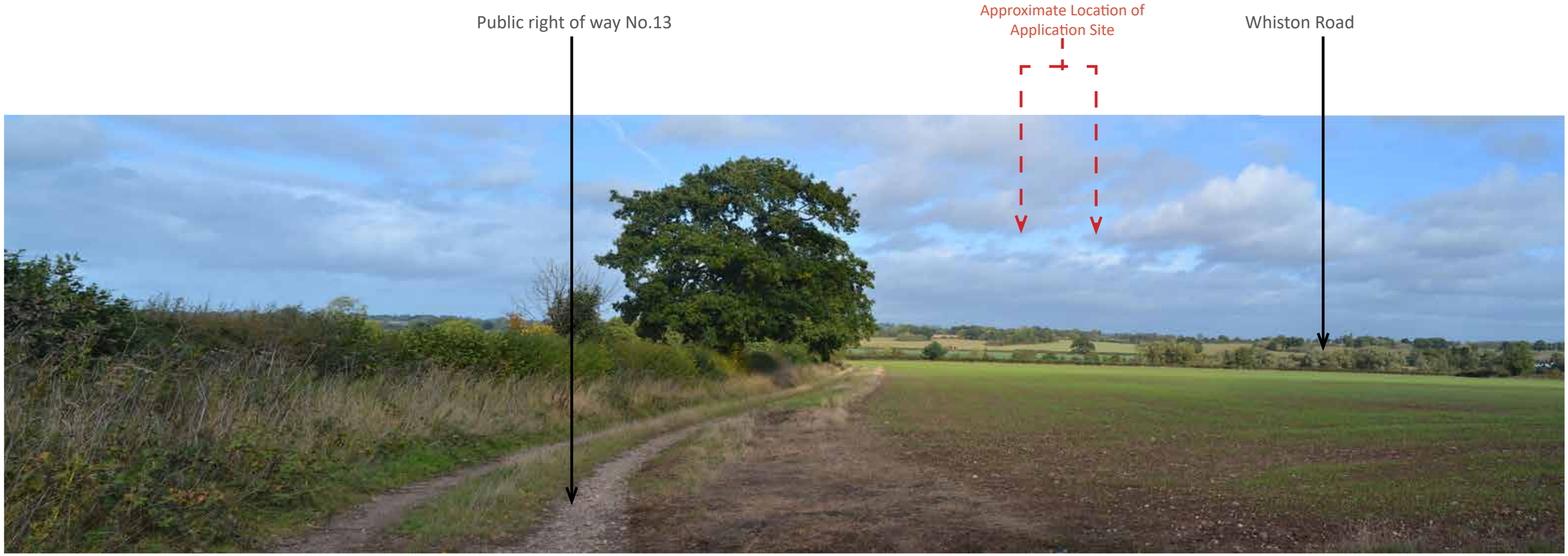
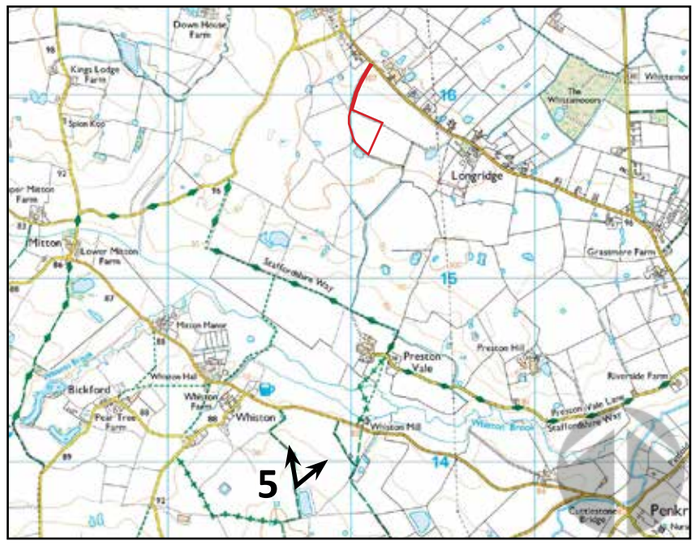


Viewpoint 5	Viewpoint taken from the Public Right of Way ref no 13 looking north towards the Application Site. (Recreational Corridor)
Visual Sensitivity	High (Users of the Public right of way)
Camera Type	Nikon D3100 with 35mm lens equivalent
Date	06.10.2022
Approx Elevation	95m AOD
Distance to Site	2km



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Viewpoint 5

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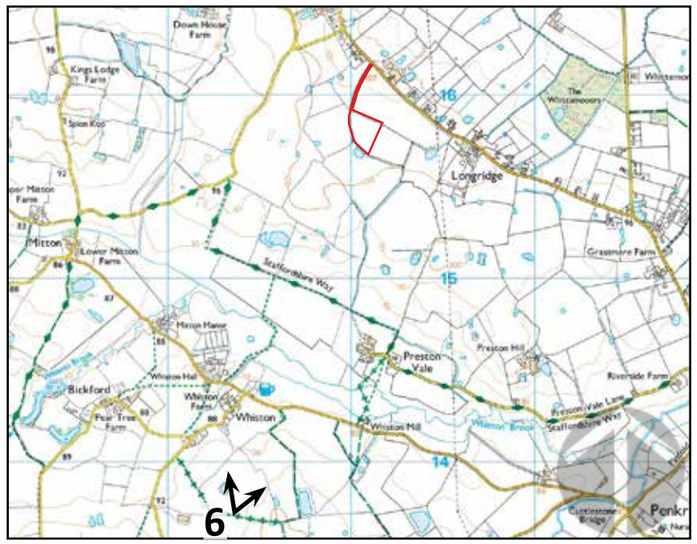
Viewpoint 6	Viewpoint taken from the Byway Open to All Traffic ref no: Penkridge 0.1045 looking north east towards the Application Site. (Recreational Corridor)
Visual Sensitivity	High (Users of the Public right of way)
Camera Type	Nikon D3100 with 35mm lens equivalent
Date	06.10.2022
Approx Elevation	95m AOD
Distance to Site	2.2km



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scale
N/A

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title
Viewpoint 6

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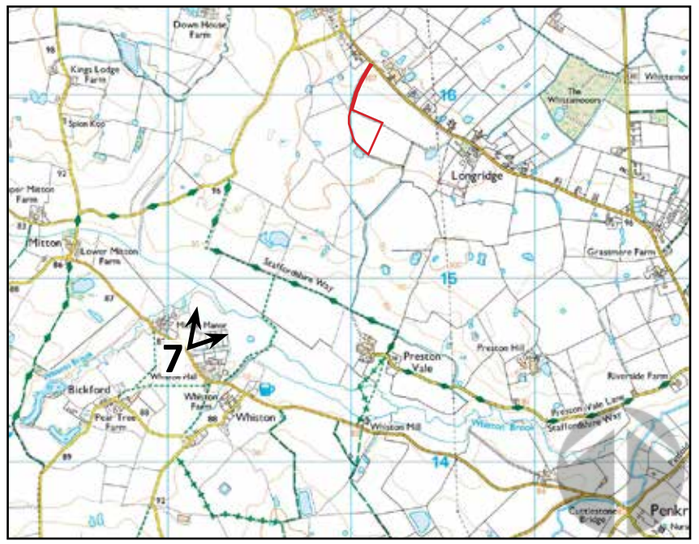
Viewpoint 7	Viewpoint taken from Whitson Road looking north east towards the Application Site. (Movement Corridor)
Visual Sensitivity	Moderate (Users of the Public Highway)
Camera Type	Nikon D3100 with 35mm lens equivalent
Date	06.10.2022
Approx Elevation	88m AOD
Distance to Site	1.6km



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scale
N/A

date
Oct 2022

title
Viewpoint 7

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RH

drawing number
Figure 23

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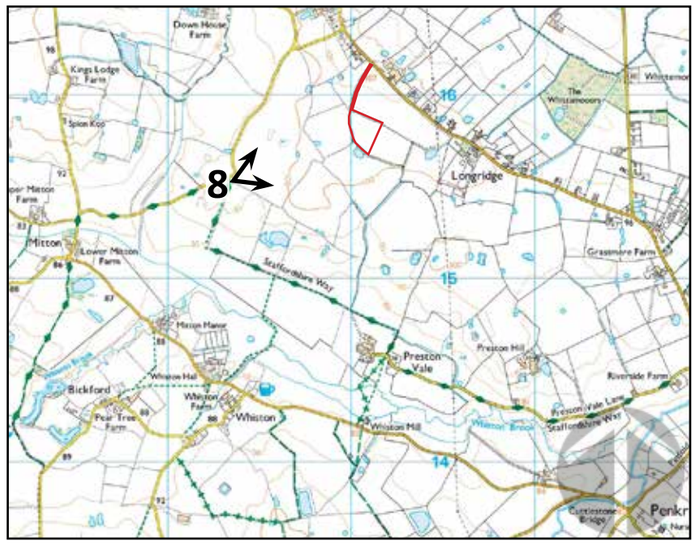
P05

Approximate Location of Application Site

Viewpoint 8	Viewpoint taken from the Public Right of Way No.41 looking north east towards the Application Site. (Recreational Corridor)
Visual Sensitivity	High (Users of the Public right of way)
Camera Type	Nikon D3100 with 35mm lens equivalent
Date	06.10.2022
Approx Elevation	95m AOD
Distance to Site	800m



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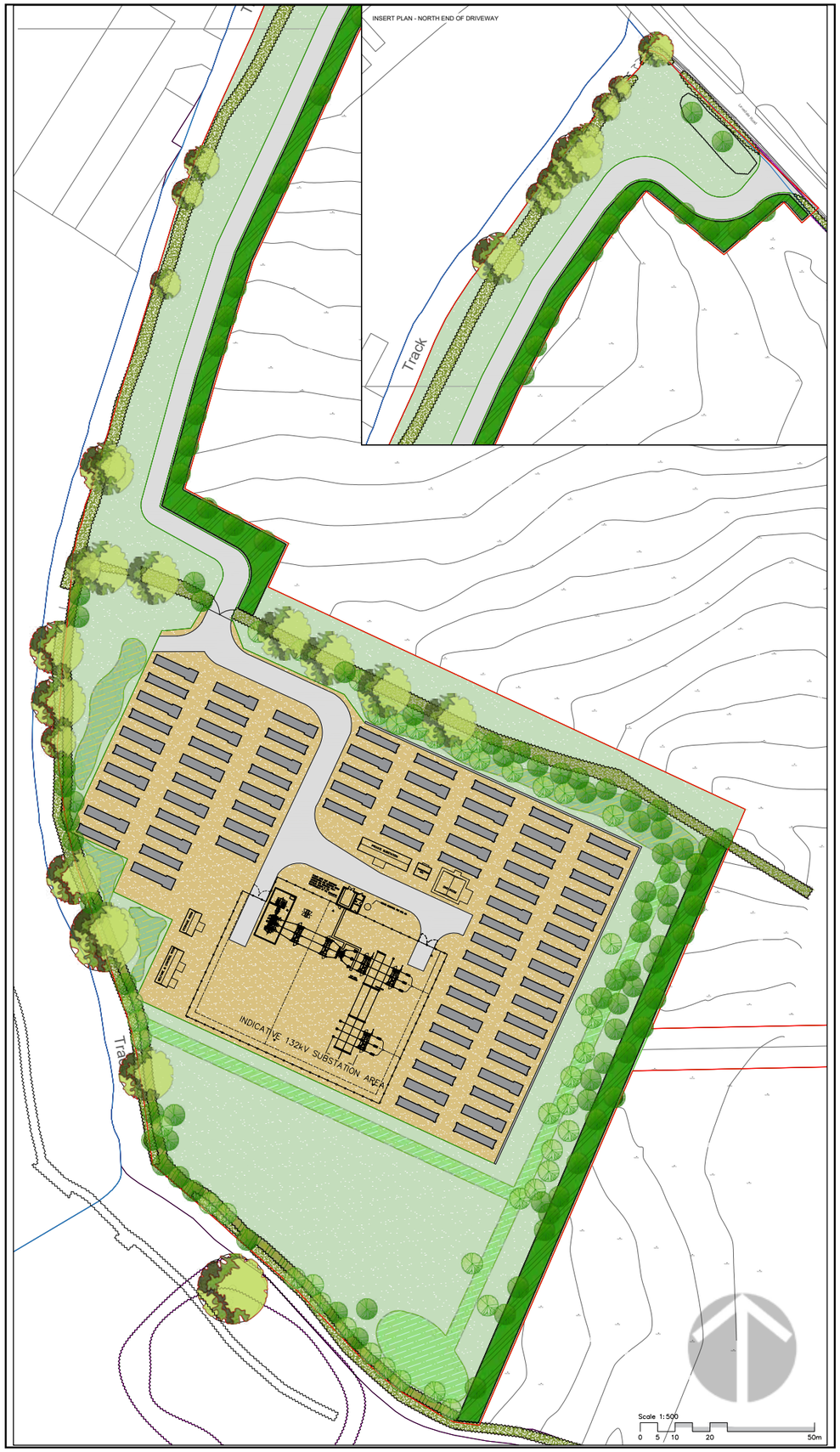
title Viewpoint 8	drawn by ZX checked RH
drawing number **Figure 24**	revision P05



N

LANDSCAPE KEY

- SITE BOUNDARY
- LAND IN CLIENT'S CONTROL
- PROPOSED BUILDING LINE
- PROPOSED TREE
  To be selected from the following:
  Prunus Avium
  Quercus Robur
  Alnus Glutinosa
  Prunus Malus
- PROPOSED ADDITIONAL TREE PLANTING
  To be selected from the following:
  Prunus Avium
  Quercus Robur
  Alnus Glutinosa
  Prunus Malus
- EXISTING TREE
- EXISTING HEDGE
- PROPOSED HEDGEROW/ BUFFER PLANTING
  Crataegus monogyna,
  Prunus spinosa,
  Alnus glutinosa,
  Corylus avellana,
  Rosa canina,
  Ilex aquifolium,
  Sambucus nigra,
  Fagus sylvatica
- AMENITY TURF AREA
  Suggested seed mixture:
  Emorsgate- EG10 'Tussock Grass Mixture '
  or similar
- WILDFLOWER SEED MIX
  Suggested seed mixture:
  Emorsgate- EM2 'Standard General Purpose Meadow Mixture'
  or similar
- WILDFLOWER SEED MIX
  Suggested seed mixture:
  Emorsgate- EM8 'Meadow Mixture for Wetlands"
  or similar
- ADDITIONAL HEDGEROW PLANTING
- PERMEABLE GRAVEL MATERIAL
- TARMACADAM SURFACE
  Supplier: To Engineers Specification
- SELF BINDING GRAVEL PATHWAY
- SINGLE GATE ACCESS WITH PALISADE FENCE
- ACOUSTIC BARRIER

revision	date	description	dwn	chkd

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project
05-1095
Land on the South West Side of Levedale Road, ST19

scale
N/A

date
Oct 2022

title
Landscape Strategy

drawn by
ZX

checked
RH

drawing number
Figure 25

revision
P05