Ecological Appraisal of Land to the South of Copyhold Cottages, Wilbees Farm, Arlington

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Summary

- This document presents a Preliminary Ecological Appraisal of land previously part of Wilbees Farm, Arlington, on behalf of the owners, the Ecological Land Co-operative (ELC). ELC seeks planning permission for three temporary dwellings on 18.54 acres of existing farmland to create three residential smallholdings.
- This appraisal is based on two site visits and a review of a comprehensive Biodiversity Data Report for the site and a 2 km radius around it, provided by Sussex Biodiversity Record Centre. Our review of the Biodiversity Data Report also included extracting information on the natural capital and ecosystem services of the surrounding 2 km area of land.
- During the site visits, basic data and information was also collected on the natural capital of the site, the ecosystem services it provides and of the natural capital and ecosystem services provided by the neighbouring surrounding land and water (over a maximum of 1 km from the site).
- Our findings are that the biodiversity of the field portion of the site itself is of low value, and that the biodiversity value of the surrounding hedgerows is considerably higher.
- The oldest hedgerows along the internal boundaries and part way along the road boundary contain mature oak, ash and willow trees (with all their associated biodiversity) along with 6 other species of native tree and bush plus a range of common climbing, spreading and ground-layer species. More bird species were seen and heard within the hedgerows than in the field itself during field visits, despite a significant bias the other way in terms of land area of the two.
- A preliminary assessment was also made of the natural capital of the site and, again, the field itself has low natural capital:
    - mineral, clay soil with little or no visible organic matter content and low below-ground biomass;
    - no standing or flowing water and little evidence of water flow across or around the site;
    - temporary habitat of ruderal weeds which does not indicate high ecological health; and
    - low biodiversity.
- The natural environment provides a wide range of benefits to people. These include, for example, production of clean water and many raw materials used in economic activities, regulation of climate and flooding, soil formation and crop pollination, and

cultural benefits such as aesthetic value and recreational opportunities. These multiple benefits that people derive from ecosystems are known as 'ecosystem services'. Ecosystem services underpin our health, economy and quality of life, albeit that many have been overlooked over many decades and up until very recently. For this reason, ecosystem services will increasingly frame the way that we assess the impacts and implications of how we interact with the natural environment, and they will also shape the ways in which we manage both the environment and human activities impinging upon it. It isn't just the environment that will gain from enhanced biodiversity, natural capital and ecosystem services, but the local human population too – the enhancement of these important elements has the potential to make the local economy more resilient.

- The ability of the field part of the site to provide ecosystem services is currently limited and thus the number and quality of ecosystem services provided is low and the extent of each individual ecosystem service that is provided is also small.
- By contrast, the surrounding area is relatively rich in biodiversity, with relatively high natural capital value over significant areas and with specific 'hotspots' providing a very large range of ecosystem services to fairly high levels.
- In part, due to its strategic location, there is considerable opportunity for the site to be enriched by ecological restoration for the benefit of livelihoods of on-site smallholders, biodiversity in general, and also for targeted species as well as extending to contributing to the living landscape. Of primary restoration value will be strengthening woodland continuity. Rehabilitation of soil and hydrology is envisaged by ELC as part of the smallholders' creation of viable livelihoods for themselves.
- Farming has been an important component of the Arlington community historically and traditional values as custodians of the land for future generations remain. The ELC proposals for sustainable livelihoods for several smallholders living from the land on site would seem to be in keeping with this.
- It is likely that the site's ecological health would be increased by the proposed land use. The potential to enhance biodiversity, natural capital and ecosystem service provision is significant through the proposed use of the land for low-impact, ecologically sensitive livelihoods. If the proposed development does provide such benefits, the Local Landscape Character will also be enhanced, potentially significantly.
- The beneficiaries of this enhanced biodiversity, natural capital, ecosystem service provision will be not only the incoming smallholders, but also local individual

residents nearby, the local community and (to a decreasing degree) the District and beyond.

- The ELC proposals appear to meet the highest environmental requirements of the National Planning Policy Framework (NPPF) and also to directly assist Wealden DC policies on Green Infrastructure and biodiversity, as expressed in the WDC Local Plan.

Introduction

Dr. Tingle & Ms. Holloway were contracted by the Ecological Land Co-operative (ELC) to make a preliminary Ecological Appraisal of the land directly to the south of Copyhold Cottages purchased by ELC in 2016. The site was previously under the ownership and management of Wilbees Farm, Arlington and had been used for conventional arable agriculture in preceding years, cropping maize for about 10 years and used as pasture before that.

ELC seeks planning permission for three temporary dwellings on 18.54 acres of existing farmland to create three residential smallholdings.

> "Farming has always been important to the Arlington community and today's local farmers, whilst more mechanised and intense than in times past, still feel they hold true to traditional values as custodians of the land for future generations".
>
> "Fields around the village will regularly support sheep and cattle alongside arable crops, managed woodland and lifestyle plots."
> (Arlington Village website, 2016 http://arlingtonvillage.co.uk/farming-community/).

Both these statements from the village website appear highly consistent with the aims of the ELC for enabling viable, smallholder farming livelihoods on their site.

This report aims to provide an assessment to assist with information on some basic elements of the ecology of the site to inform ideas for producing a plan for the rural enterprises there which are "ecologically beneficial", to meet the ELC mission (ELC, 2016).

Planning Policy Background

The ecology of a given site is highly dependent not only on the land use and management of the particular site, but also by the environmental health, land use and land management of surrounding areas over a fairly wide area.

The natural environment provides a wide range of benefits to people. These include, for example, production of clean water and many raw materials used in economic activities, regulation of climate and flooding, soil formation and crop pollination, and cultural benefits such as aesthetic value and recreational opportunities. These multiple benefits that people derive from ecosystems are known as 'ecosystem services'. Ecosystem services underpin our health, economy and quality of life, albeit that many have been overlooked over many decades and up until very recently. For this reason, ecosystem services will increasingly frame the way that we assess the impacts and implications of how we interact with the natural environment, and they will also shape the ways in which we manage both the environment and human activities impinging upon it (Everard & Waters, 2013).

National Planning Policy Framework

The National Planning Policy Framework (NPPF) states under para 109 that "The planning system should contribute to and enhance the natural and local environment by:

- protecting and enhancing valued landscapes, geological conservation interests and soils;
- recognising the wider benefits of ecosystem services;
- minimising impacts on biodiversity and providing net gains in biodiversity where possible, contributing to the Government's commitment to halt the overall decline in biodiversity, including by establishing coherent ecological networks that are more resilient to current and future pressures; and
- remediating and mitigating despoiled, degraded, derelict, contaminated and unstable land, where appropriate (DCLG, undated).

The site falls under the jurisdiction of the Wealden District Council. The Wealden District Core Strategy Local Plan was adopted in 2013 and contains local policies relating to nature conservation. The main policies drawn from these, which are relevant to the site, are indicated below (Wealden District Council, 2013):

Policy WCS12: Biodiversity

"In order to contribute to the biodiversity targets provided in the Sussex Biodiversity Action Plan, the Council will prevent a net loss of biodiversity, ensure a comprehensive network of habitats, and work with partners to maximise opportunities to ensure habitats, biodiversity features and ecological networks are maintained, restored, enhanced and where possible created to achieve a net gain in biodiversity and sustain wildlife in both rural and urban areas. This will be achieved through the development and implementation of an integrated green network strategy."

Policy WCS13: Green Infrastructure

"The District's existing network of green infrastructure will be protected, improved and enhanced by the implementation of a Green Infrastructure Strategy, ensuring a multifunctional, accessible network which maintains and improves biodiversity and landscape character, increases opportunities for healthy living and contributes to healthy ecosystems and climate change objectives."

When set beside the aims and vision of the Ecological Land Co-operative:

> "Sustainable rural livelihoods – such as small- scale ecological food production – protect the environment and reduce greenhouse gas emissions by reducing fossil fuel use ... help build a vibrant, living countryside in which people flourish alongside our cherished landscapes and natural biodiversity, and have a important role to play in ensuring food and energy security".
> and
> " … our vision is one where land is valued and used as a means to enhance our collective good …. our model champions a collective, ecological and co-operative vision of land ownership and land use." (Ecological Land Co-operative, undated)

The objectives of both National & Wealden DC Planning Policy and ELC appear closely aligned.

This report aims to provide the ELC with the information and adequate data to demonstrate to what extent its proposals will perform in relation to these requirements of the NPPF, as well as to aspects of the Local Plan dealing with environmental health and wellbeing.

Local Landscape Character Assessment

The Low Wealden Landscape[1]

The Low Weald National Character Area

- Broad, low-lying, gently undulating clay vales with outcrops of limestone or sandstone providing local variation.
- The underlying geology has provided materials for industries including iron working, brick and glass making, leaving pits, lime kilns and quarries. Many of the resulting exposures are critical to our understanding of the Wealden environment.
- A generally pastoral landscape with arable farming associated with lighter soils on higher ground. Land use is predominantly agricultural.
- Field boundaries of hedgerows and shaws (remnant strips of cleared woodland) enclosing small, irregular fields and linking into small and scattered linear settlements along roadsides or centred on greens or commons. Rural lanes and tracks with wide grass verges and ditches.
- Small towns and villages are scattered among areas of woodland, permanent grassland and hedgerows on the heavy clay soils where larger 20th-century villages have grown around major transport routes.

Physical Landscape Character

This predominantly low-lying Local Landscape Character Type (LLCT) is characterised by a lower level of tree cover than much of the study area, and very gently rolling topography. The landscape is largely rural, comprising a mixture of small pastoral fields, and larger fields managed as arable land. The lowest lying areas also have a presence of some floodplain grazing marsh. This lowest-lying land frequently encompasses a network of man-made drainage ditches, which add to the existing naturally occurring small watercourses that criss-cross the landscape, many of which flow into the main drainage channel that crosses this LLCT, the River Cuckmere. Field boundaries are predominantly hedgerows, with occasional hedgerow trees and shaws, usually associated with smaller pastoral fields. Settlements are small and scattered, and include a number of farmsteads.

[1] taken from www.wealden.gov.uk/nmsruntime/saveasdialog.aspx?lID=16778&sID=2131

Landscape Sensitivity

Overall, the Open Clay Vales LLCT is assessed as having High Landscape Sensitivity. There is a strong strength of place as a result of open views southwards to the ridges of the South Downs and a recognisable landscape pattern of arable/pastoral fields and stream corridors. The landscape also has a strong landscape structure, resulting from the networks of mature hedgerows and trees lining road corridors. There is strong historic continuity throughout the LLCT, with many ancient field patterns apparent. Overall visibility is considered to be moderate. Landform is predominantly flat and is considered to be visually insignificant. There is also a strong sense of openness throughout much of the LLCT.

Arlington

The large expanse of Arlington reservoir is the key landscape feature within this LLCA. Open views across the water from locations in close proximity to the reservoir are a key feature. In addition, views southwards to the ridges of the South Downs contribute to recognisable sense of place. The reservoir is a nature reserve and is designated as a Site of Special Scientific Interest for its ecological interest. The northern and western edges of the reservoir are fringed with mature woodland. The River Cuckmere valley runs north-south through the eastern part of the area, to the east of the reservoir. This is lined with a patchwork of arable and pastoral fields. Settlements include the small village of Arlington, to the east of the reservoir and the small hamlet of Berwick to the southwest, which has developed in conjunction with the railway corridor. The railway corridor crosses the southern part of the area and the A22 main road corridor forms the southern boundary. Both of these transport corridors introduce a source of noise and movement to this otherwise predominantly tranquil landscape.

Site Description

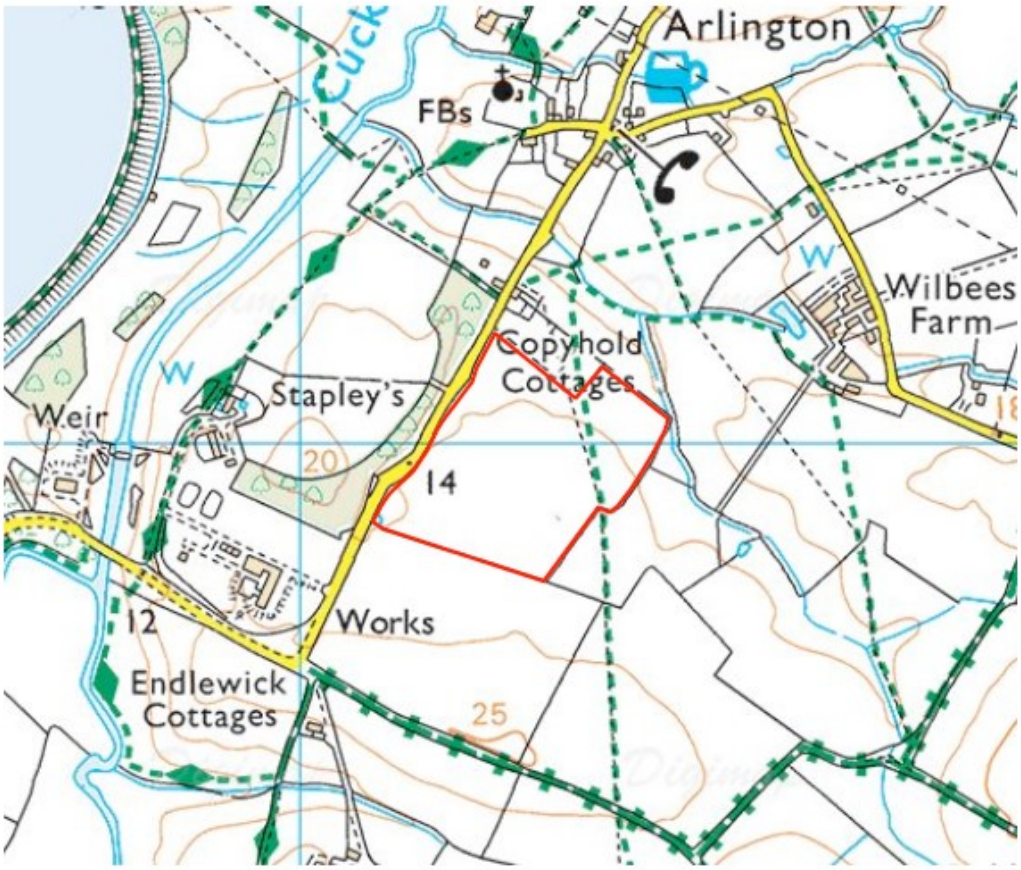


Fig. 1 The site – outlined in red

Wilbees Farmland is located in the Weald of Sussex with views towards the South Downs. It is about 10 miles from Lewes and 9 miles from the South Coast and lies on the immediate outskirts of the village of Arlington.

The 7.5ha site is located on farmland in the southern part of the Low Weald. The site is situated adjacent to the 15 ha site on which Wilbees Solar Farm is under construction.

The field in question is a level block of Grade III arable land extending to some 18.54 Acres (7.5 Hectares), with long frontage to the lane on its western boundary (Fig. 1). The field had been down to maize for about 10 years and was pasture prior to that (Rodker, pers. Comm., 2016). An underground cable has now been installed leading from the Solar Scheme on land to the south of the field (Lambert & Foster, 2016) which crosses the whole site leading in a north-easterly direction (Fig. 2). The highest part of the Site is located on the south side

at approximately 25m aOD (Fig. 3). The lowest part of the Site is at the north-west corner at approximately 15m aOD (Fig. 4).



Fig. 2 Hedge boundary to land field



Fig. 3 Route of underground cable across field



Fig. 4 Southern hedge



Fig. 5 View towards Northwestern corner

There is a footpath that crosses the land, cutting from the western side and running north-north-eastward and leaving to the northern side of the site. The Site is bounded on its east side by woodland and an extensive area of woodland, Abbots Wood, is located approximately 900m to the north-east.

The solid geology within the Site comprises Mudstone of the Weald Clay Formation. This sedimentary bedrock was formed approximately 121-132 million years ago in the Cretaceous Period within a local environment dominated by swamps, estuaries and deltas (BGS, 2014 quoted in Cotswold Archeology, 2015).

Methodology

This appraisal entails several different elements, with different methodologies.

Biodiversity: This section is based largely on a desk-top review of data for the site and the surrounding 2 km (radius) area provided by Sussex Biodiversity Records Centre (Appendix 1). Their data is specifically designed to be well suited to applications for planning permission on the site in question (Sussex Biodiversity Records Centre, 2016). The data specific to the grid squares in which the field lies at site specific locations is in Appendix 2.

A visit to the site in August 2016 and another in September 2016 allowed additional field observations to be provided. These are for a snapshot in time and not comprehensive, but provide some supporting field-based evidence. The field was traversed 3 times in different directions and the entire field boundary was walked.

Natural capital: There is, as yet, no single, agreed, standardized method for the assessment of natural capital, despite widespread agreement across government of the importance of taking account of natural capital in decision-making, the establishment of the National Natural Capital Committee and a good deal of academic research on methodologies..
The key components of the Natural Capital of a given site are determined by its:

- underlying geology
- soil type & soil health
- Water resources and flows (hydrology)
- The vegetation/habitat type/s and the health of those
- The biodiversity

The preliminary natural capital assessment here is based mainly on field observation of soils and water on site, with a little input from desk study using the data provided by SBRC on habitats and on soil analysis carried out by Brogdale for ELC.

Underlying geology comes from the desk study, as do basics of soil type, habitats, vegetation and biodiversity. Soil type and habitats have been verified by field observation with vegetation and biodiversity records also backed up by field visits.

Soil: 20 cm x 20 cm samples of soil were dug to 15 cm deep at 5 sites across the field. The soil-type was assessed by hand (Grant, 2002a). The soil profile was also examined and the soil from the sample checked visually for humic matter and living plant biomass (roots, etc.) (IBERS, undated).

At each sample site, the soil from this area was dug out and sorted by hand (AHDB, 2016). Any living, macro-invertebrate soil fauna was identified (to Order or ecological niche) and recorded.

Water: Water and water flow was assessed visually.

Vegetation Cover: This was assessed in the field using the Braun-Blanquet technique (Grant, 2002b)

Vegetation/habitat type/s and their health: Assessed visually

Biodiversity: Covered in the sections on biodiversity

Ecosystem services: As with natural capital assessment, no standardized method has yet been agreed for ecosystem service assessment at site-specific level. The guidance outlined in Everard & Waters (2013) is more detailed and comprehensive than is required for this preliminary Ecological Appraisal. This section is thus based on appropriate elements of that guidance and one of the templates provided is used along with expert knowledge and experience supplemented by limited field verification of the habitats, their size and their health, so as to arrive at a list of ecosystem services being provided and a ranking of the amounts likely to be produced (-ve; 0; minimal; low; moderate; high – see Appendix 3).

Current Status of Site

The biodiversity of the field portion of the site itself is of low value, but the biodiversity value of the hedgerows – particularly those that contain mature trees – is much higher (see biodiversity section) and demonstrates the potential to rehabilitate the field through working with the surrounding natural ecosystems.

Biodiversity is an important element in an area's natural capital and underpins the ecosystem services provided from any given area of land or water, thus biodiversity, natural capital and ecosystem services are all inter-dependant. However, a given site is also not existing in isolation and there is a constant potential for exchange between any given site and its surrounding area. Just as an area can have its biodiversity and natural capital reduced through certain types of intensive management, it can also see enhancement of both these vital natural elements given appropriate management. Below, each of these issues is treated independently, but the reader needs to know the importance of the inter-relationship between these issues and their dependence on land-use and management. Management of one site will impact on others, directly or indirectly, which means that management practices that recognise this can be very positive in terms of building the health of ecological processes and functioning, so benefitting overall levels of biodiversity and natural capital. This, in turn, benefits the people living nearby and (potentially) further afield.

Biodiversity

Habitats

The site is composed of 2 basic habitats

i) Fallow arable agricultural land with ruderal weed species

ii) Mature hedgerows

Species from Protected Species Register

There are none recorded from the site.

There is a record of Great Crested Newt from Wilbees Farm garden nearby (record from 2002), but at present no suitable habitat on the site for this animal to inhabit.

Rare Species Inventory

There are no species from the rare species inventory recorded from the site and none were seen during the site visits in August and September.

BAP species

No BAP species were recorded from the site itself.

Bats

No bats have been recorded from the site. Dusk observations (visual and with a bat detector) at the site on 15th September revealed no sign of bats. However the hedgerows bordering the field consist of a good number of old, large trees with splits, cracks, loose bark, holes and crevices that are especially attractive to bats.

Notable birds

Notable birds: Only one of the notable bird species was seen (or heard) during site visits – a small feeding group of house martins. Fifteen species have been recorded from Wilbees farm (but none from the site itself). These are considered in the section on the surrounding area.

Other birds

An additional 63 species of birds have been recorded from Wilbees Farm (though not necessarily from the site); these are mostly common, widespread species but do include Woodcock and nightingale amongst others (see Appendix 2). Very few species were seen on site (either in the field or in the surrounding hedgerows) during field visits – only 10 species during 5 hours.

Alien Invasive species

One species of insect, the Harlequin ladybird, has been recorded at Copyhold Cottages bordering the site – see Appendix 2. None of the alien invasive species were seen on site during the field visits, except for one – a single individual Harlequin Ladybird *NB*. This is a highly mobile insect that can turn up almost anywhere, regardless of the nature of the site.

Some of the ruderal “weed” plants currently observed in the field (post arable cultivation) are also characteristic of neutral grassland communities in the locality. Species include Marsh Cudweed, Fleabane, Red and White clovers and Birdsfoot trefoil. These are providing some biodiversity value.

Natural Capital

Geology

Sedimentary – mudstone

Soil

Wealden Clay. A brown clay, flecked with patches of grey (in some places, not others). Very even consistency with no large stones and very little gravel within it.
pH 6.2-6.5 (depending on position in field)

Soil profile

The soil has a very even profile to a depth of approx. 30-40 cm with just one visible horizon. There is very little or no sign of organic/humic matter in the soil (Fig. 6 a & b).

Evidence of compaction – there is clear surface evidence of soil compaction from the recent passage of heavy vehicles. However, deeper in the soil there is little evidence of air holes or holes caused by animal movement and the soil appears fairly compact to at least 30-40 cm.

Fig. 6 Soil profile – a) a sample removed b) profile elsewhere after soil removal





Soil health

deficient

pH: deficient - normal
pH 6.2-6.5 (depending on position in field)

Nutrients:

P – 16-24 - low
K - 74-155 - deficient
Mg – 52-87 – deficient-nr. optimum (depending on site)

N_2 - unknown

The abundance and distribution of nettles (*Urtica dioicea*) across the site does not suggest high levels of nitrogen in the soil. Nettles are present in low densities, they are relatively small plants and not very vigorous; the opposite would be characteristic of soils with high N_2 content.

Organic/humic matter

Little or no organic matter can be seen within the soil. The soil has poor structure.

Soil functioning (health of soil processes)

There is low abundance of life in the soil. No worm casts were seen whilst walking across the field (several transects were walked – 3 entire widths/lengths of the field). From the 5 soil sampling areas it is estimated that worms occur at about 115/m^2, which is low for an ecologically healthy, self-sustaining soil. It is also low by comparison with, for example, grassland soils, but not unusual for intensive arable fields (where numbers may drop as low as 62/m^2). Density of the 4 other macro-invertebrate groups (slugs, enchitraeid worms, beetle larvae and centipedes) found in the samples was very low, as is characteristic of soils with low organic matter content. Larger meso-fauna - collembola (springtails) and soil mites - seen were also counted and again densities were low or very low (although clearly the smaller meso-fauna in these groups would not have been seen in the field due to their small size).

Soil samples taken from areas with clover cover showed higher densities and diversity of all the soil fauna that was seen.

Soil-Water

Soil moisture – The soil varied from moist to dry across the field – moist
near the hedgerows and dry anywhere from 20 m in from the hedges and across the open part of the field. No quantitative measure was made.

Water holding capacity – This has not been assessed, but is likely to be high.

Field capacity – as above.

Water (hydrology)

The site was very dry on the day of the main field visit and no water was visible on site, including in the hedgerow ditch along the length of the western hedge-line.

The small pond at the south-western corner of the site is fenced off and dry – i.e. no standing water, although the soil/silt at its base was very wet immediately below the surface and to at least 20 cm depth.

During the first site visit in August, there was standing water in the bottom of the deep channel cut by mechanical diggers to sink the electric cable from the solar farm in the neighbouring field. The water was at approx. 50-60 cm below the soil surface at that time (*NB*. There had been relatively recent rainfall across the area in the previous days).

The water table was not assessed, but this information should be available via the Environment Agency

Water flows

No surface water was flowing on site on the days of the site visits. The small watercourse that clips the north-east corner of the site was heavily overgrown and completely dry. There was little evidence that the northern corner of the site, despite being the lowest point in the field, is any damper than across the rest of the field apart from a slight change in the ruderal vegetation in this area – there were no particular indicators of moist soil within this change in vegetation.

Vegetation/Habitat Type and Health

Semi-natural, highly anthropogenic, a 'fallow'/uncultivated conventional arable field with mature hedges on three sides. The field may be an assart created many centuries ago (Bannister, 2010), with the hedgerow on two sides indicating that it was previously mature woodland. The hedgerow on the third side has been coppiced and shows evidence of current coppice hedgerow management on the road side. The field itself comprises typical arable, roadside and waste area ruderal 'weeds', low in species richness.

Field Vegetation

This is low in biodiversity and devoid of anything other than common, ruderal annuals/perennials (see biodiversity section). The average number of species seen per m^2 across the whole field was 6.2 (with the range 3-9/m^2).

Vegetation cover

Vegetation cover is varied across the site. There was bare soil along the line of the electric cable, over a width of 4-5 m. Also, there was bare soil over the area of the 'drainage pit' recently dug near to the site entrance and in limited areas near the West hedge-line where there had been heavy vehicle movement. Over the rest of the field the cover was either abundant or dominant (according to the Braun-Blanquet scale (Grant, 2002b).

A number of the ruderal annuals present are recognised as having 'biodiversity value' (Clarke *et al*., undated).

Hedge vegetation – Varies between the hedgerows and within each hedge, but is reasonably biodiverse for its small area and mostly well structured. Key large, mature trees comprise English Oak (*Quercus robur*), Ash (*Fraxinus excelsior*) and a few very large Willows (*Salix* sp.), whilst there are also Field Maple, Holly, Hazel, Hawthorn, Elder, Crab apple and Blackthorn mixed amidst them. Notably, along the roadside, the hedge is principally hazel that has been maintained as coppice in recent times, on stools that appear reasonably old (and large).

Ecosystem Service Provision

The site is relatively low in ecosystem service provision, both quantitatively and in variety provided. We consider the field itself separately from the hedgerows to show the distinction in benefit provision.

The field would have produced food whilst under conventional agriculture, though indirectly when it was an arable field – it was used for growing maize, presumably for cattle feed – hence part of the food chain to provide meat for the butcher or supermarket. The field itself currently supplies little in the way of ecosystem services – no provisioning services (except potentially a minimal medicinal herb provision via dock plants and camomile), a minimal to low amount of regulating services (pollination from flowering weeds, soil erosion control from vegetation cover, carbon sequestration (to a minimal degree) from plant metabolism and carbon storage in roots, etc.) and provision of cultural services is also low-minimal. There is low primary production on site and nutrient cycling due to the nitrogen fixing ability of the clovers that appear within the ruderal vegetation, thus there are small amounts of supporting services in action.

Of the 27 groups of ecosystem services listed in Waters & Everard (2013), only 5 are provided by the field at low levels. Fifteen of these ecosystem services are provided at minimal levels by the field; the other 7 are not provided at all.

The hedgerows provide multiple ecosystem services, but in relatively small quantity due to their limited area. Of the 27 ecosystem services tabled in Everard & Waters, 21 are provided by the hedgerows at low or moderate levels. Only 2 are not provided at all.
Specifically, the hedgerows offer low levels of provisioning services such as wild food, materials (e.g. hazel for hurdles, bean poles, willow for basket making, etc.) and fuel wood; regulating services such as soil erosion control, pest regulation, pollination; cultural services such as aesthetic value, recreation/leisure (e.g. bird watching); supporting services such as primary production, soil formation, nutrient cycling and habitat.

To sum up, the current status of much of the site is poor with regard to biodiversity value, Natural Capital and Ecosystem service provision, these being provided very largely by the surrounding mature hedgerows. These biodiverse hedgerows demonstrate the Natural Capital potential to integrate wildlife conservation with production of goods for people (e.g. hazel coppice, a particularly delicious variety of blackberry, etc.) and many other services too. They also provide an example of effective use of space to maximise yields of a range of “crops”.

Current Status of Surrounds (extending to 2 Km)

Current biodiversity and ecosystem service values of the site itself are low, but potential values are high given the bio-climate of the area and that the site was once (almost certainly) species rich, broadleaved woodland. Reference to the surrounding hedgerows and adjacent (managed) woodland indicate the potential to achieve structurally diverse functional ecosystems or agro-ecosystems on this site.

Biodiversity

Habitats:

The surrounding 2 km contains a variety of habitats:

i) Open water
ii) Reed beds (a small area)
iii) Woodland (including ancient woodland)
iv) Traditional Orchard (a small area)

v) Flood plain grazing marsh

vi) Agricultural land

Specific different habitats are considered in more detail under the Natural Capital heading, below.

The environment surrounding the field comprises a diversity of habitats of varying biodiversity value. Much of the biodiversity, especially rare and notable species are concentrated in a few key specific sites that have been well recorded. The mature hedgerows and network of watercourses provide reasonable spatial connectivity, not only enhancing the viability of individual sites and species but also potentially increasing resilience and adaptation to environmental change, especially climate change.

Although some is arable, much of the agricultural land in close vicinity to the field is pasture with cattle or sheep grazing. A large proportion of agricultural land slightly further afield (though some within half a kilometre) is under Environmental Stewardship Agreements, both Entry Level Stewardship (ELS) and Higher Level Stewardship (HLS), some of which is also organic. This level of sensitive management provides some continuity through the landscape with regard to conservation of wildlife and biodiversity.

Species from Protected Species Register

There are 7 species recorded from the 2 km around the ELC site – 1 flowering plant, 1 amphibian, 3 reptiles and 2 mammals:

Spiked Rampion (*Phyteuma spicatum*)
Great Crested Newt (*Triturus cristatus*)
Slow-worm (Anguis fragilis)
Common Lizard (*Zootoca vivipara*)
Grass Snake (*Natrix natrix*)
European Water Vole (*Arvicola amphibius*)
Hazel Dormouse (Muscardinus avellanarius)

All of these were recorded in areas of known high biodiversity value and most records were from Abbots Wood or Arlington Reservoir SSSI. Some species may be more widespread in the area than records indicate. An example is the Hazel Dormouse, a protected species that has been recorded from both Arlington Reservoir and Abbots Wood.

Rare Species Inventory

There are 107 species from the Rare Species Inventory recorded from the 2 km area surrounding the ELC site, indicating the rich and important biodiversity in particular habitats around the site. One of these species is a Bryophyte (liverwort), 17 are flowering plants, 8 fungi, 78 insects and 2 species of fish.

There is 1 liverwort species (Large-celled Flapwort (*Lophozia capitata*)) and one aquatic flowering plant (Frogbit (*Hydrocharis morsus-ranae*)), recorded near to the ELC site. Records are not particularly recent - 2006, or old - (in the case of the liverwort) from 5 decades ago, 1961.

Three additional species are recorded from the same grid-squares, but from further afield. All these are highly unlikely to appear on-site under current conditions as no suitable habitat exists for them - 2 species of dragonfly (Small red-eyed damselfly (*Erythromma viridulum*); Scarce chaser (*Libellula fulva*)) generally found near on around standing or flowing water and 1 beetle species (a rove beetle – Staphylinidae - (*Gyrohypnus atratus*)) that appears to be a woodland species.

BAP species

Fifty BAP species have been recorded from the 2 km area around the ELC field, again demonstrating the rich biodiversity of the surroundings. Of these, one is a Bryophyte, 3 are flowering plants, one is a lichen, 34 are insects, 2 fish, 2 amphibians, 3 reptiles and 4 are mammals.

Five BAP species have been recorded from the same grid reference as the ELC site, but none from the site:

Lophozia capitata	Large-celled Flapwort
Tyria jacobaeae	Cinnabar moth
Coenonympha pamphilus	Small Heath butterfly
Lasiommata megera	Wall butterfly
Triturus cristatus	Great Crested Newt

Bats

Seven types of bats have been recorded in the 2km surround the site. Of these, only 4 have been identified to species: Brown Long-eared bat (*Plecotus auritus*), Common Pipistrelle (*Pipistrellus pipistrellus*), Saprano Pipistrelle (*P. pygmaeus*) and Serotine (*Eptesicus serotinus*). Two have been identified just to genus (*Plectotus* sp. And *Pipistrellus* sp.) and

the other 2 records are just for bats (Chiroptera). All of those recorded to species level are common and widespread.

The range of suitable habitats for bats is good with the pattern of woodland, diverse hedgerows, pasture, open and flowing water. It is likely that bats have been under-recorded within the area because it holds records of only five of the 18 bat species resident in the UK (all of which have been recorded in Sussex).

There are records of 2 species (possibly more) from near the site though not actually recorded from the hedgerows around the field site: Common pipistrelle and Brown Long-eared Bat. The pipistrelle was recorded in 2015, but the Brown long-eared bat in 1989 (although an unidentified species of *Plecotus* – very likely the same species – was recorded in Arlington in 2011).

Birds

251 species of birds have been recorded in the 2 km area surrounding our site of interest, which amounts to getting on for ½ the UK species list.

Notable birds

Immediately abutting the field, to the west, is Arlington Reservoir Local Nature Reserve and SSSI, managed under Higher Level Stewardship (HLS). A significant proportion of this comprises open water which is important for bird passage migrants as well as resident species, with over 170 species of bird recorded, some species at times gathering in vast abundance. Thirty-seven of the Notable bird species recorded within 2km radius of the field that are associated with wetlands, occur adjacent, in the Reserve. Interestingly, other notable bird species, not normally associated with open water, such as Grey Partridge and Quail, have been recorded from Arlington Nature Reserve. This may perhaps partly reflect sample effort (public access, bird watchers) but is likely that it also reflects the level of protection and appropriate management the reserve affords. This could indicate the potential of other sites in the area to support these species, given appropriate management.

A number of notable birds of prey are also predominantly recorded from Arlington Reservoir Reserve (some only as passage migrants), including Red Kite, Marsh Harrier, Honey Buzzard, Osprey, Hobby, Peregrine, indicating sufficient abundance of prey species.

The status of some species recorded for the locality may currently be in decline or even lost. An example is notable birds recorded in the locality such as Lapwing last recorded in 2010

though not recorded as breeding since 2004 and Snipe last recorded in 2012, though not recorded as breeding since 1985. It is unclear if breeding birds of these species continue to inhabit the area unrecorded, or if recent environmental change has rendered former sites unsuitable.

Fifteen species have been recorded from Wilbees farm (but none from the site itself). These are: Black Redstart; House martin; swallow; swift; long-eared Owl; barn owl; Turtle Dove; Snipe; Lapwing; Hobby; Red kite; Heron; Little Egret; any of which may have been seen in or flying over the site.

There are also 3 additional species – Widgeon, Garganey and Kingfisher – seen at the same grid reference, but almost certainly all at the pond at Wilbees Farm.

Many of the records are not recent, the most recent for Wilbees Farm being in 2012 for swallow, turtle dove, snipe, little egret and grey heron, in 2011 for swift and barn owl, in 2010 for Lapwing and in 2009 for Black redstart (see Appendix 2).

Within one kilometre of the field site is another important site for biodiversity, Abbots Wood, managed by the Forestry Commission. Many rare species recorded in the area are predominantly recorded from Abbots wood (51 rare invertebrate species) whereas only three rare invertebrate species are primarily recorded from Arlington Reservoir and environs. However, there are also many species common to both sites. Other woodlands of high biodiversity value such as Beaton's Wood, a Site of Nature Conservation Interest and ancient semi-natural woodland site. Beaton's Wood lies close to Abbots Wood and is tenuously connected to Abbots Wood for species able to navigate hedgerows.

Natural Capital

Geology

Sedimentary rock – mudstone

Soil

Wealden Clay. This has not been sampled across the whole area, but a few samples taken in grassland near the Cuckmere river near Arlington and in woodland soils on both sides of the Wilbees Farm field indicate a brown clay, mostly of even consistency with few stones and little gravel.

pH – untested.

Soil profile

The soil profile has not been investigated across the 2 km area, but the small samples taken (all within 1 km of the centre of the field, see above – Soil) showed an even profile in the surface soil, with just two visible horizons to a depth of 10-15 cm: the top horizon comprising darker, humic matter (2-5 mm, depending on habitat within which soil taken); the second being even, brown clay.

There is very little or no sign of organic/humic matter in the second horizon within in the soil.

Evidence of compaction – Not widely assessed. Little or no evidence of soil compaction in any of the samples taken (see above), but particularly the woodland soils, showed better soil structure than all the samples taken in the field.

Soil health

Moderate-good
pH: untested
Nutrients - unknown
Organic/humic matter – not widely assessed across area.
Soils examined surrounding the field had a more crumbly texture and better aeration than that from samples taken in the field, indicating better water infiltration and root penetration.

Soil functioning (health of soil processes)*:* unassessed over the wider area. There is, however, good reason to assume that the soils in the pasture grasslands will have healthier ecological functioning than the intensive arable soils; pasture grasslands will vary in health of ecological functioning depending on their degree of 'improvement' (i.e. pesticide and artificial fertilizer input, length of 'ley' period, etc.), with unimproved, seasonally grazed grasslands/meadows being of higher biodiversity and with semi-sustainable, functioning soil ecology – albeit a functioning that is transitional, given that were natural processes to prevail, the ecology would shift to scrub and then woodland via ecological succession. Woodland is the natural vegetation/habitat for this area and the longer the woodland has been established, the healthier the soil functioning is likely to be.

The wetlands and wet woodlands will have their own soil ecology and, again, the more 'natural' and unmanaged they have been (over long periods) the healthier is likely to be their soil functioning.

Soil-Water

Soil moisture – Not examined

Water holding capacity – This has not been assessed, but is likely to be variable across the area.

Field capacity – as above.

Water (hydrology)

Water resources and flows (hydrology)

There are significant water resources across the 2 km area surrounding the site.
Arlington Reservoir is an artificial lake of approx. 35 ha and holding approx. 750M l water at capacity (BBC, 2016).

The whole area is crossed with an extensive range of small streams, rivulets and by the Cuckmere river which exceeds 5 km of flowing water across the area (Appendix 1, Habitat & Natural Features Map (SxBRC/16/414)). The river flows, slowly during its passage through this area, from North to South (approx.) and is fed by numerous small tributaries – originating from a large number of small springs via both natural brooks, streams and other watercourses and via man-made ditches – running mostly westerly from the eastern side of the area, with a few short tracts from the westerly side towards the east and into the river.

There are quite a number of small or very small ponds & other areas of standing water scattered across the area, including several on Wilbees Farm land and patches of its land that have been recently sold. It has not been possible within the scope of this appraisal to examine these to assess their value as Natural Capital, nor their ecological health.

Milton Gate Marsh consists of two wetland depressions forming a valley fen on alluvial soils created by the River Cuckmere and one of its tributaries. Agriculturally unimproved and marshy grasslands dominated by rushes and sedges make up much of these depressions, but there are also areas of reed bed, sallow carr

and open water. This mosaic of habitats supports a rich assemblage of invertebrates including one proposed Red Data Book+ species, and numerous nationally rare and scarce species. The site is also of local importance for the breeding bird community it supports (Natural England, undated).

There is also an area of floodplain grazing marsh along the Cuckmere river towards the southern border of the 2 km area, some of which falls within Milton Gate Marsh SSSI, but not all. This area will provide a different (and increasing rare) type of natural capital from the other wetland areas.

Water is an important element in the natural capital across the area.

Vegetation/habitat type/s and their health

The area is predominantly agricultural land, the majority of which is arable although there is a swath of pasture relatively close to the site itself. Visual assessment of the 2 km radius area around the site indicates approximately:
55% Arable
20% pasture/grassland
10% woodland (the majority of which is ancient woodland ±6-7%)
7% wetland/watercourses
5% built environment
1-2% hedgerows

Most of the habitats that are not farmland are protected in some way and/or managed for wildlife to some degree and thus their ecological health is likely to be moderate to good. There are 2 SSSI's within the area, Arlington Reservoir SSSI and Milton Gate Marsh SSSI. There are also 4 Local Wildlife Sites within the 2 km radius Abbot's wood, Beaton's Wood (SNCI CW28), Monken/Monkyn Pyn – (SNCI CW21), Ludlay Coppice (SNCI CW94) and Abbot's Wood (SNCI CW92).

The surrounding 2 km also abut the South Downs National Park, who's border passes between Wilmington and Wilmington Green.

Ludlay Coppice CW94 is a small woodland, situated on the opposite side of the road from, and directly opposite to, Arlington Reservoir, a designated Local Nature Reserve. It is marked on the Ancient Woodland Inventory as a semi-natural ancient woodland, that is, continuous woodland cover has been present since at least 1600 AD.

Monken/Monkyn Pyn – (SNCI CW21)
Small but diverse area of predominantly neutral, species-rich, unimproved grassland with small areas of scrub, bisected by a minor road.

Beaton's Wood – (SNCI CW28 TQ554080) An ancient wood of Oak-Bracken-Bramble type. There is also some Hornbeam coppice. This site is of high conservation value as it is a good example of typical Wealden Bluebell wood. It is one of the most southern blocks of ancient, semi-natural woodland on the Weald and is a typical example of a Wealden Bluebell wood. There are also 3 small areas of traditional orchard (see Appendix 1 SBRC report Habitat & Natural Features Map (SxBRC/16/414)).
The agricultural land also has a significant proportion under Entry Level plus Higher Level Stewardship agreements (Appendix 1 Ownership & Management Map (SxBRC/16/414)), indicating both higher biodiversity and higher natural capital in these areas as a result.

Vegetation cover
Varies with habitat-type across the area. It was not possible to assess this over the entire area as part of this preliminary ecological assessment.

Biodiversity
This has already been examined in some detail above (see pg. 23)

Ecosystem Service provision

Since the area is rich in Natural Capital and biodiversity which underpins ecosystem service provision, provision of these services is good. Of the 27 ecosystem services from Everard & Waters, all 27 are provided within the 2 km^2 surrounding the ELC site. By way of example, Table 1 describes just the provisioning services.

Table 1. Provisioning services provided over the 2 km radius area surrounding the ELC site south of Copyhold Cottages, Arlington.

Category	Type	Nat Cap source	Status
Provisioning	Fresh water	Arlington reservoir, Cuckmere river, groundwater	Arlington Reservoir is the source of drinking water for households over a wide area

	Food - Wild food	Arable & pasture land Abotts Wood, hedgerows, Cuckmere river, Arlington Reservoir	Large quantities from both arable farming and from pasture (providing milk & meat) Abbotts wood is seasonally rich source of mushrooms and fungi; it also has nut trees and brambles, rosehips, etc.; The Cuckmere river is used by anglers, as is Arlington reservoir; the whole area is well supplied with hedgerows that provide a variety of wild food
	Medicinal herb/products	Wetlands, woodland, grassland	A range of medicinal herbs and other plants are found in the habitats mentioned
	Fibre and fuel (e.g. timber, wool, etc.)	Woodlands, hedgerows, Osier beds, grasslands	Some coppice woodland locally is used for firewood production, some for fencing materials; Osier beds provide willow for basket-making and the hedgerows also provide a wide variety of materials for basket-making and other hand crafts; there is sheep production locally, providing some wool

Clearly, regulating services such as water regulation by ponds, ditches, streams, river, lake, trees, woodland, hedgerows are of high importance in the area. The interconnected mosaic of habitats and patterns of land use ensure that provision of cultural services such as recreation, health and livelihoods is good. Supporting services are also strong, particularly primary production, nutrient cycling, habitat provision, the water cycle, etc. Importantly, since there are interactions and interdependencies between ecosystem processes (as there are between species), the services from a healthy landscape are greater than those from its individual habitats alone.

Scope for Ecological Restoration and Rehabilitation

As suggested in above sections, in part due to its strategic location, there is opportunity for the ELC site to be enriched by ecological restoration for the benefit of livelihoods of on-site smallholders and also for targeted species as well as biodiversity in general, extending to contributing to the living landscape.

Of primary value, will be strengthening woodland continuity in various parts of the site and especially along the southern margin where a fine band of wooded connectivity currently exists.

The small pond at the south-western corner, although overshadowed by Sallow and currently dry, is perhaps seasonally wet and until recently connected to a drainage ditch. It may be of value to consider enhancing the biodiversity value of this pond and perhaps also creating a small wetland area at the extreme north eastern corner associated with the small stream tributary of the River Cuckmere that clips this corner of the site.

There will be benefits from some ecological rehabilitation of the field site if it is to supply sustained livelihoods for future smallholders. Rehabilitation will entail a focus both on recovering a functional soil ecosystem and on ameliorating hydrological flows.

Currently, as above sections indicate, the field has been depleted of ecological resources and the soil has been exhausted through intensive arable production to the extent that the soil ecosystem is very low on organic material that will help it function sustainably. It is important to recover a functional soil ecosystem so as not to be reliant upon high inputs to increase short-term fertility. Aside from specific measures to stimulate soil aeration and structure, and accumulation of organic matter, advantage can be taken of surrounding more intact ecosystems to repair the soil ecosystem. Examples include seed sources and important soil organisms such as mycorrhizal fungi. Vessicular Arbuscular Mycorrhyzae (VAM) have been found to increase health and yields of many fruit and vegetables including aubergine and cucumber. Adjacent areas are likely to support VAM as part of a functional soil ecosystem and there are ways of cultivating VAM on site and inoculating the soil appropriately. Mycorrhizal fungi will help make more use of what little potassium there is.

Since, clay soils of this type are always ‘heavy’ and prone to waterlogging and that hydrology has been compromised due to past intensive management and compaction from heavy machinery, it will be important to recover more natural hydrological flows within the site. This

might include specific measures to collect and store rainwater, perhaps on the slightly higher ground that would offer the option of then directing the flow of water across and through the site. This would also reduce the likelihood of runoff and erosion resulting from storm water, promote water infiltration through the soil and increase availability of water over an extended period of time. Plantings of species with varying root structures and water uptake, that are adapted to clay soils, will also help improve hydrology.

Reference (via careful observation) can be made to the specific ecological processes enabling healthy functioning of the natural ecosystems surrounding the site for both ecological restoration and for site rehabilitation.

Qualitative Evaluation of Natural Capital Potential of the Site

However, appropriate future management of the site may bring the potential for the site as a whole to support very much greater biodiversity, including some of the protected, rare, notable and BAP species found within the vicinity. Although the site is not suitable for any more than the occasional visit from most of the notable bird species recorded close to the site (i.e. on other parts of Wilbees Farm or on Arlington Reservoir SSSI), there is potential to manage the site to benefit a number of the 15 species mentioned in the Biodiversity Section, since they either currently or previously inhabited the locality e.g. Swallow, Housemartin and possibly Lapwing & Snipe that may be in decline in the area.

There also exists the possibility of habitat connectivity for some species between Arlington Reservoir Nature Reserve and Abbots Wood via the hedgerow running along the south side of the field side. There would be high value in strengthening this linkage within the field site, whilst it could also support livelihood benefits for resident smallholders.

The Hazel dormouse may be using connecting hedgerows, particularly for dispersal. It would be of value to actively promote suitable hedgerow networks to secure the viability of this species. There is potential to enhance connectivity for the Hazel Dormouse at the field site. *NB.* The site field boundaries containing mature trees within species-rich and wide hedgerows, is likely to provide roosting as well as foraging habitat for bats. Again maintaining, enhancing and extending such tree-dominated areas on the site is likely to be highly favourable to bats.

It is not possible, at this stage in the process of ELC meeting its aims for the site, to know who will apply to live on the site, what types of activities they can demonstrate will allow them to make sustainable livelihoods from the land. Evaluation of the future natural capital

potential for the site is thus necessarily speculative, cannot be overly prescriptive and needs to be made in general terms.

However, based on the livelihood examples and the positive changes to the ELC site in Devon (ELC, 2016) the outlook for the Arlington site is good with respect to biodiversity, natural capital and ecosystem services, particularly given that the Greenham Reach site had considerably higher biodiversity value at the start than does the Arlington site.

Small, sustainable, farm-based livelihoods here would improve ecology, for example through planting of fruit trees - which increase opportunities for pollinators and other invertebrates; fruit and shelter trees for their water interception, plus carbon sequestration and storage; a mixture of crop plants means additional biodiversity – insects and invertebrates in particular, on site composting and leaf litter means more organic matter in soil, as do animal manures when well managed. The additional organic matter contributes to soil care and well managed planting design and care over water management means less erosion. All of these elements will increase the natural capital of the site and also the provision of ecosystem services from it. We estimate that the ecosystem service provision from the field alone could increase from 2 to as much as 20 ecosystem services, thus providing multiple benefits (even if at relatively low levels in some cases) to the smallholders and the surrounding community.

If the ELC also follow their model in Devon for this site and involve school visits as part of their programme, then the cultural ecosystem service of education from the site will increase.

It would be of value to consider the merits of two options with regard to site management by small holders. One scenario could be each of the three smallholders working on their plots as discrete units and the other with all three small-holders working in collaboration to achieve site wide improvements, particularly with regard to rehabilitation measures but also other measures that will enhance the Natural Capital, promoting more sustainable, assured livelihoods.

It is not difficult to deduce that the optimal way forward will be collaboration over site wide improvement measures, especially those described in the section on Scope for Ecological Restoration and Rehabilitation and earlier in this section. This would provide benefits to the small holders in the immediate and longer term, some benefits almost certainly extending to the wider community and to the health of the surrounding ecosystems and enhancing the overall Landscape Character.

An important consideration with regard to the viability of the proposed land management is that the field will be divided amongst three smallholders, each of whom will necessarily be highly motivated to manage the land in order to make a viable living within a few years and thereafter to make a sustainable living without expensive external inputs. This demands thoroughly considered business plans and investment in the site and its potential to offer ecosystem services (free and sustainable under appropriate management) – something the ELC model offers. This field is therefore likely to be managed more intensively from the perspective of natural capital, ecosystem health and biodiversity than previously and with a longer term plan than was previously possible under an annual tenancy in the context of a conventional market-driven business model. The ELC approach provides a different opportunity for livelihoods from this land, unavailable to the previous farmer.

Resilience and adaptation to external environmental change such as climate change will be an inevitable consequence.

The ELC proposals appear to meet the highest environmental requirements of the NPPF and also to directly assist Wealden DC policies on Green Infrastructure and biodiversity, as expressed in the WDC local plan.

Glossary

Assart: a piece of land converted from forest to arable use.

Ecological restoration: an intentional activity that initiates or accelerates the recovery of an ecosystem with respect to its health, integrity and sustainability.

Ecosystem services: the benefits people obtain from ecosystems, categorised as supporting services (e.g. nutrient recycling), provisioning services (e.g. food), regulating services (e.g. carbon sequestration), and cultural services (including sports).

Landscape Character: A distinct, recognisable and consistent pattern of elements in the landscape that makes one landscape different from another, rather than better or worse.

Low-impact: development which through its low negative environmental impact either enhances or does not significantly diminish environmental quality.

Natural capital: the world's stock of natural resources, which includes geology, soils, air, water and all living organisms.

Ruderal: A ruderal species is a plant species that is first to colonize disturbed lands.

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