Heckington Fen Solar Park

ENO10123

Environmental Statement | Volume 1: Technical Chapters

Chapter 16: Land Use and Agriculture

Applicant: Ecotricity (Heck Fen Solar) Limited

Document Reference: 6.1.16

Pursuant to: APFP Regulation 5(2)(a)

February 2023

Planning Act 2008

CHAPTER 16: LAND USE AND AGRICULTURE

Document Properties		
Regulation Reference	Regulation 5(2)(a)	
Planning Inspectorate Scheme Reference	EN010123	
Application Document Reference	6.1.16	
Title	Chapter 16: Land Use and Agriculture	
Prepared By	Heckington Fen Energy Park Project Team (Kernon Countryside Consultants Ltd)	
Version History		
Version	**Date**	**Version Status**
Rev 1	February 2023	Application Version

Table of Contents

List of Tables

Appendices

16 LAND USE AND AGRICULTURE

16.1 EXECUTIVE SUMMARY

This Chapter considers the potential effects of the Proposed Development on the agricultural land use of the Energy Park, and the potential effects on agricultural land quality and soil resources. In particular the Chapter considers:

(i) the agricultural land quality of the Energy Park and the extent to which the Proposed Development will result in the permanent loss or downgrading of the agricultural land involved;

(ii) the soil resource of the Energy Park and the potential effects of construction and decommissioning works on those soil resources;

(iii) the effects on agricultural land use, agricultural enterprises and production within the Energy Park;

(iv) the soil resource and the potential effects of the proposed Grid Cable Route.

The Energy Park has been surveyed and comprises a mixture of land qualities. The Energy Park comprises 49% land of the best and most versatile quality, being a mix of Grades 1, 2 and 3a in a complex pattern mostly intermixed with grade 3b, such that few fields are wholly of BMV quality.

It is considered that the installation of solar arrays has a limited effect on the underlying soil resource and the land quality and is a reversible installation. Accordingly, the underlying soil resource and land quality is not affected across the areas where panels will be located.

It is concluded that the area of land that is sealed (i.e. where soils are removed and buildings, stone or concrete are added, such that the agricultural land is permanently lost or lost for the duration of the Proposed Development), are limited and are mostly located on poorer quality land. Fixed equipment, tracks etc will seal less than 3 ha of BMV agricultural land, and 17.4 ha of poorer quality land. The overall impact is a moderate adverse environmental impact.

It is concluded that agricultural land use can and will continue for the duration of the Proposed Development.

It is concluded that the installation of the Grid Cable will not result in any long term or significant effect on soils.

16.2 INTRODUCTION

16.2.1 This section considers the potential effects of the Proposed Development on agricultural land and businesses during construction, operation and decommissioning. It identifies the baseline of the Energy Park in terms of agricultural land quality, soil type and distribution, and occupying farm businesses. It identifies the potential effects, both direct and indirect and negative and positive, within the Energy Park. This section considers the effects of the cable route corridor and substations within the Proposed Development.

16.2.2 Therefore:

- agricultural land quality, soils and farm business effects are considered within the Energy Park;
- soil movement and transient farm impacts are considered within the Proposed Development for the cable route outside the Energy Park area.

16.3 ASSESSMENT APPROACH

16.3.1 The key receptors considered in respect of agriculture are:

(i) agricultural land quality. The quality of agricultural land, its pattern and distribution, and the potential effects on the land quality as a resource, are considered. Land of Grades 1, 2 and 3a of the Agricultural Land Classification (MAFF, 1988) are defined as "Best and Most Versatile" in the NPPF (MHCLG, July 2021);

(ii) soil structure. Soil has many different functions and can be affected positively or negatively by land use and management even if agricultural land quality is not affected; and

(iii) local farm businesses. Land management is influenced by many factors, and the effects on the ability to farm land may have localised implications, positive or negative.

Methodology

16.3.2 This section considers all the land within the application site in respect of the proposed Energy Park. It considers the route corridor in respect of the proposed cable connection.

16.3.3 The following methodology is described:

- agricultural land classification assessment;
- soil survey assessment;
- land-based business assessment

16.3.4 The following terminology or phrases are used in this Chapter:

- ALC: This is the Agricultural Land Classification, a method for grading land according to its agricultural potential;
- Sealing: This terminology is taken from the Institute of Environmental Management and Assessment guide "A New Perspective on Land and Soil in Environmental Impact Assessment", and is a description of physical changes that in effect lose future agricultural potential use, i.e. it is irreversible development;
- downgrading refers to the potential change in ALC grade to a lower (i.e. poorer) ALC quality grading.

16.3.5 **Agricultural Land Classification.** Agricultural land quality is assessed using a system of Agricultural Land Classification (ALC). This was devised by MAFF in the 1970's. The ALC methodology was last updated in 1988 (the Guidelines).

16.3.6 The Agricultural Land Classification is based on the long-term physical limitations of land for agricultural use. Factors affecting grade are the climate, site, soil characteristics, and the important interactions between them. Climate and soil factors determine soil wetness and soil droughtiness, which influence the choice of crops, the level and consistency of yields, and the use of land for grazing livestock.

16.3.7 The ALC system is concerned with the inherent potential of land under a range of farming systems. The current agricultural use, or intensity of use, does not affect the ALC grade.

16.3.8 The ALC Guidelines do not specify a sampling density for ALC. A detailed ALC would normally involve sampling at a density of one auger per hectare, but for very large sites or where the agricultural land quality is not likely to be adversely affected, an alternative sampling density may be appropriate.

16.3.9 The sampling across the Energy Park site has been carried out in two stages, in consultation with Natural England and NKDC. Initially a semi-detailed ALC was carried out, involving sampling on a regular 200 metre by 200 metre grid. Some 138 auger samples were taken across the northern part of the Energy Park site, plus two soil pits were excavated to assess stoniness and better describe soil profiles. Three samples were sent to an accredited laboratory for particle size distribution analysis to validate the hand-texturing results. This provided a clear indication of the pattern of land quality over the Energy Park site.

16.3.10 The semi-detailed results were shared with Natural England, and an agreed additional sampling programme was discussed and agreed. A further 313 auger samples were taken in August and September 2022, covering most of the areas identified as BMV in the semi-detailed survey, and to refine the boundaries of BMV to non-BMV land. As a result of the additional sampling the ALC results show a more complex pattern of grades. We identified additional areas of Grade 1 in the east in particular, but a more complex mix of grades across the majority of the Energy Park, reflecting the historic effects of water on the soils.

16.3.11 The ALC has therefore involved a total of over 450 sampling points.

16.3.12 It has been agreed that the cable route involves temporary disturbance of the soils to enable a trench to be dug and the cabling to be inserted. This will not involve the sealing or downgrading of the land quality. Accordingly a walk-over soil survey of the cable route has been carried out, and a Outline Soil Management Plan (oSMP) (appendix within document reference: 7.7) created, but the ALC of that temporary works area has not been recorded.

16.3.13 **Soil Survey.** The soils on the Energy Park site were assessed and recorded as part of the field work for the ALC survey. The soils have been assessed at over 450 auger sample locations, as well as at the pits that were dug as part of the ALC. In addition, as shown below, a review of the open trenches which were being examined as part of the archaeological survey was also carried out.

Photos 1 and 2: Example of Open Trenches

16.3.14 The soil types were recorded from these surveys and this has enabled the types of soils to be plotted.

16.3.15 **Farm Businesses.** The farming circumstances of the occupying farm business have been identified and considered by Savills, and are reported as part of the ES at Appendix 16.1 (document reference: 6.3.16.1). The Farming Circumstances set out in the ES draws from a combination of this Savills report, direct contact with the management of the farm business and a walk-over survey of the Energy Park site in June 2022.

Methodology for Assessment of Significance

16.3.16 The assessment of significance is assessed using the methodology set out in the Institute of Environmental Management and Assessment (IEMA) Guide "A New Perspective on Land and Soil in Environmental Impact Assessment" (February 2022). This Guide, whilst not compulsory for an ES, sets out a suggested methodology for EIA.

16.3.17 The significance of effects is assessed based on a combination of considerations:

- the magnitude of the effect;
- the sensitivity of the resource;
- and therefore the significance of the effect.

16.3.18 The assessment of significance is based on the tables set out in **Appendix 16.2: Agricultural and Soils Significant Effect Methodology (document reference: 6.3.16.2)**. In respect of soils and agricultural land quality these tables take full account of the Institute of Environmental Management and Assessment (IEMA) Guide "A New Perspective on Land and Soil in Environmental Impact Assessment" (February 2022).

16.3.19 The assessment methodology identifies the sensitivity of the various receptors in terms of their importance (land quality) and their susceptibility to damage when being trafficked (soil type). It then identifies magnitude thresholds for environmental assessment and assesses the significance using a matrix of magnitude and sensitivity.

16.3.20 The impact magnitude in the IEMA Guide is based on the "**permanent, irreversible loss of one or more soil functions or soil volumes (including the**

permanent sealing or land quality downgrading)". The assessment therefore considers whether there is permanent sealing or downgrading of agricultural land as a result of the proposals.

16.3.21 Under the IEMA Guide the methodology considers the permanent sealing of land or ALC downgrading of more than 20 hectares to be a major adverse magnitude of impact. It considers losses of 5 – 20 ha to be a moderate adverse magnitude and losses of less than 5 ha to be slight adverse magnitude.

16.3.22 The IEMA Guide is not an obligatory methodology. It sets the thresholds for the major impact at 20 ha, which is the threshold for consultation with Natural England regarding the potential loss of BMV agricultural land. It has been common practice in EIA for major adverse magnitudes to have been set at the loss of 50 ha of BMV (ie Grades 1, 2 and 3a). Therefore, under the IEMA Guide agricultural impacts are generally recorded as more significant than previously assessed.

16.3.23 The IEMA methodology considers land of ALC Grades 1 and 2 to be of very high sensitivity, and land of Subgrade 3a to be of high sensitivity. The consequence of this is that the loss of any quantity of Grades 1 or 2 agricultural land, is recorded as a "moderate or large" impact. Therefore 0.5 ha of Grade 2 land is classified as a minor magnitude impact on a resource of very high sensitivity, which is a "moderate or large" impact in the IEMA tables. Professional judgement needs to be applied to the assessment.

16.3.24 The methodology considers soils of high clay content in wetter climate regions to be sensitive to damage from trafficking.

16.3.25 The IEMA Guide does not provide impact assessment guidance on assessing land use and farm business impacts. Farm businesses, and land-use (agricultural or otherwise) are generally management decisions and can vary over short periods of time, influenced by many factors (for example personal choice, weather, world prices, government policy, disease etc). The IEMA Guide refers at paragraph 8.3.3 to assessing the following impacts, but it does not set thresholds:

- land use changes;
- the proportion of a holding affected by land take;
- the effect on land management, access to land and severance;
- the loss of farm buildings and infrastructure.

16.3.26 The methodology in the ES considers farm businesses to be more resilient to change. Full-time businesses that are terminated by proposals are considered to be a major adverse magnitude of impact, with farm businesses less affected being moderate or minor magnitude impacts.

Legislative and Policy Framework

16.3.27 Land of ALC Grades 1, 2 and 3a is defined as the "best and most versatile" agricultural land, referred to hereafter as BMV (NPPF Annex 2).

16.3.28 The overarching National Policy Statement for Energy (EN-1) (DECC, July 2011) sets out "Generic Impacts" in Part 5. Paragraph 5.10.8 advises that Applicants should seek to minimise impacts on BMV agricultural land except where this would be inconsistent

with other sustainability considerations. Effects on soil quality should be identified and minimised.

16.3.29 There is no reference to the consideration of grades of Agricultural Land for site design within the National Policy Statement for Renewable Energy Infrastructure (EN-3) (2011). Agricultural land quality is referred to in the Draft National Policy Statement for Renewable Energy Infrastructure (EN-3) at paragraphs 2.48.13-15, 2.50 and 2.53. It is noted that agricultural land of Grades 3b, 4 and 5 should be preferred, avoiding BMV crop land **"where possible". "However land type should not be a predominating factor in determining the suitability of the site location".**

16.3.30 The National Planning Policy Framework (2021), to the extent that it is relevant, sets out in paragraph 174(b) that the economic and other benefits of BMV agricultural land should be recognised in planning decisions.

16.3.31 The Local Plan, to the extent that it is relevant, is the Central Lincolnshire Local Plan (adopted April 2017). Policy LP19 "Renewable Energy Proposals" sets out a policy for assessing the merits and impacts of proposed schemes. These include taking account of the agricultural land classification, including a presumption against photovoltaic solar farm proposals on the Best and Most Versatile agricultural land. The policy notes that proposals will be supported where the benefits outweigh the harm, or harm can be mitigated as far as reasonably possible.

16.3.32 Policy LP55 "Development in the Countryside" Part G seeks to protect BMV agricultural land and to protect opportunities for food production and the agricultural economy. Development affecting BMV will only be permitted if:

(a) there is insufficient lower grade land available or it has other environmental considerations;

(b) the impacts on ongoing agricultural operations have been minimised through design;

(c) where feasible any development will be removed at the end of its life and the land restored to its former use and of equal quality.

16.4 RESPONSE TO SCOPING AND PEIR COMMENTS

16.4.1 The ES, and the methodology, have taken into account comments made in response to the Scoping.

16.4.2 The ES and methodology has also taken account of comments made in response to the PEIR, in particular:

(i) comments made by Natural England (NE);

(ii) comments made by Lincolnshire County Council (LCC);

(iii) comments made by North Kesteven District Council (NKDC), and their consultees Landscope Land and Property.

16.4.3 Natural England's comments were directed to the sampling density and distribution of the ALC survey.

16.4.4 LCC and NKDC's comments commented on other matters, notably:

(i) the potential effect on unfettered agricultural (arable) production from the Energy Park site for the duration of the Proposed Development;

(ii) the implications of the Proposed Development in a Lincolnshire-wide context;

(iii) the potential effect of using good quality agricultural land for biodiversity net gain agricultural management;

(iv) the extent to which management under the panels involving sheep grazing is practicable.

16.4.5 These matters are considered in the ES, and the Applicant's responses and regard had to these comments is summarised in the following table.

Table 16.1: How Consultation Comments Have Been Addressed

Consultee	Summary of comments	Summary of how these have been addressed
LCC	Arable land produces food and should be protected for its own sake.	The policy and practical implications are quantified and assessed in the ES.
LCC	Proposed Biological Net Gain (PBNG) and Community Orchard areas may affect BMV land and should be so assessed.	The proposals have been revised to take account of these comments.
LCC	The biodiversity benefits of change from intensive arable production to grazing should be balanced against the reduction of intensive arable production.	The implications are quantified and assessed in the ES.
NKDC	The potential to farm areas of BNG in the future needs to be considered.	Considered in the ES.
NKDC	The economics and practicalities of grazing sheep under the panels needs to be considered carefully.	This is considered in the ES.
NKDC	The effects of construction on soil structure should be considered carefully.	This is addressed in the ES.
NKDC	More detail on the proposed storage of soils is required.	This is described fully and addressed in the ES.
NKDC	The impact of lost arable production should arguably be considered a major adverse magnitude.	The methodology for assessment and the effect are considered fully in the ES.
NE and NKDC	Targeted additional ALC sampling is required.	This has been completed and is described in the ES.

Limitations to the Assessment

16.4.6 There are no significant limitations to the assessment.

16.4.7 Reference is made to published land quality maps from the 1970s, which should be used cautiously given how they were produced (and were intended to be used). These

maps and related data are used for contextual purposes only. The ALC field survey provides adequate data for accurate assessment) of the Energy Park.

16.5 BASELINE CONDITIONS

Agricultural Land Quality of the Site and Panel Areas

16.5.1 Agricultural land quality is assessed by use of the system of Agricultural Land Classification (ALC) devised by the Ministry of Agriculture, Fisheries and Food (MAFF). This is a methodology, last revised in 1988, that classifies land according to the extent to which its inherent physical or chemical characteristics impose long-term limitations on agricultural use.

16.5.2 The ALC system divides land into five grades 1 to 5, with grade 3 divided into subgrades of 3a and 3b. The National Planning Policy Framework (NPPF) (2021) places Grades 1, 2 and 3a within the definition of the 'best and most versatile agricultural land' (BMV). Natural England in their Technical Information Note TIN 049 (2012) estimates that 42% of agricultural land in England is within the BMV category.

16.5.3 An ALC survey of the Energy Park was undertaken in late 2021. This was carried out at a semi-detailed level and involved examining the soils on a regular 200m grid. It involved analysis of the soils and land quality at 138 locations, from which it was possible to map the general distribution of land quality and soil types. Further surveys involving an additional 313 auger samples, were carried out in August and September 2022. In total 451 auger samples have been carried out over 589 ha.

16.5.4 The results for the Energy Park are presented in Table 16.1, Figure 16.1 (document ref: 6.2.16) and reported in full at Appendix 16.3 (document Reference: 6.3.16.3).

16.5.5 As described in the ALC report (Appendix 16.3) (document Reference: 6.3.16.3) the soils on the Energy Park site and their distribution has been affected by the location of the land's location near the sea. The underlying mudstone and siltstone is entirely covered by Tidal Flat Deposits (clay and silt).

16.5.6 The soils all fall within the Wallasea 2 Association. All the soils are non-calcareous. There is a complex variety of soil textures and drainage status (Wetness Class) over the Energy Park site, which reflects the variety of Tidal Flats Deposits deposited by the sea in the past. The texture of the topsoil ranges from medium silty clay loam, through heavy clay loams to silty clay. The soil profiles range from well-drained (Wetness Class I) where the subsoil is sandy (i.e., fine sandy loam to loamy fine sand), to slightly seasonally waterlogged (Wetness Class II) where the subsoil is slowly permeable, gleyed and mottled, silty clay. Where the depth of the slowly permeable silty clay is closer to the surface, the soil profiles are seasonally waterlogged and placed in Wetness Class III.

16.5.7 At the scoping and PEIR stages a wider area of agricultural land, extending to 589 ha, was surveyed. The ALC identified that the land to the south and west of the Energy Park comprised mostly land of BMV quality, and mostly land of Grades 1 and 2 quality.

16.5.8 As is described in more detail later in this chapter of the ES, some of the agricultural fields are a complex mix of ALC grades, which significantly affects the potential for farming the different land grades in a different manner. The Proposed Development has been amended and the area for the Energy Park reduced. Fields to the west and south

have been excluded from the Energy Park. These fields were mostly ALC Grades 1 and 2. The area for the Energy Park is now 524 ha.

16.5.9 The Energy Park does not include any fields which are wholly Grade 1 or 2. As described later in the ES, the Grade 1 and 2 land within the Energy Park forms a complex mix and pattern, usually mixed with Subgrade 3b moderate quality land.

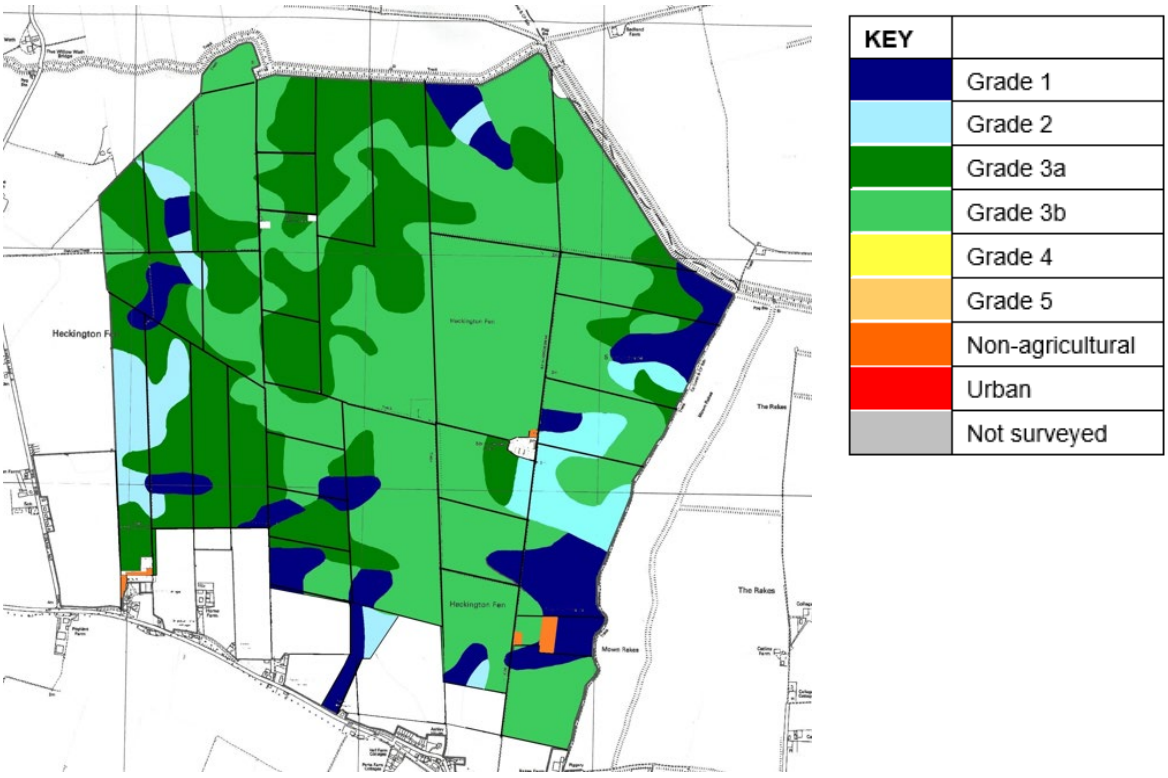
16.5.10 The ALC results for the area proposed for the solar panel arrays within the Proposed Development are presented in Table 16.2. The ALC identifies the areas in hectares and the proportions of land, in each grade. This is based on 405 auger samples.

Table 16.2 ALC Results for the Proposed Panel Areas

ALC	Area (Ha)	Area (% of total Site)
Grade 1	58	11.1
Grade 2	39	7.4
Grade 3a	160	30.5
Grade 3b	265	50.6
Grade 4	0	0
Grade 5	0	0
Non-agricultural	2	0.4
Urban	0	0
Total	**524**	**100**

16.5.11 The distribution is complex, reflecting the historic influence of water in the soil pattern. The ALC map for the Proposed Development is shown below. The full plan is at Figure 16.1 (document ref: 6.2.16) and Appendix 16.3 (document Reference: 6.3.16.3) .

Insert 1: ALC Results



16.5.12 Therefore, the ALC for the Proposed Development identifies that:

- 49.0% of the site, an area of 257 ha, is within the BMV category;
- 50.6% of the site is however Subgrade 3b, and therefore poorer quality land;
- the scheme has been revised to reduce the amount of Grade 1 and 2 land within the Energy Park, excluding fields that are mostly of Grade 1 and 2;
- the grade 1 and 2 land that remains within the Energy Park is mixed, in a generally complex pattern, with land of mostly Subgrade 3b moderate quality.

Agricultural Land Quality of the Wider Area

16.5.13 As set out in Natural England's Technical Information Note 049 (2012), an estimated 42% of agricultural land across England is of Grades 1, 2 and 3a. Maps from the 1970's show the estimated distribution of land grades under an earlier system of ALC, before Grade 3 was split into subgrades. The ALC methodology was last revised in 1988. The distribution of ALC grades, and subgrades, under the revised ALC methodology have never been mapped, and no distribution maps are therefore available. Further, other than the figures provided in TIN 049, there are no published statistics estimating the area of agricultural land by ALC grade under the 1988 methodology.

16.5.14 Natural England estimate that under the 1988 ALC methodology, Grades 1 and 2 land account for about 21% of all farmland in England, and Subgrade 3a also covers about 21%.

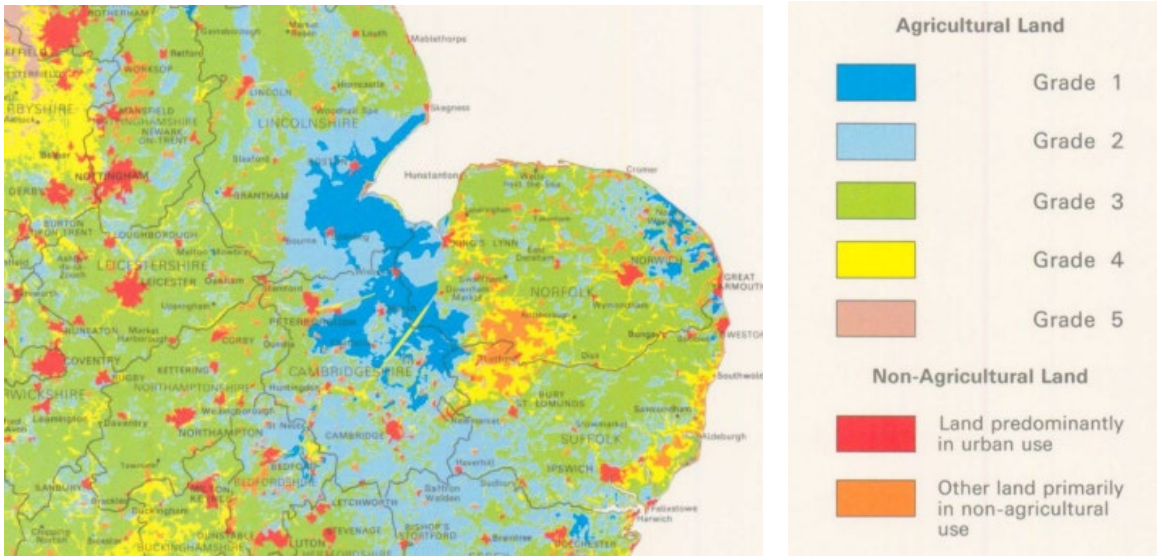
16.5.15 Published statistics from the "provisional" ALC maps from the 1970s need to be used cautiously, but they represent the only measured basis available. Those statistics estimate the agricultural land of England, under the old ALC, as follows. They are still relevant for comparative assessments, but the actual figures should be used with care.

Table 16.3: ALC Areas

ALC Grade (pre 1988)	Area (ha)	Proportion (%)
1	354,562	3.1
2	1,848,874	16.2
3	6,290,210	55.0
4	1,839,581	16.1
5	1,100,305	9.6
Total	11,433,532	100

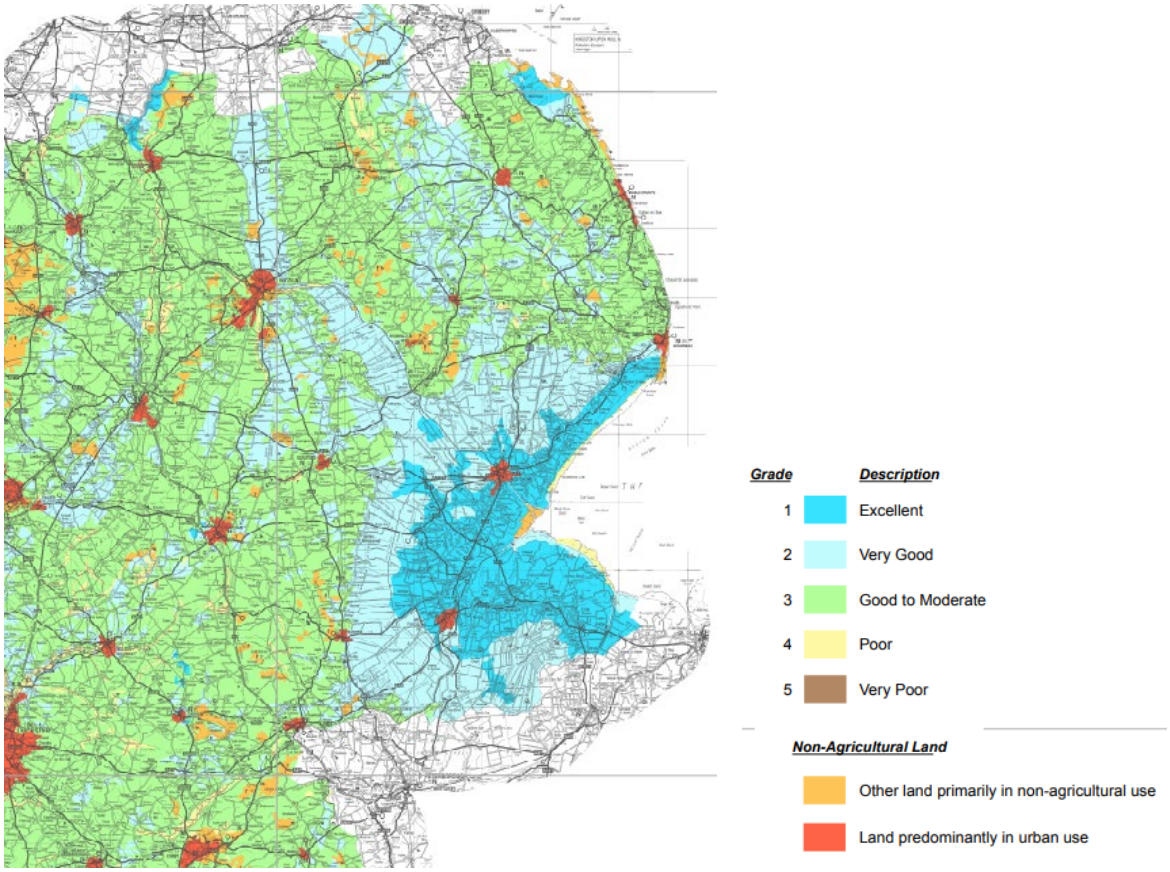
16.5.16 An extract from the "provisional" ALC for England and Wales is provided for the central and eastern England area is below. This shows the general distribution of the Grade 1 and 2 land.

Insert 2: Extract from 1:2,000,000 Scale Provisional ALC



16.5.17 The "provisional" ALC maps for the East Midlands shows that this area has a high proportion of Grades 1 and 2 as shown below.

Insert 3: Extract from 1:250,000 East Midlands Region Provisional ALC Maps



16.5.18 The "provisional ALC map" statistics estimate that Grades 1 and 2 amount to about 19.3% of agricultural land across England. Under the post 1988 ALC Natural England estimate that this has increased to about 21%, so for comparative purposes we

have increased the quantum of Grades 1 and 2 to bring the proportion up to 21%, made Subgrade 3a 21% (as per Natural England's estimate) and decreased the rest of Grade 3 by the equivalent area, leaving Grades 4 and 5 as previously estimated.

16.5.19 On that basis, the area and proportion of agricultural land in Lincolnshire and North Kesteven, are estimated as follows.

Table 16.4: Area and Proportion of Lincolnshire and North Kesteven

ALC Grade (pre 1988)	Lincolnshire		NKDC	
	Area (ha)	%	Area (ha)	%
1[1]	82,600	14.6	1,260	1.4
2[2]	203,600	36.0	39,830	44.9
3a[3]	116,700	20.6	18,340	20.7
3b	155,900	27.5	28,220	31.8
4	7,400	1.3	1,130	1.2
5	0	0	0	0
Total	566,200	100.0	88,780	100

[1] 75,757 x 1.09

[2] 186,752 x 1.09

[3] 296,243 x 0.394

16.5.20 In context this analysis identifies that:

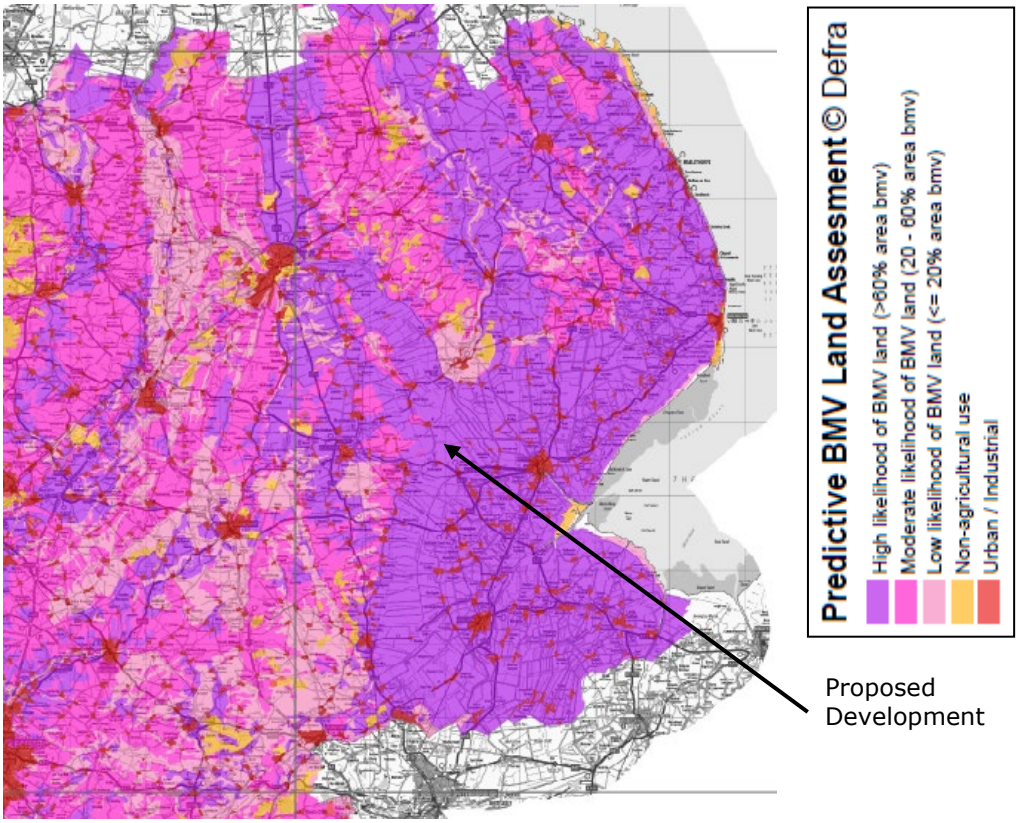
- an estimated 42% of agricultural land in England is estimated to be of BMV quality;
- across Lincolnshire the estimated proportion of BMV rises to 71.2%;
- across North Kesteven the proportion of BMV at 67% is slightly lower than the Lincolnshire average, but this still covers two thirds of agricultural land, and is above the national average.

16.5.21 The published "provisional" ALC maps are of limited use, given their age and the changes to the ALC system. However, in 2017 Natural England published predictive best and most versatile maps, showing the proportion of land expected to be of BMV quality. There are three categories:

- low (<20% area bmv);
- moderate (20-60% area bmv);
- high (>60% area bmv).

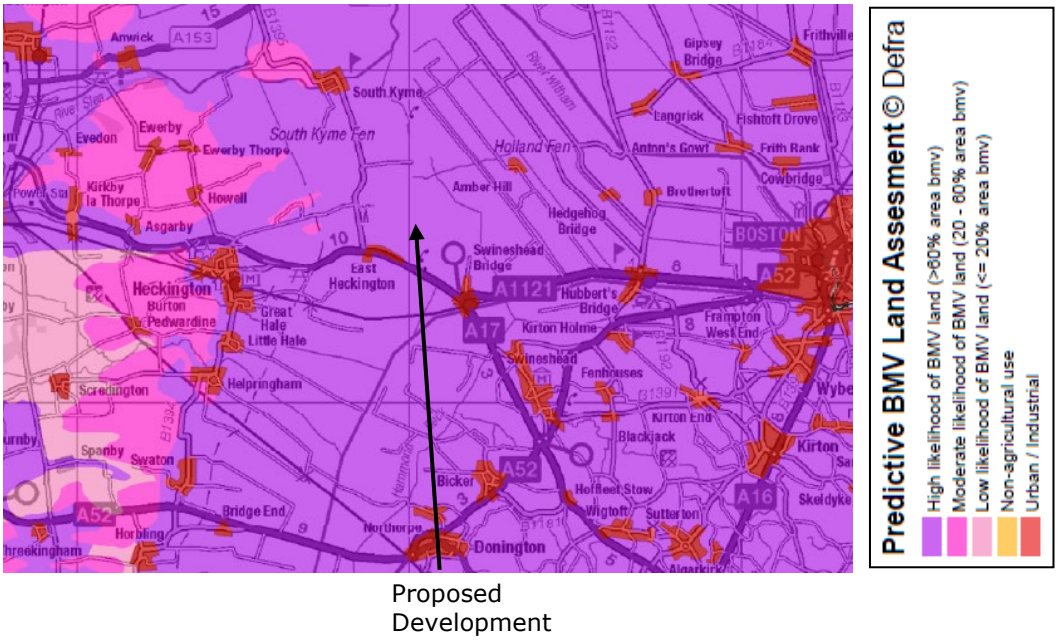
16.5.22 The extract below shows the predicted proportion of BMV in the wider area. This area is expected to be mostly more than 60% BMV by area. The location of the Energy Park site is indicated by the arrow.

Insert 4: Extract from the Predictive BMV Map



16.5.23 A more localised image from the predictive BMV maps is shown below.

Insert 5: Extract from the Predictive BMV Map



16.5.24 Therefore, land quality in the local and wider area is generally expected to contain a high proportion of BMV agricultural land.

Soil Integrity, Structure and Environmental Benefits

16.5.25 The semi-detailed and detailed ALC and soil survey determined that the soils within the Energy Park are non-calcareous soils of the Wallasea 2 Association. There is a complex variety of soil textures and drainage status (Wetness Class) over this surveyed Energy Park site, which reflects the variety of Tidal Flats Deposits deposited by the sea in the past (see the Geology section in Appendix 16.3) (document Reference: 6.3.16.3). The texture of the topsoil ranges from medium silty clay loams through heavy clay loams to silty clay. The soil profiles range from well-drained (Wetness Class I) where the subsoil is sandy, to slightly seasonally-waterlogged (Wetness Class II) where the subsoil is slowly permeable, gleyed and mottled, silty clay. Where the depth of the slowly-permeable silty clay is closer to the surface the profiles are seasonally waterlogged and are placed in Wetness Class III.

16.5.26 Soil texture is recorded in Appendix 16.3 (document Reference: 6.3.16.3) for each sample location. In order to substantiate topsoil texture determined during the ALC survey by hand-texturing, samples of topsoil were collected and were sent to an accredited laboratory for analysis of particle size distribution (PSD).

16.5.27 Soils have a number of functions beyond biomass production, for which the ALC process is relevant. Other functions can include ecological habitat, soil carbon reserves, soil hydrology as a pathway for water flow, archaeological and cultural interest and as a source of materials (IEMA, 2022).

16.5.28 Some soils are more susceptible to damage when handled during construction. There will be limited handling and moving of soils during the construction of the Proposed Development. Some soils are however more susceptible to structural damage from machinery and vehicular activity, depending upon soil type, climate and wetness class. An outline Soil Management Plan has been drafted for the Energy Park and is set out as an appendix to the Outline Construction Environmental Management Plan (document reference 7.7). This same appendix also sets out a draft Soil Management Plan for the Offsite Cable Route Corridor.

Agricultural Businesses and Land Use Considerations

16.5.29 The Proposed Development has the potential for both adverse and beneficial effects on the one agricultural business which owns and operates the agricultural land within the Energy Park site. The land is wholly in arable cropping uses, mostly cereals with arable break crops. The farm distribution and data of relevance has been collected through interviews with the operating business.

16.5.30 The Energy Park affects part of a larger farming operation. The farm buildings within the area of the Energy Park area (but not within the Proposed Development) are only used in association with the surrounding farmland and consequently there will be no additional, off-site effects on farms.

16.5.31 The limitations of the land for farming as described in the Savills report (**Appendix 16.1**) (document Reference: 6.3.16.1). The land is used for producing feed wheat, or industrial oilseeds, and is farmed as a single block.

16.5.32 How land is farmed is a management choice of the landowner. It can be influenced by many factors. Economic factors are a significant driving force, but disease

control and limitations, personal choices, rotational limitations and other factors all influence the choice of cropping, and hence the type of agricultural use (e.g. cereals, sheep, grass).

16.5.33 If a landowner makes a choice to produce crops, then the agricultural land quality can influence productivity. Productivity (i.e. yields) is not only influenced by land quality, however. For most crops the yield is affected more by the inputs than the underlying land quality. Yields (i.e. productivity) are also affected by management decisions, weather, the use of fertilisers, breakdowns, chemical applications etc. The land quality can enable land to be used more productively, but the productivity levels depend upon management decisions.

16.5.34 A farmer could legitimately farm the land on a low-input or organic basis. If they did so yields would drop significantly compared to high-fertiliser intensive management. A farmer could take advantage of agri-environmental grants and farm in a manner to provide greater biodiversity benefits. Or a farmer could farm under highly-intensive production methodologies.

16.5.35 As set out in Natural England's TIN 049, the ALC system considers the inherent potential, rather than the current use or intensity of use. Hence reducing the intensity of farming activities, or increasing it, does not change ALC grade.

16.5.36 In the context of the productivity of agricultural land being an economic land-use consideration, rather than an environmental consideration, the following assessment seeks to put production from the Energy Park into a national and regional context.

16.5.37 As set out in the Savills report (**Appendix 16.1**) (document Reference: 6.3.16.1), the block of land produces cereals and arable break crops. The area farmed in this block extends to 589 ha. In 2021 the block of land produced 4,342 tonnes of feed wheat, mostly for compound animal feed (although 1,421 tonnes went for low-grade biscuit grist). The 2020 oilseed rape crop went to a German processor for non-food industrial use (Savills Appendix 26).

16.5.38 The farm (including land within the Energy Park site) has a significant blackgrass problem, which is a perennial arable weed (see Savills). Straw is usually baled and sold away.

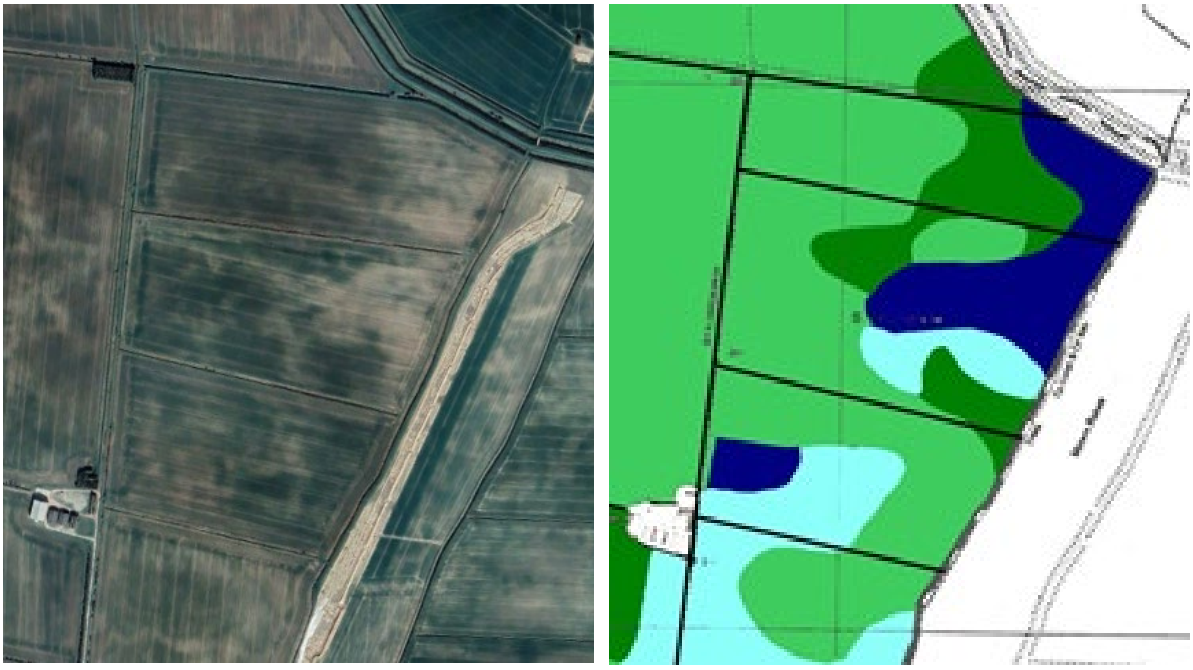
16.5.39 As described by Savills, the land within the Energy Park is farmed as a block. Within that block individual fields are also farmed according to the most limiting factor within the field, and within the overall block farm management approach.

16.5.40 Fields across the Energy Park are generally divided by deep ditches. This means a physical barrier between fields, such that the current field shape will be retained irrespective of land quality variations. There are also usually only single bridge entry points to most fields, such as the one shown below, that again prohibit farming other than on a whole-field scale. Because of this most fields have tracks around the edges that are not cropped, which provide access to other parcels.

Photos 3 and 4: Field Ditches and Bridges

16.5.41 The practical difficulties in exploiting high quality land are illustrated in the north east corner of the Energy Park site, comparing the aerial image with a similar extract from the ALC maps. The aerial image (Google Earth with an ascribed date of March 2022) shows the variability in the soils across the fields. This has been picked up in the ALC survey work. The extracts show the variability of land quality across individual fields, and which can be seen in satellite images. Within fields with very variable soils and land quality patterns, BMV land is usually not possible to farm differently to the rest of the field with a lower ALC grade.

Inserts 6 and 7: Google Earth and ALC Extract.

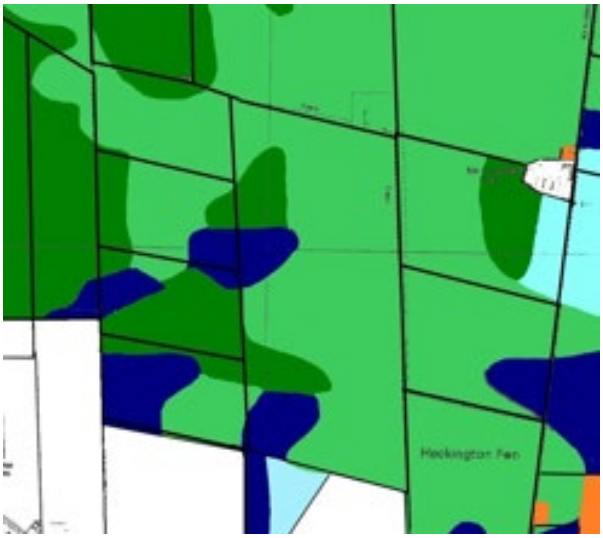


16.5.42 These three fields are only accessible from bridges on the western side of each field, for example. Consequently there is no potential to access the Grade 1 land at the eastern end of the fields other than by passing over the Subgrade 3b first. These parcels are therefore all farmed as single fields.

Photo 5: Eastern Fields, Looking East

16.5.43 Similarly, the block of four fields in the central southern part of the Energy Park site can only be accessed from field-edge tracks accessed via internal bridges, that run along the western edge of the fields. Each field is inevitably farmed as a single unit for cropping, and the patches of Grade 1 are not capable of separate exploitation in a practical, farming system.

Inserts 8 and 9: Google Earth and ALC Extract



16.5.44 The existence of meandering old river courses through the landscape is clearly evident in the 2023 aerial image below, of the northern part of the Energy Park site.

Insert 10: Google Earth 2023

16.5.45 Crop storage exists on the land. Straw is stored outside on an earth pad.

Photos 6 and 7: Crop and Straw Storage

16.5.46 Whilst the block of farmland within the Energy Park covers 524 ha, in the context of England and regional production, the effect of non-production of arable crops from this area is modest.

16.5.47 The utilised agricultural area of England in 2022 (Agricultural Land Use in England at 1 June 2022, Defra, 29.09.22) was 8.9 million hectares. 55% of this was croppable, some 4.9 million hectares.

16.5.48 The area of arable crops is about 3.7 million hectares in England. Cereals account for 71% of the area, some 2.6 million hectares, with wheat grown on almost 1.7 million hectares, and barley on 0.8 million hectares. The provisional 2022 wheat harvest is 14.4 million tonnes, an increase of 12% on 2021, with barley at 5.2 million tonnes (up 6.6%) and oilseed rape at 1.2 million tonnes (up 43% driven by a 20% increase in area and a 19% increase in yield).

16.5.49 The Lincolnshire crop area figures are published periodically. The following table shows the 2013 and 2021 area figures.

Table 16.5: Farming Statistics for Lincolnshire

All areas in ha	2013	2021
Area farmed (commercial holdings)	483,525	488,915
Arable crops and uncropped arable/bare fallow	379,159	382,638
Wheat	164,011	178,337
Total Cereals	215,789	253,856

16.5.50 The United Kingdom Food Security Report 2021 (22 December 2021) section 2.1.6 estimates that domestic wheat production is of the order of 15 million tonnes per year, at around 8 tonnes per hectare. The 524 ha of the Energy Park site, at 8 t/ha, would produce of the order of 4,200 tonnes, so 0.03% of the national production. The variability between years is evident. The provisional 2022 yield for wheat, as estimated by Defra (Provisional cereal and oilseed rape production estimates for England 2022, Defra, 10 October 2022) was up 11% nationally to 8.6 tonnes per hectare, reflecting variables other than underlying land quality.

16.5.51 As shown in the production statistics above, the cropped area and yield of different crops can vary significantly year to year. Nationally the contribution of this area is limited. Based on the 2021 statistics for commercial holdings, the 524 ha of the site represents 0.1% of the 488,915 ha commercially farmed within the county.

16.5.52 Furthermore, agricultural production will not be lost. The land under and around the panels will be farmed, being used for the production of sheep. Appendix 16.1 (document Reference: 6.3.16.1) includes an analysis showing that this is a physically feasible land use option. Therefore, there will be continued agricultural use of the Energy Park Site.

16.5.53 In response to the PEIR, NKDC questioned the practicality of grazing sheep. Sheep grazing is common around and under solar panels. It is a good way to manage the grass and provides an income and agricultural use. It results in some deposition of dung and makes a valuable return of nutrients.

16.5.54 The following photographs show sheep grazing under panels. Sheep, being shy creatures, are difficult to film as they tend to run away. The farmers in the example below cited a stocking density similar to organic grassland sheep farming. The grassland under the panels within the Energy Park proposed will be managed as organic grassland.

Photos 8 – 11: Sheep Grazing Under and Around Panels




16.5.55 There are also environmental benefits from a break from intensive arable production, as set out in the Savills report at Appendix 16.1 (document Reference: 6.3.16.1). Savills quantify environmental benefits including from the reduced use of chemicals, diesel etc.

16.5.56 There will be considerable benefits to the soil. Carbon is held in soil in two principal ways: soil organic carbon (SOC), being organic matter levels in the soil, and soil inorganic carbon (SIC) mostly held in weathering rocks within the soil. In most agricultural soils the soil organic carbon is less than 5%.

16.5.57 The role of soil organic carbon in soils is complex, as described in the British Society of Soil Science Note "Soil Carbon" (2021), reproduced at Appendix 16.4 (document Reference: 6.3.16.4). As described under the heading "Soil Carbon Functions" on page 4:

> "**In general therefore, a soil with a greater SOC content has a more stable structure, is less prone to runoff and erosion, has greater water infiltration and retention, increased biological activity and improved nutrient supply compared to the same soils with a smaller SOC content. Even small increases in SOC can markedly influence and improve these properties**".

16.5.58 It is noted at the top of page 5 that "**Significant long-term land use change (e.g. conversion of arable land to grassland or woodland) has by far the biggest impact on SOC, but is unrealistic on a large scale because of the continued need to meet food security challenges**". That, however, is a land use decision. The benefits for the soil from reversion to grassland, are clearly significant.

Implications of Climate Change

16.5.59 Climate change is expected to affect agricultural practices and enterprises, due to changes in rainfall patterns and quantities, and due to increasing temperatures, which may alter cropping and stocking patterns and choices in the future. The ability of these soils to grow crops depends upon the availability of water, especially in the spring and early summer peak growing season. Climate change may necessitate different cropping in the future.

16.5.60 The IEMA Guide (2022) sets out in section 6.5.1 the anticipated effects of climate change on soils. It is anticipated that climate change could affect soil properties including drainage, soil moisture content, nutrient recycling rates, carbon sequestration, changes in leaching and run-off, and soil biodiversity and stability through clay shrinkage.

16.5.61 It is noted that drier conditions could affect agricultural cropping and capability, or resulting in other localised impacts from more extreme weather events. However, the ALC classification is based on a climate data set published in January 1989 and therefore does not take climate change into account (Climatological Data for ALC, the Met Office, January 1989).

Biodiversity Net Gain

16.5.62 Following consultation responses to the PEIR the proposals for Biodiversity Net Gain (BNG) over arable land outside the panel area have been amended. Concern was raised by NKDC and their consultees that intensive arable land should not be changed to low-intensity herb-rich meadow land, despite this being an agricultural use. Accordingly, the proposals for the BNG are now less ambitious and involve reducing the Order Limits of the southern boundary of the Energy Park site so that this higher-grade land is retained so that it can be used for arable production.

16.5.63 In the consultation responses NE were supportive of the southern band of higher grade land altering from intensive arable to the low-intensity herb-rich meadow as they viewed this as ongoing agriculture whilst increasing the biodiversity within the Order Limits.

Offsite Cable Route Corridor

16.5.64 The Offsite Cable Route Corridor has been surveyed by a walk-over survey. The full extent of the land use of the Offsite Cable Route Corridor is arable land, with the photographs below being representatives. There are small exceptions to this use, namely roads, drainage ditches, the railway line and the Local Wildlife Site (LWS) of the South Forty Foot Drain. In addition, a solar farm, Vicarage Drove, has gained planning consent and is located next to the Bicker Fen substation. Vicarage Drove solar farm is using arable land which will change use once the solar farm is constructed. This change of use is considered in more detail in the cumulative assessment within this chapter.

Photos 12 – 14: Proposed Cable Route

16.5.65 The cable installation process will take place in the construction phase and will be a temporary activity and is assessed later in this Chapter.

16.6 ASSESSMENT OF LIKELY SIGNIFICANT EFFECTS

16.6.1 This section describes the potential effects on agricultural land quality and soils, and the occupying farm business, during the construction, operational and decommissioning phases of the Energy Park.

Mitigation in Design

16.6.2 Throughout the iterative design process consideration has been given to utilise the low-grade land before BMV land. The main design iterations are outlined in Table 3.2 within Chapter 3 of the ES.

16.6.3 The mitigation embedded into the design was set out earlier in the ES. This has included reducing the extent and spread of panels to avoid fields that are mostly of ALC Grades 1 and 2 quality. Figure 3.3: Working Indicative Site Layout Rev H (document reference: 6.2.3) included additional land to the south and west, which is now outside of the Order Limits. This excluded land is Grade 1 and 2 and BMV.

16.6.4 Figure 3.7: Indicative Site Layout (Rev J) (document reference 6.2.3) reduced the Energy Park site by approximately 110ha. This alternative design considered the removal of land to the south and more land to the west, than was considered in Figure 3.3. The Applicant considered this proposal and determined that removal of approximately 49ha of land from the western section of the Site, which would be used for solar panels, was not appropriate or commercially attractive when considering the wider planning balance and reductions in energy generation.

16.6.5 The western section of land (49ha) is a mix of Grade 2 and 3a, and would be used to house solar panels, ancillary equipment and ongoing sheep grazing for the operational life of the Site, after which the solar panels will be removed. This area of land is not being removed from agricultural use for the lifetime of the Proposed Development, nor is its BMV value being decreased by the operation of the solar farm. Instead, its agricultural land use is being altered from intensive arable to grazing.

16.6.6 The removal of this western section of land from the Order Limits could have resulted in the proposed Permissive Path not being possible as the southern section of the path would no longer be within the Order Limits.

16.6.7 Removal of the southern parcels of land would reduce the area of land being offered for potential Biodiversity Net Gain. The removal of approximately 62ha from the southern section of the Energy Park site due to its higher land grade and that it was not needed to achieve the 10% BNG policy requirements was considered acceptable by the Applicant as a design mitigation.

16.6.8 Accepting this design mitigation of removing approximately 62ha of Grade 1 and Grade 2 land from the Order Limits, along the southern boundary resulted in the Environmental Statement Layout (Rev I), as shown in Figure 2.1 (document reference: 6.2.2) being progressed and assessed within this Environmental Statement. The removal of this land resulted in the boundary of the Order Limits of the Energy Park site being reduced. This Grade 1 and Grade 2 land, which is excluded from the Order Limits, will continue to remain in agricultural use for the lifetime of Energy Park development.

Construction

16.6.9 The potential for adverse effects on agricultural land (both on soils and land quality) is greatest during the construction phase. The trafficking of agricultural land by construction vehicles and machinery, the timing of work on soils and the timing and methodology of cable laying will be required to be carried out in accordance with industry good practice and methodologies tailored specifically for the soils within the Energy Park. A similar approach is taken for the cable route to the substation. See the Outline Soil Management Plan (document reference: 7.7).

16.6.10 There will be primary and secondary construction compounds, and internal access tracks. Where these are temporary there is the potential for short-term construction impacts and soil handling and management plans (which will be set out in the outline CEMP (document ref: 7.7)) will be required to ensure that at the end of the construction phase these areas are restored with no or minimised impact on soil structure or land quality. This will be necessary to avoid potentially long-term, albeit localised, effects on soil structure and, in extreme cases, land quality, albeit localised.

16.6.11 There will be areas where fixed equipment is required, especially transformers. These will be raised with their legs placed on concrete pad point foundations, so there is minimal need to remove topsoils to construct base areas. Where this is required, the soils will be stored and there is the potential for these areas to be restored to comparable quality when the Energy Park is decommissioned.

16.6.12 So far as possible and practicable, areas of fixed equipment have been located on the lowest quality agricultural land available.

16.6.13 There should not be a direct loss (permanent sealing or downgrading of land quality) of one or more soil functions by the installation of the PV Arrays. The expected construction process involves piling support poles into the soils but there is no disturbance to the land, and the land is not sealed. The construction process is described in detail, as it affects soils and agricultural land, in Appendix 16.5: Construction Methodology (as it affects soils) (document ref: 6.3.16.5).

16.6.14 The PV modules are attached to mounting structures, which are bolted together onsite. The mounting structure is attached to the ground via legs. These legs are lightweight, profiled metal legs with a narrow cross-section. If piled, they are inserted into the ground using a pneumatic hammer action, which pushes the legs straight down into the soil to the correct depth. Figure 4.4 Solar Panel Elevations (document reference 6.2.4) (In some areas it may be necessary, for archaeological reasons, to use above-ground foundations. These will not affect soils.)

16.6.15 This process does not involve any digging or mixing of the soils. It is similar to the process of knocking-in a fence post. Consequently, the soil around the legs is not disturbed. The soil simply moves laterally as the leg is knocked in.

16.6.16 The process of panel legs being inserted into the ground is shown below, taken from Appendix 16.5 (document ref: 6.3.16.5). This shows legs inserted in summer and in winter.

Photo 15: Photo of Team Inserting Legs

Photo 16: Photo of Legs Inserted in a Field

Photo 17: Photo of Legs Inserted in an Arable Field During Winter

16.6.17 As a consequence of the minimal impact of the process, the soil profile is not changed. Therefore, the soil resource, and the inherent agricultural land quality, is not affected by the presence of solar panels on the Energy Park site.

16.6.18 The installation process requires vehicular access to the land. Typically the post-inserting machinery is smaller than farm machinery (as shown in the photograph above), and the legs and panels are transported on trailers towed by tractors. Nevertheless there is the potential for the soil to be adversely affected by vehicular movement during this part of the construction process, depending upon the timing of the works.

16.6.19 The soils are all non-calcareous soils of the Wallasea 2 Association. There are limited opportunities for landwork without a subsequent need for soil amelioration normally between mid-December and mid-March, and the installation process needs to minimise the need to traffic these soils, so far as is practicable, in this winter period.

16.6.20 The oSMP (document ref 7.7) seeks to build in some flexibility on these dates, because the English weather is anything but predictable. Heavy and persistent rain in autumn or early spring could affect these dates, and the oSMP seeks to address this. The key principle is to try to minimise the travelling with vehicles when soil conditions are wet.

16.6.21 It is unlikely that soil quality or agricultural land quality will be adversely affected, however, even if the land is trafficked when conditions are not ideal. It is common, albeit avoided where possible, that harvesting causes soil structural damage when conditions are bad, e.g. vining peas harvested in wet years, or maize harvesting in a wet October. These soils can normally be restored readily once they have dried out in the spring, and are rarely adversely affected in the medium or long term.

16.6.22 By adherence to good practice, damage to soils during construction should generally be limited and readily restored. The installation process involves only a few passes with machinery, as follows

(i) a tractor and trailer carrying out the legs for laying out in position;

(ii) a post-knocker to insert the legs;

(iii) a tractor and trailer carrying out the framework for the panels;

(iv) a tractor and trailer and fore-end loader to bring out and as needed help lift off the panels, for bolting onto the framework.

16.6.23 None of these machines should be larger than normal farm machinery. Once the legs are in place, the machinery will run down between the rows. It will, therefore, follow a route similar to the tramline methodology used in arable fields, whereby for the duration of the crop up until harvesting the tractors follow the same route.

16.6.24 This can be illustrated in the following photographs, from the oSMP (document ref: 7.7).

Photos 18 and 19: Panels Under Construction

16.6.25 If there is localised compaction during the installation process, this can be recovered easily by standard agricultural machinery, for example a tractor pulling a set of harrows to loosen the upper surface.

16.6.26 This is illustrated in the following two photographs, showing a winter installation in Sussex, where the surface of the field became muddy and tracked by vehicles. It was readily restored for seeding once the soils had dried out.

Photos 20 and 21: Restoration of Light Surface Damage

16.6.27 Therefore, the installation of PV Arrays will not result in a significant adverse effects on soils. It will not result in any change to the ALC grade.

16.6.28 It is generally accepted that the installation of solar panels does not adversely affect the ALC grading. For example, in EN010101 Little Crow Solar, the Secretary of State agreed (4.50) with his Inspector (ER 4.10.39) that the effect of installing solar panels on agricultural land was:

- "**short term, reversable, local extent and of negligible significance during the construction and decommissioning phases; and**

- **medium term, reversable, local in extent and of negligible significance during the operational phase, with a moderate beneficial effect for the quality of the soils within the Order Limits, because intensive cropping would be replaced by the growing grass**".

16.6.29 In the Welsh DNS 3247619 site at St Asaph the Inspector concluded, following a Hearing on the topic, as follows (IR 310 and 314):

> "**310 I am therefore satisfied that the technical details necessary to minimise the risk of damage to the soil resource and the likelihood of permanent loss of BMVAL could be delivered by the CMS, the outline and detailed DMS and the SMP, secured by way of conditions;**
>
> **314 Nevertheless, because the proposal would be temporary and the proposed mitigation would ensure that it would not degrade the quality of the land over the time it would be in place, I find that it would not result in any irreversible or permanent loss of agricultural land**".

16.6.30 Consequently, only those areas of land proposed for the fixed equipment and substations, should be treated as sealed-over or irreversibly lost. The final Construction Management Plans can require those areas to be restored to agricultural use at the end of the operational phase, but a cautious approach is taken in this ES and it is assumed that restoration may not be back to comparable quality, at least initially, following decommissioning.

16.6.31 The areas of fixed equipment, and the ALC grades, are estimated as follows. The area of the substation will include the storage of soil from the construction phase for subsequent restoration.

Table 16.6: Areas of Land Affected within the Energy Park for the Operational Phase of the Proposed Development

ALC Grade	Area Affected (ha)			
	Tracks	Solar Stations	Substation	Total
1	0.5	<0.1	0	0.5
2	0.5	<0.1	0	0.5
3a	1.6	0.2	0	1.8
3b	3.5	0.4	13.5	17.4
Total	**6.1**	**0.6**	**13.5**	**20.2**

16.6.32 The Offsite Cable Route Corridor has been considered in terms of the soils. The installation process for a buried cable is a temporary activity, and will not result in any diminution of agricultural land quality, and consequently does not increase the quantum of land affected.

16.6.33 Accordingly, the impact on agricultural land within the Energy Park site is assessed as follows:

- the amount of Grade 1 and 2 land (very high sensitivity) sealed over is just over 1.0 ha;
- the amount of Subgrade 3a land sealed over (high sensitivity) is 1.8 ha;
- the total BMV land sealed over is less than 3 ha;
- the total agricultural land sealed over is of the order of 20.2 ha;
- the impact is therefore as follows, by ALC land grade.

Table 16.7: Assessment of Significance

ALC Grade	Area on Energy Park site (ha)	Sensitivity	Magnitude	Significance
1	0.5	Very high	Minor	Moderate or large
2	0.5	Very high	Minor	Moderate or large
3a	1.8	High	Minor	Slight or moderate
3b	17.4	Medium	Moderate	Moderate

16.6.34 Where the significance table gives a range, professional judgement is needed. The loss of 0.5ha Grade 1 and 0.5ha of Grade 2 can be considered as no greater than a moderate adverse impact.

16.6.35 In terms of soils, the Field Capacity Days for this area (i.e. the period when soils are replete with water) is defined in the ALC climate data as around 117 days per year. Most of the Energy Park site has medium clay or silty soils, which are not identified as sensitive in the ES methodology tables (see Appendix 16.2 (document ref: 6.3.16.2)). The effect on soils is not significant, but is neutral or slight adverse.

16.6.36 Soil removed from the areas of tracks and infrastructure will be stored next to the onsite substation within the Energy Park. Soils will be stored in bunds, to a maximum height of 3m, in accordance with good practice, as set out in the outline Soil Management Plan (document ref: 7.7).

16.6.37 There is potential for adverse short-term effects on farm businesses and enterprises as a result of construction, such as closure or severance of field access points at stages during the construction process. However, the Energy Park is well-contained, and access to all areas will be maintained as far as possible during construction. There is the potential for disruption and short-term severance within the Proposed Development, especially during construction of the offsite Grid Connection Route Corridor, but this will be managed to minimise severance and disruption. The effect on farm businesses will be slight adverse.

16.6.38 The route of the offsite Grid Connection Route Corridor has been surveyed. The cable route will be underground and laid either through open trenching or through directional drilling where open trenching is not possible. At some key points along the offsite Grid Connection Route Corridor there will be a need for above ground infrastructure. The locations of these above structures will be located in the corners or edges of the fields to minimise the impact on the efficient use of the field for farming.

16.6.39 As each section of cable is laid it will be back filled and farming would be able to re-commence on this land. As for the above ground infrastructure the offsite Grid Connection Route Corridor will be located close to field boundaries (ecology permitting) for much of the route to minimise the construction impact on the agricultural activities on the land.

16.6.40 A trench for the cabling would be approximately up to 1m wide by 1.2m deep and would stretch for approximately 5.5km offsite. Where directional drilling is required this could be up to 10m in depth. Construction will be short term so the magnitude of

change would be low. As set out in the oSMP (document ref:7.7), none of the soils are of particular sensitivity under the assessment criteria, or will be adversely affected. The overall impact will be neutral or slight adverse, with the area of land for fixed equipment being of minor magnitude, leading to a minor adverse impact. A number of services, related to other projects, have been buried underground around this area and there is no evidence of any effect on soils or agricultural productivity post installation. There are buried cables and pipes nearby, as shown below, with no long-term effects on soils or agricultural use.

Photos 22 and 23: Nearby Buried Cables

Operation

16.6.41 There will be areas within the Proposed Development where the soils and agricultural land quality will be affected for the duration of the operation (40 years), such as internal access tracks, transformers etc. These effects will have occurred during the construction phase and continue through the operational phase. These areas of land are removed from agricultural use for the whole of the operational phase of the Proposed Development.

16.6.42 The effects on soils across the Energy Park, other than the localised areas described above, will be limited. There will be normal ongoing agricultural grazing land uses and agricultural management of the grassland beneath the PV Arrays and the areas used for ecological enhancement, but there should be no requirement for trafficking of soils or ground disturbance relating to the operation of the energy generating infrastructure, and limited need for vehicular access across land other than any periodic maintenance requirements (including cleaning and maintenance of panels). The potential for an adverse impact on soils during the operational phase is therefore considered to be negligible.

16.6.43 The cable within the offsite Grid Connection Route Corridor will be buried and the land above it will be farmed. There will be no operational effects of the offsite Grid Connection Route Corridor during the operational phase.

16.6.44 The land management and farm enterprises will inevitably change. Continued agricultural use of the land within the Energy Park, principally by grazing with sheep, and

grassland management (especially to encourage nesting and flowering) can continue. This reduced-intensity use of the land and soil has the potential for overall benefits to soils as a result of arable soils reverting to pasture, through, for example, a build-up of organic matter. The British Society of Soil Science Note "Soil Carbon" (2021) notes that soil organic carbon in soils is complex. It is noted that "**a soil with a greater SOC content has a more stable structure, is less prone to run-off and erosion, has greater water infiltration and retention, increased biological activity and improved nutrient supply compared to the same soils with a smaller SOC content**". Therefore, in terms of soils, there will be a benefit from the use of the land as grassland for the operational phase. See Appendix 16.4 (document ref: 6.3.16.4).

16.6.45 Overall, adverse effects on soils and land quality during the operation of the Energy Park will be limited to the areas of fixed equipment and access tracks.

16.6.46 There will be changes to farming practices within the panel areas of the Energy Park for the operational lifetime of the Proposed Development. Arable farming will cease, but grassland farming for sheep, including rearing lambs for food production, and biodiversity land management will occur. These will involve land management requirements. The effects on the farm business are not anticipated to be significant, as set out in Appendix 16.1: Farming Report (document ref: 6.3.16.1).

16.6.47 There will be benefits for agricultural labour. By way of comparison, Table 16.8 is a comparison of the estimated amount of labour per hectare per year from a winter wheat crop compared to the estimated amount of labour per year from managing sheep, taking a stocking level of 2-3 ewes per ha, plus at certain times of the year, their lambs.

Table 16.8: Comparison of Labour Needs on Arable and Sheep farming

Crop	**Hours of labour required per hectare per year**	
	Premium	**Average**
Winter cereals	6.2	9.2
Bale and cart straw	3.4	4.8
Total cereals hours per hectare	9.6	14.0
Ewes hours/ewe	2.75	4.0
Ewes/ha	10	8 (low)
Total sheep hours per hectare	27.5	32.0

Source: Pocketbook for Farm Management 2023, 53rd Edition, the Andersons Centre, 2022

16.6.48 Consequently, agricultural labour requirements across the Energy Park overall will increase during operation as a result of the Proposed Development.

16.6.49 The areas of different ALC grades within the Energy Park site is set out in Table 16.2 above.

16.6.50 The area of BMV agricultural land within Lincolnshire is estimated to be more than 380,000 ha. The area of BMV land within the Energy Park is a small fraction of the BMV land area of Lincolnshire, at 258 ha (Table 16.2). This resource is mostly not lost. The sealing of agricultural land, at least for the duration of the Proposed Development, is limited to less than 3 ha of BMV land, and 17.4 ha of Subgrade 3b.

16.6.51 The effects on the farm business is generally expected to be beneficial in terms of a secure, diversified source of income, which would last for the duration of the Proposed Development.

16.6.52 The effect on the farm business is therefore considered to be a impact of a minor adverse magnitude on a business with a medium sensitivity, which results in a slight adverse effect. This conclusion can be drawn as whilst there will be significant effects on the current farm business, there will be increased overall labour needs to manage the sheep, and new full-time farm businesses could emerge. Overall, therefore, operational effect on the farm business in minor and would be considered insignificant.

16.6.53 The implications for food production are economic rather than environmental considerations. The land is used for growing crops which can be for industrial use as well as for animal or human food. There is no policy requirement to produce food from agricultural land.

16.6.54 Across Lincolnshire in 2021 some 178,337ha of land produced wheat. Using the national average of 8.6 t/ha, that would in 2022 have produced of the order of 1.5 million tonnes of wheat.

16.6.55 The area of land within the Energy Park is 524 ha and would have produced, at the 2022 average of 8.6 t/ha, some 4,500 tonnes of wheat.

16.6.56 Assessing the production from the Energy Park as an environmental impact or loss would not, however, be a realistic assessment. Setting aside that there is no requirement to farm land (of whatever quality), if the solar arrays proposed across the 257 ha of BMV within the Energy Park was to be moved from BMV land to poorer quality land elsewhere, the consequence would be the decrease in production levels between the BMV and non-BMV land, rather than the loss of production. In other words the assessment should be the cropping difference between BMV and non-BMV land, not between BMV and no production.

16.6.57 Accordingly taking the 2023 Pocketbook for Farm Management (September 2022) budget figures and assuming BMV land achieves a "high" yield and non-BMV achieves an "average" yield, the budget book predicts an extra 1.4 tonnes per hectare.

16.6.58 This means that if energy park development was moved from the 257 ha of BMV within the Energy Park and was instead located on poorer quality land, the consequential reduction in production would be about 360 tonnes of winter wheat (257 ha x 1.4 t/ha equals 360 tonnes). For other crops such as barley or oilseed rape, which yield less heavily, the implication is a smaller reduction in overall production.

16.6.59 The potential 360-tonne reduction in yield can legitimately be compared to the yield from the circa 178,000 hectares of wheat producing land in Lincolnshire in 2021 (see Table 16.5 above). If the 178,000 ha of Lincolnshire yielded the national average of 8.6 t/ha, Lincolnshire would produce in the order of 1.5 million tonnes of wheat each year. As 71% of Lincolnshire is estimated to be BMV, production would be higher than this. The 360-tonne annual reduction in the county's wheat yield is approximately a 0.02% reduction.

16.6.60 Consequently, the effect on production of crops for animal feed, energy or for human food is limited and would be considered insignificant.

16.6.61 It is concluded that:

(i) the land quality resource is neither lost nor downgraded as a consequence of the Proposed Development;

(ii) the amount of BMV land irreversibly developed is about 1 ha, which is a minimal area;

(iii) the decrease in production of wheat from the BMV land within the Energy Park, compared to non-BMV land, is about 360 tonnes per annum of wheat, which is a modest amount;

(iv) food production is not considered an environmental benefit and has no requirement in planning policy.

Decommissioning

16.6.62 Decommissioning would involve the dismantling and removal of the above ground features of the Proposed Development. It is estimated that this phase of the development would take 6-18 months. Areas of land used for the access tracks and transformers etc would be restored using the soil which had beenretained onsite from the construction phase. This soil is being retained on site in managed bunds, or additional new top soil could brought to the Energy Park site.

16.6.63 For the decommissioning process all above ground infrastructure will be removed as would any concrete to a depth of 1m. As the underground cables within the Energy Park and the offsite Grid Connection Route Corridor will have been laid to a depth of greater than 1m, these will not be removed in the decommissioning process. Therefore, any impact to the soil quality or agricultural practices will be more limited than the construction phase of this Proposed Development.

16.6.64 There is the potential to damage soils and soil structure during the decommissioning phase. The trafficking of soils when conditions are unsuitable (e.g. soils are saturated or frozen) could damage soil structure necessitating remedial activity to restore quality, but is unlikely to affect agricultural land quality. Damage to soil structure is generally a short-term effect recoverable with normal agricultural cultivation equipment.

16.6.65 These effects would be mitigated by careful management of the physical activities and by timing activities to when the soils are suitable for being worked, as they were at the construction phase. Such measures would be implemented through the oCEMP (document ref: 7.7). With careful management the effects are capable of being minimised to a potentially low magnitude of change. The decommissioning process on the soil quality and ALC grade, if the outlined mitigation was implemented, would be negative minor to moderate, but would not be considered significant.

16.6.66 There is limited potential for disruption to farm businesses during the decommissioning. This impact would be considered negligible.

16.6.67 The decommissioning process on the soil quality and ALC grade for the offsite Grid Connection Route Corridor, if mitigation was implemented would be negative minor to moderate, but would not be considered significant.

16.6.68 The likelihood is that the land will be returned with the land quality unaltered, soil structure retained, and with an enhanced organic matter content, and available for unrestricted farming operations.

16.6.69 The agricultural use of the land following decommissioning will be a matter for the landowner. The land could be kept as grassland, or returned to arable production, or a combination of the two. This will be an economic land-use matter for the landowner,

rather than an environmental consideration, and will be influenced by economic, world-wide and policy considerations of the time, together with the landowners' personal wishes.

16.7 MITIGATION AND ENHANCEMENT

Mitigation by Design

16.7.1 At the detailed design stage, the permanent sealing of BMV will be minimised as far as reasonably practicable, and where operational constraints enable, by locating access tracks and fixed equipment within Grade 3b land. This design mitigation has already been implemented within the indicative layout design Figure 2.1 Indicative Site Layout (document ref: 6.2.2).

16.7.2 Good soil management practices such as avoiding trafficking or handling soils when wet and restoring soils into trenches in the same order they came out (Defra (2009), BRE (2014), IQ (2021)) will be adhered to during the construction phase of the Proposed Development and would be implemented through a CEMP.

16.7.3 Whilst the potential impact on soils during the operational phase are expected to be minimal, good practice will be employed to ensure that any works (such as the maintenance of the PV Arrays and the management of the land underneath the PV Arrays) will be undertaken in a manner that prevents damage to the soil resource, so far as possible.

16.7.4 Potential short-term effects on farm businesses and enterprises as a result of construction and decommissioning, such as closure or severance of field accesses at key times of the farming year, will be mitigated by timing and liaison with landowners, and a CEMP will be implemented to ensure effects are minimised.

Additional Mitigation

16.7.5 No additional mitigation is considered to be necessary.

Enhancements

16.7.6 There is limited research data available at the present time, as explained earlier in this chapter, but there are indications that soil health and, to a lesser degree, soil structure will be enhanced by a 40-year period of permanent grassland cover. .

16.8 CUMULATIVE AND IN-COMBINATION EFFECTS

16.8.1 The Heckington Fen Proposed Development is a standalone proposal not connected to any other proposed developments, solar or otherwise. As such there are no direct cumulative effects on the use of agricultural land, and on any agricultural land losses, with other developments.

16.8.2 The Scoping Response from the Planning Inspectorate asked that the cumulative impact from the other known NSIP schemes within Lincolnshire was considered specially for the potential loss of agricultural land.

16.8.3 As detailed in Table 2.7 Cumulative Schemes (Chapter 2) there are other NSIP solar schemes within the County. There are also further solar schemes within 11km of the Heckington Fen Proposed Development. These solar sites have been considered within the cumulative assessment and are listed in the table below.

Table 16.9 Details of Cumulative Schemes

		Name of Scheme	LPA	NSIP	Reference Number	Size of Scheme	Distance from Application Site	Area of Site (ha)	Grade
1		Vicarage Drove – Approved	BBC	No	B/21/0443	49.9MW	*c.*4.5km south of the Energy Park at its closest point but adjacent to the proposed extension to the substation at Bicker Fen	80	Predominately 3b
2		Land to the North and West of Northorpe and to the West of Bicker- Screening	BBC	No	B/21/0412	49.9MW	c.5.6km south of the Energy Park Site at its closest point but adjacent to the proposed extension to the substation at Bicker Fen	92	Provisional ALC Map used for screening – Grade 2
3		Land at Little Hale Fen- Screening	NKDC	No	21/1337/EIASCR	49.9MW	*c.*4.6km north-east of the Energy Park at its closest point	80	Provisional ALC Map used for screening – Grade 2
4		Land at Ewerby Thorpe – Screening	NKDC	No	14/1034/EIASCR	28MW	*c.*4.1km north-west of the Energy Park at its closest point	73	Provisional ALC Map used for screening – Grade 3
5		Land to the North of White Cross Lane – Approved	NKDC	No	19/0863/FUL	32MW	*c.*8.4km west of the Energy Park at its closest point	20	Over 90% Grade 3b Grade 2 – 7%
6		Land South of Gorse Lane, Silk	NKDC	No	19/0060/FUL	20MW	*c.*11km west of the Energy Park at its closest point	70	Grade 3b

		Willoughby – Approved							
7		Land West of Cowbridge Road, Bicker Fen, Boston- Full Planning Application awaiting decision	SHC[1]	No	H04-0849-22	49.9MW	c.5.3km south of the Energy Park Site at its closest point	110	Grade 1 – 6.4% Grade 2 – 6.4% Grade 3a – 87.2%
8		Cottam Solar Project	PINS – BDC[2] & WLDC	Yes	EN010133	50MW + (NSIP)	*c.*43.6km north-west of the Energy Park at its closest point	1270	Grade 2 – 2% Grade 3a – 6.2% Grade 3b – 91.7%
9		Gate Burton Energy Park	PINS – BDC[3] & WLDC	Yes	EN010131	50MW + (NSIP)	*c.*48.6km north-west of the Energy Park at its closest point	684	Grade 3a – 11% Grade 3b – 74% Estimated Grade 3b – 10% Non-agricultural – 5%
10		West Burton Solar Project	PINS – BDC[3] & WLDC	Yes	EN010132	50MW + (NSIP)	*c.*41.3km north-west of the Energy Park at its closest point	788	Grade 1 – 2.4% Grade 2 – 4.5% Grade 3a – 35.4% Grade 3b – 57.5%
11		Mallard Pass Solar Farm	PINS - SKDC[3]	Yes	EN010127	50MW + (NSIP)	*c.*33.2km south-west of the Energy Park at its closest point	900	Under review. Mix of Grade 2, 3a and 3b

[1] South Holland District Council

[2] Bassetlaw District Council and West Lindsey District Council

[3] South Kesteven District Council

12		Temple Oaks	PINS – SKDC, NKDC, BBC, SHC	Yes	EN010126	50MW + (NSIP)	c.18.4km south-west of the Energy Park Site at its closest point	350	Grade 3b
13		Boston Alternative Energy Facility	PINS-BBC	Yes	EN010095	50MW + (NSIP)	c.11.7km west of the Energy Park Site at its closest point	27 ha	Grade 2 and 3a
14		Tillbridge Solar Project	PINS-BDC & WLDC	Yes	EN010142	50MW + (NSIP)	c.47.9km north-west of the Energy Park Site at its closest point	1400	Provisional Grade 3
15		Outer Dowsing Offshore Wind (Generating Station)	PINS-	Yes	EN010130	Up to 1.5GW	c.390m east to the onshore scoping boundary for indicative gird connection search area		Provisional Grade 3 with smaller areas of Grade 1 and 2
16		South Lincolnshire Reservoir	PINS	Yes	TBC	TBC	c.7.7km west of the Energy Park Site at its closest point	Unknown	Provisional Grade 3

16.8.4 Therefore, if all of these schemes were to gain planning consent, and all of the land within the application redlines was used for solar development the total use of agricultural land would be of the order of 5,950 ha. The Energy Park site area for the Heckington Fen Proposed Development is 524 ha.

16.8.5 Table 16.10 shows this use of agricultural land when compared to the total area of agricultural land within Lincolnshire.

Table 16.10: Total Cumulative Use of Agricultural Land in Lincolnshire (based on the 1977 MAFF Provisional ALC, see tables 16.3 and 16.4 above)

Area Measurement	Hectares	5,950 ha as a Percentage
Total Area of Lincolnshire	591,800	1.0
Total Area Agricultural Land in Lincolnshire	566,200	1.05
Area farmed (commercial holdings only)	488,915	1.2

16.8.6 It can therefore be concluded that if all of these solar farms became operational and none carried out any ongoing agricultural practices within their application sites for their operational lifetimes, 1% of Lincolnshire's agricultural land would be used for solar farms, and 1.2% of its commercially farmed area.

16.8.7 At this time, the statistical breakdown on area of land which is BMV for all of these cumulative sites is not possible due to a lack of data. It may be possible to obtain this information from the developers of each of these sites or through public record in due course, but the information presented in this chapter is a summary of public information at this time. As Table 16. shows on average within Lincolnshire 71.2% of agricultural land is considered BMV. Using this percentage across the cumulative sites, there would be a cumulative use of 4,200 ha of BMV land.

16.8.8 The details of proposed construction techniques and timing for these other sites is not known at this stage. Were these proposals to result in the loss of BMV agricultural land, this would be of major adverse significance. However, it may be that, as with this proposal, the proposed developments are generally reversible and the loss of BMV agricultural land is more limited.

16.8.9 In reality this potentially significant impact is likely to be reduced when mitigations such as understanding the actual breakdown of BMV land on the sites, proposed construction and decommissioning works, and ongoing agricultural practices are considered.

16.9 SUMMARY

Land Quality and Soil Resources

16.9.1 The Proposed Development has been designed to minimise the impact on BMV agricultural land. The tracks and fixed infrastructure, where BMV land cannot be avoided, will affect approximately 1 ha of Grades 1 and 2 land, and less than 2 ha of Subgrade 3a. This results in a moderate adverse effect, which is not significant. 3 ha of BMV land is not a significant development of agricultural land in NPPF terms. It is just 15% of the threshold

for consultation with Natural England. Development of this land for the Proposed Development not a significant adverse effect.

16.9.2 The installation of legs and solar panels will not result in the sealing of agricultural land, and an agricultural use will continue. The installation process has the potential to affect soils in localised areas but this will be minimised through avoiding trafficking soils when conditions are not well suited to vehicle passage. The effect on soils overall is not significant.

16.9.3 The limited physical impact of inserting legs, the limited and restorable effect of trenches, and with a combination of good practice and careful management and mitigation, the agricultural land quality will not be significantly adversely affected at the installation phase. The agricultural land classification of the land is not affected and the resource is retained. The overall effect on soils and agricultural land quality is not significant.

16.9.4 At decommissioning stage the panels can be unbolted and removed. The removal of the legs should not create any significant disturbance to the agricultural land. There should be no significant adverse effects on the land quality or soils.

16.9.5 Overall, therefore, the quantum of Grades 1 and 2 land sealed over is 0.5 ha of each grade, with 1.8 ha of Subgrade 3a sealed over. These impacts amount to minor adverse magnitude effect on resources of very high or high sensitivity, and overall a moderate adverse impact. 13.5 ha of Subgrade 3b is required for the substation, which is a moderate magnitude impact on a medium sensitivity resource, which is a moderate adverse impact.

16.9.6 The installation of the Grid Connection cable will involve mostly open trenching. The installation of cabling via trenching and backfilling will not result in any adverse effect on soil utility or structure.

16.9.7 There should therefore be no overall significant adverse effect on the agricultural land quality of the Energy Park or offsite Grid Connection Route Corridor and, with carefully planned and well executed decommissioning works, the ALC resource will not be significantly adversely affected by the Proposed Development.

16.9.8 There should be no additional adverse effects on soils or land quality during the operational stage, as any need for traffic to pass over agricultural land will generally be limited to normal land and grassland management practices and maintenance.

16.9.9 The BSSS identify that soils will benefit from the reversion to a long-term grassland use, through increased soil organic carbon. Appendix 6.4 (document ref: 6.3.16.4).

Agricultural Businesses

16.9.10 The potential to use the Energy Park for different arable or livestock uses will be reduced as a result over the operational lifetime of the Proposed Development. However, a reduction in flexibility of land use is neither a policy requirement nor an environmental impact.

16.9.11 With careful planning and practice any localised effects on farm businesses can be avoided or mitigated.

16.9.12 There will be a change from arable to grassland farming, which will require increased labour. The overall effect on farm businesses is minor, and potentially beneficial.

16.9.13 The land for the Energy Park is currently used for agricultural production. This land will continue to be used for agricultural production when the Energy Park is operational. The incremental difference between using the BMV land within the Energy Park for sheep grazing rather than for cereal or industrial oilseed production, compared to the crop growth were poorer quality land to be used instead, is less than 360 tonnes per annum. Planning policy does not require or protect intensive agricultural use, but the implications are in any case limited and not significant.

16.10 REFERENCES

Agricultural Land Classification of England and Wales: revised guidelines and criteria for grading the quality of agricultural land, MAFF (October 1988).

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The Construction Code of Practice for the Sustainable Use of Soils on Construction Sites, Defra (September 2009).

Agricultural Good Practice for Solar Farms, BRE (2014).

Good Practice Guide for Handling Soils in Mineral Workings, The Institute of Quarrying (July 2021).

Climatological Data for Agricultural Land Classification, The Met Office (January 1989)

Table 16.11: Summary of Effects, Mitigation and Residual Effects

Receptor/ Receiving Environment	Description of Effect	Nature of Effect	Sensitivity Value	Magnitude of Effect	Geographical Importance	Significance of Effects	Mitigation/ Enhancement Measures	Residual Effects
Construction								
Loss / sealing of BMV agricultural land during construction	BMV quality agricultural land	Permanent, Adverse, Direct	High (3a) to Very High (1 and 2)	Minor (<3ha)	UK	Moderate adverse	Careful management and soil handling	Moderate adverse
Loss / sealing of poorer quality agricultural land during construction	Lower quality agricultural land	Permanent, Adverse, Direct	Medium	Moderate (13.5 ha)	UK	Moderate adverse	Careful management and soil handling	Moderate adverse
Effect on soil quality and structure during construction	All agricultural land	Temporary, Adverse, Direct	Mostly low sensitivity	Minor	Local	Slight adverse	Careful management and soil handling	Slight adverse
Disruption to farm businesses during construction	Farm businesses	Temporary, Adverse, Direct	Medium	Minor	Local	Slight adverse	Construction Management Plan	Slight adverse
Operation								
Effect on agricultural land during operation	BMV and lower quality agricultural land	Permanent, Adverse, Direct	Medium to Very High	Negligible	UK	Negligible	Careful management	Negligible
Effect on soil quality and structure during operation	All agricultural land	Temporary, Adverse or beneficial, Direct	Mostly medium or low sensitivity	Negligible	Local	Negligible	Careful management	Negligible
Effects to agricultural	Farm businesses	Temporary, Adverse/beneficial, Direct	Medium	Minor	Local	Neutral / slight beneficial	None	Neutral / slight beneficial

Receptor/ Receiving Environment	Description of Effect	Nature of Effect	Sensitivity Value	Magnitude of Effect	Geographical Importance	Significance of Effects	Mitigation/ Enhancement Measures	Residual Effects
businesses during operation								
Cumulative and In-combination								
Loss of Agricultural Land from Cumulative Solar Farms	Presence of Operating Solar Farms stopping any form of agricultural activity taking place on the land	Temporary, Adverse, Direct	Very High to High (assuming BMV land)	Major	UK	Very large adverse	Determining if land is BMV and allowing agricultural activities to continue on land for operational lifetime of solar schemes	Very large adverse
Decommissioning								
Effect on agricultural land during decommissioning	BMV and lower quality agricultural land	Permanent, Adverse, Direct	Medium to very high	Minor	UK	Slight adverse	Careful management and soil handling (DEMP)	Slight adverse
Effect on soil quality and structure during decommissioning	All agricultural land	Temporary, Adverse, Direct	Mostly medium or low	Minor	Local	Slight adverse	Careful management and handling (DEMP)	Slight adverse
Disruption to agricultural businesses during decommissioning	Farm businesses	Temporary, Adverse, Direct	Medium	Minor	Local	Neutral / slight beneficial	Careful management (DEMP)	Neutral / slight beneficial