Mallard Pass
Solar Farm

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Environmental Statement Volume 1
Chapter 12: Land Use and Soils

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12.1 Introduction

12.1.1 This chapter of the Environmental Statement (ES) presents the approach and findings of the assessment of potential impacts on agricultural land, soils and agricultural businesses. This chapter presents the methodology followed and provides a review of the baseline conditions in the vicinity of the Proposed Development and surrounding area as well as Embedded Mitigation measures. The chapter then presents the results of the assessment and the impact of the Proposed Development on the baseline environment in order to determine the anticipated magnitude of impact and significance of effect. Additional Mitigation measures are presented and discussed to minimise the impacts of the Proposed Development during the construction, operation and decommissioning phases to an acceptable level.

Planning Policy

12.1.2 This assessment has been undertaken with regard to the following policy documents:

National Planning Policy Statements

a. Overarching National Policy Statement for Energy (EN-1)

b. Draft Overarching National Policy Statement for Energy (EN-1)

c. National Policy Statement for Renewable Energy Infrastructure (EN-3)

d. Draft National Policy Statement for Renewable Energy Infrastructure (EN-3)

National Planning Policy

a. National Planning Policy Framework (NPPF)

b. Local Planning Policy

c. Rutland Local Development Framework: Core Strategy (Adopted July 2011)

d. South Kesteven Local Plan 2011- 2036 (January 2020)

Guidance

a. A New Perspective on Land and Soil in Environmental Impact Assessments [**Ref 12-1**].

12.1.3 Further detail on these policies and guidance of relevance to this assessment is provided in ***Appendix 12.1*** [**EN010127/APP/6.2**].

12.1.4 The Land Use and Soils assessment follows the general approach to undertaking Environmental Impact Assessment (EIA) as detailed in ***Chapter 2: Overview of the EIA process*** of the ES **[EN010127/APP/6.1**], albeit it has been modified to take account of relevant industry guidelines and best practice. The approach to the assessment of the sensitivity of receptors, magnitude of impacts and the significance of effects in relation to agricultural land, soils and agricultural businesses is described in ***Appendix 12.2.***

12.1.5 A summary of the consultation undertaken, setting out the main key matters raised by stakeholders and a description of how and where these matters have been addressed in the ES, including in relation to the PEIR and Scoping Opinion is provided in ***Appendix 12.3***.

Assumptions and Limitations

12.1.6 One of the key measures used in this assessment is the system of Agricultural Land Classification. This was introduced in the 1970s and last updated in 1988. The ALC system uses a climate data set from 1950 – 1980. Given that it continues to be used in planning decision making, it is assumed that the ALC methodology will not be amended, and that climate change will not therefore alter ALC grading.

12.2 Baseline Conditions

Current Baseline

12.2.1 The key baseline receptors considered in respect of agriculture are:

a. Agricultural land quality. Land quality is measured by a system of Agricultural Land Classification (ALC) based on the inherent potential of land under a range of farming systems, and is a system used in land-use planning decisions;

b. Soil structure. The underlying soil has many different functions which can be affected by land use, land management and the timing of activities, even if agricultural land quality under the ALC methodology is not affected;

c. Land-based businesses. Land is managed for many different purposes, including for agriculture. The management practices and businesses involved dictate current land management.

Agricultural Land Classification.

12.2.2 Agricultural land quality is assessed by use of the system of ALC devised by the Ministry of Agriculture, Fisheries and Food (MAFF) [**Ref 12-2**]. 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.

12.2.3 Factors affecting the grade are climate, site and soil characteristics, and the important interactions between them. Wetness and droughtiness influence the choice of crops grown and the level and consistency of yields, as well as use of land for grazing. The classification 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.

12.2.4 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 TIN049 [**Ref 12-3**] estimates that 42% of agricultural land in England is within the BMV category.

12.2.5 An ALC survey was initially carried out in late 2021 at a semi-detailed level, involving 217 auger samples taken on a regular 200 metre grid across the Order limits. This survey has then been enhanced by additional auger samples, a further 117, taken in autumn 2022 across areas where the land quality was variable or had been found to include the "best and most versatile" agricultural land to total 334 auger samples.

12.2.6 In addition, a total of 4 soil pits were dug to better describe the soils across the Order limits, plus 10 archaeological trenches were examined where the soil profiles had been exposed by survey trench digging. A total of 11 samples of topsoil were sent to an accredited laboratory for particle size distribution analysis to validate the hand texturing results.

12.2.7 The results of the ALC survey are reported in full at ***Appendix 12.4***. The ALC survey identifies the areas in hectares and the proportions of land, in each grade.

12.2.8 The ALC results are presented in **Table 12-1** below and the distribution of grades across the Order limits are shown on Inserts 12.1 and 12.2. The results are provided for the following two areas, as illustrated on the plans at Inserts 12.1 and 12.2:

(i) the Order limits, including the Solar PV Site and Mitigation and Enhancement areas (noting that no agricultural land exists within the Highways Works Site). As was described in ***Chapter 5: Project Description*** of the ES, approximately 239ha of the Mitigation and Enhancement Areas will remain in agricultural use and are not affected by any works;

(ii) the Solar PV Site area plus any peripheral land, being areas between the PV Arrays and the field boundary. The PV Arrays cover the areas coloured yellow (Works No 1) on the Works Plans [***EN010127/APP/2.2***]. It is considered that the strip between the PV Arrays and the field boundary is not likely to be farmed and will change from intensive agricultural production to green infrastructure and/or agricultural use (as described within the oLEMP), and so these areas are included for land-use change assessment. This is explained in ***Appendix 12.5*** and is illustrated below.

Insert 12.1: Explanation of Area Measurements

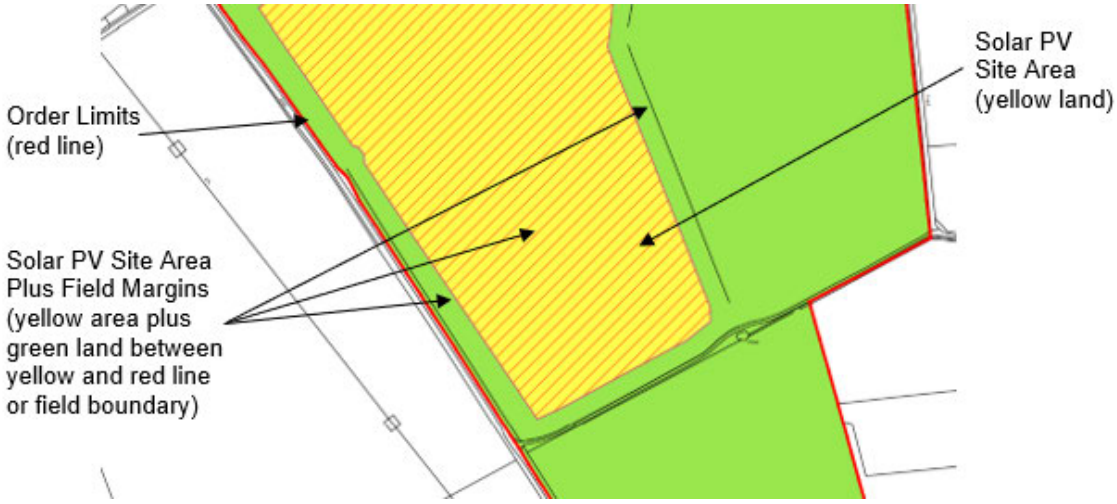


Table 12-1: ALC Results for the Order limits and Solar PV Site Area

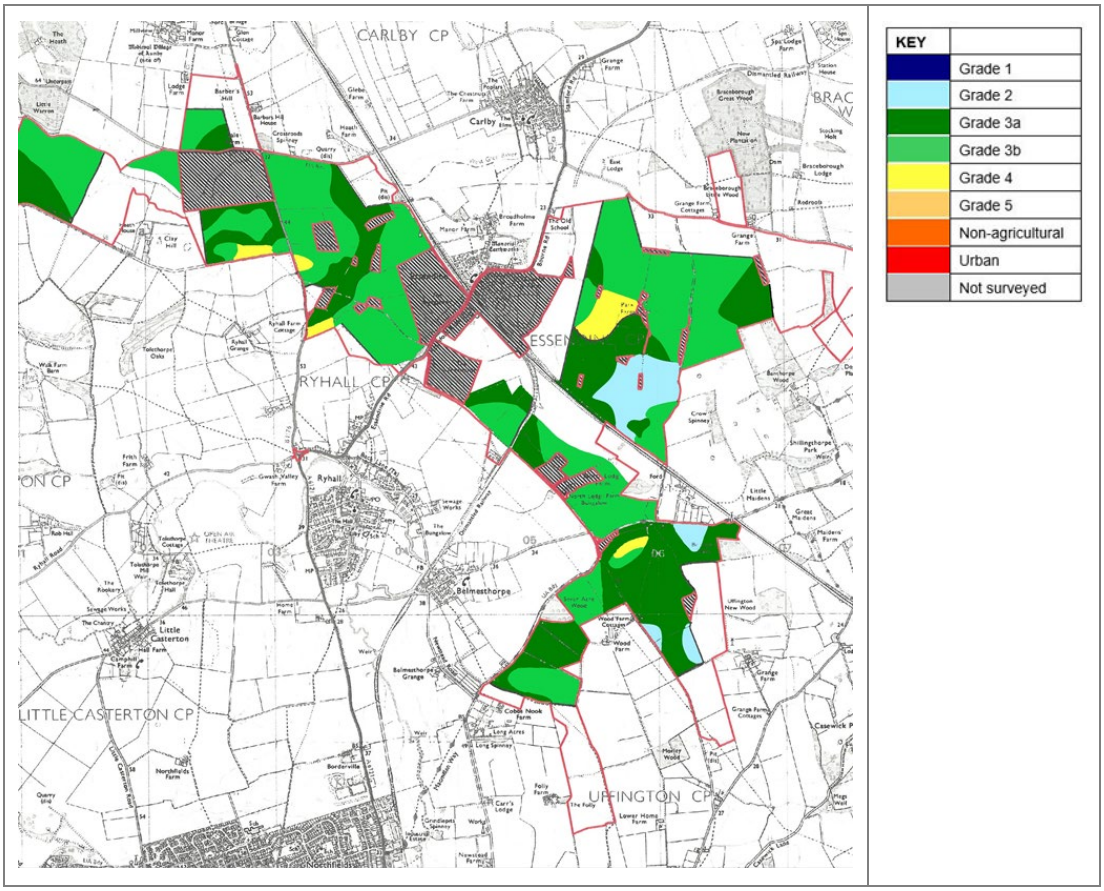
ALC#	Order limits		Solar PV Site and field margins	
	Area (Ha)	Area (% of total Site)	Area (ha)	Area (% of Solar PV Site)
Grade 1	0	0%	0	0%
Grade 2	100	11.7%	35	6.6%
Grade 3a	260	30.5%	181	34.1%
Grade 3b	439	51.5%	297	55.9%
Grade 4	18	2.1%	18	3.4%
Grade 5	0	0%	0	
Non-agricultural	0	0%	0	
Urban	3	0.4%	0	
Not surveyed (roads, railways, verges etc.)	32	3.8%	0	
Total	852	100%	531	100%

[#] The ALC identifies the areas in hectares and the proportions of land in each grade. All figures are rounded to the nearest hectare.

12.2.9 The most relevant area for this assessment is the Solar PV Site plus field margins. This is shown on Insert 12.2 below which is an extract from the plans set out in ***Appendix 12.4***.

12.2.10 The most relevant area for this assessment is the Solar PV Site and field margins. This is shown on an extract from the plans in ***Appendix 12.5*** in Insert 12.1 below.

Insert 12.2: ALC Distribution, Solar PV Site and Field Margins



12.2.11 The ALC of the Order limits and Solar PV Site can be considered in the national and local context, the baseline of which is now described.

12.2.12 As set out in Natural England's Technical Information Note 049 [**Ref 12-3**], an estimated 42% of agricultural land in England is of Grades 1, 2 and 3a, under the post-1988 ALC methodology. Beyond these figures, however, there are no published statistics estimating the area of agricultural land by ALC grade under the 1988 methodology.

12.2.13 Natural England estimate that Grades 1 and 2 land account for about 21% of all farmland in England, and subgrade 3a also covers about 21%.

12.2.14 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.

Table 12-2: ALC Areas of England (1970s Provisional Maps)

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

12.2.15 Those statistics estimate that Grades 1 and 2 amount to about 19.3% of agricultural land. Under the post 1988 ALC Natural England estimate that this has increased to about 21%, so for comparative purposes the area of Grades 1 and 2 in **Table 12-3** below have been increased by 9% to bring the proportion up to 21%, Subgrade 3a has been recorded at 21% (as per Natural England's estimate), and the remaining amount of Grade 3 has been decreased by the equivalent area, leaving Grades 4 and 5 unchanged from the pre-1988 estimates.

12.2.16 On that basis, with Natural England's estimated 21% of land being Grades 1 and 2, and 21% being subgrade 3a, the area and proportion of agricultural land in England, Lincolnshire and Rutland (making similar adjustments), are as follows.

Table 12-3: Area and Proportion of Lincolnshire and Rutland

ALC Grade	England (nearest 0.0ha)		Lincolnshire		Rutland	
	Area (ha)	%	Area (ha)	%	Area (ha)	%
1	386,000	3.4	82,600[1]	14.6	383[4]	1.0
2	2,015,000	17.6	203,600[2]	36.0	3,543[5]	9.6
3a	2,401,000	21.0	116,700[3]	20.6	12,823[6]	34.6

ALC Grade	England (nearest 0.0ha)		Lincolnshire		Rutland	
	Area (ha)	%	Area (ha)	%	Area (ha)	%
3b	3,689,000	32.3	155,900	27.5	19,723	53.2
4	1,840,000	16.1	7,400	1.3	567	1.6
5	1,100,000	9.6	0	0	0	0
Total	11,431,000	100	566,200	100.0	37,039	100.0

[1] 75,757 x 1.09

[2] 186,752 x 1.09

[3] 296,243 x 0.394

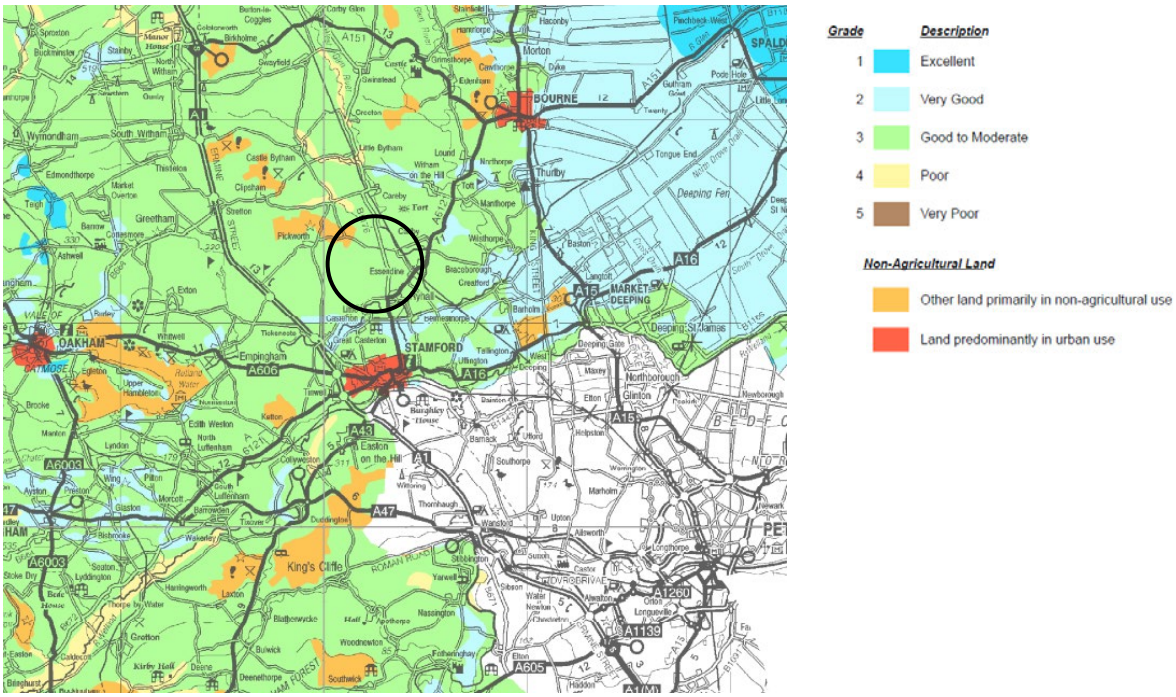
[4] 351 x 1.09

[5] 3,250 x 1.09

[6] 32,546 x 0.394

12.2.17 The distribution of these areas are not mapped. Therefore, for an indication of the distribution, the 1970s "provisional" maps have been used. The location of the Order limits in a wider context is shown below in Insert 12.3.

Insert 12.3: Extract from 1:250,000 East Midlands Region Provisional ALC Map



12.2.18 To assess the Order limits in a wider context, this analysis indicates that:

a. Natural England estimate that 42% of agricultural land in England is of BMV quality;

b. across Lincolnshire the proportion of BMV rises to 71.2%;

c. across Rutland the proportion of BMV is lower than for Lincolnshire at 45.2%, but still above the national average.

12.2.19 The published "provisional" ALC maps [**Ref 12-4**] are of limited use, given their age and the changes to the ALC system since they were published. Whilst no updated maps have been produced, in 2017 Natural England published predictive best and most versatile maps [**Ref 12-5**], showing the proportion of land expected to be of BMV quality. There are three categories:

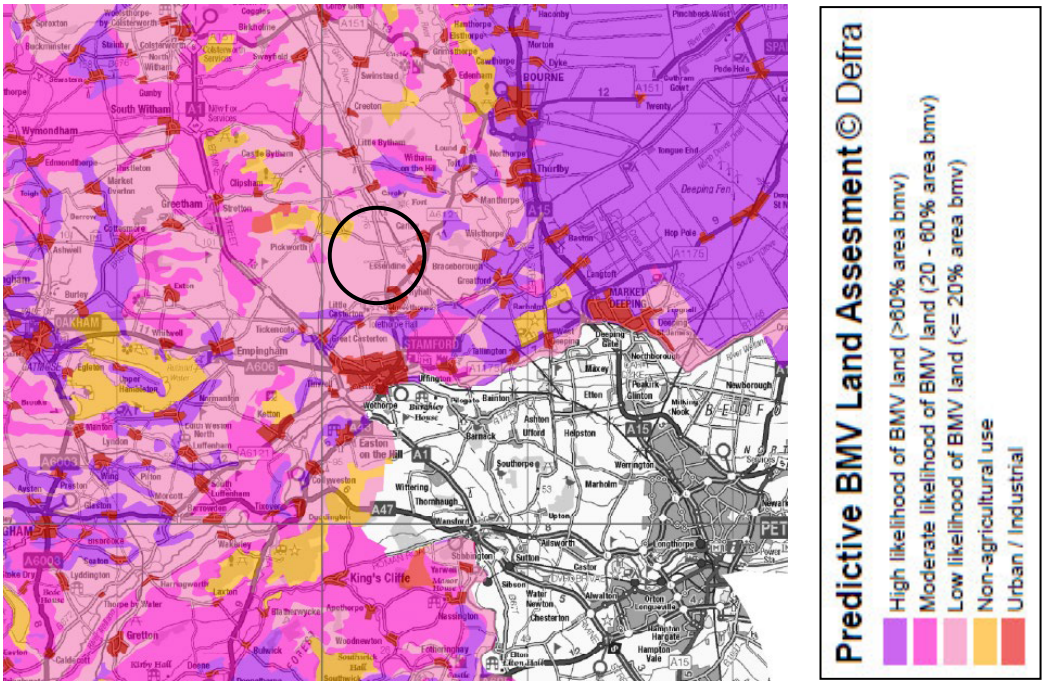
a. low (<20% area bmv);

b. moderate (20-60% area bmv);

c. high (>60% area bmv).

12.2.20 Insert 12.4 below shows the predicted proportion of BMV in the wider area of the Order limits.

Insert 12.4: Extract Predictive BMV



12.2.21 Therefore, the Order limits is identified as lying within an area shown as of the lowest probability of BMV. Much of the wider area is shown as of moderate (20-60% area bmv) or high (>60% area bmv) probability of being of BMV quality.

12.2.22 **Soil Integrity, Structure and Environmental Benefits**. The ALC and soil survey carried out in December 2021 and September/October 2022 determined that the soils within the Solar PV Site and Mitigation and Enhancement Areas are predominantly developed over limestone and are quite variable spatially, e.g. due to variations in soil depth to impenetrable rock, stone/rock content and wetness class.

12.2.23 The soils identified were grouped into soils of the Elmton 1, Elmton 3, Denchworth, Fladbury 1 and Sherborne Associations:

a. Elmton 1 soils are mainly permeable and well-drained;

b. Elmton 3 soils are usually shallow loamy and clayey soils over limestone, and usually well-drained;

c. Denchworth soils are mainly stoneless, wet, clayey soils with areas usually waterlogged for long periods in winter;

d. Fladbury 1 Association soils are deep, clayey alluvial soils and slowly permeable, and can be waterlogged in winter depending upon elevation; and

e. Sherborne Association soils are usually permeable and well drained.

12.2.24 The Soil Survey of England and Wales memoire Bulletin 13: Soils and their use in Eastern England [**Ref 12-6**], describe these soils as follows:

a. Elmton 1 (343a) and Elmton 3 (343c) soils are permeable and overlie well-fissured limestone and are thus well drained.

b. Sherborne association soils (343d) occur in small patches in Lincolnshire and are similar to Elmton soils.

c. Denchworth association soils (712b) are mainly wet clayey soils, often waterlogged in winter.

12.2.25 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. This chapter focusses on biomass (ALC) and, as per Table 4 of the IEMA Guide [**Ref 12-1**], the sensitivity or resilience of soils to structural damage from

being handled or moved. All the soils across the Order limits are of medium sensitivity (medium resilience to structural damage) under the IEMA Guide Table 4 that forms the basis of the assessment methodology set out in ***Appendix 12.2***.

12.2.26 **Agricultural Businesses**. The land across the Order limits is currently farmed. The land is predominantly 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 businesses.

12.2.27 There are four principal farming enterprises occupying land within the Order limits. A summary of interviews conducted with each farm business is provided in ***Appendix 12.6***. The affected farm businesses are:

a. Walk Farm Barn;

b. Wood Farm;

c. Manor Farm;

d. Grange Farm.

12.2.28 There is a farmyard and farm buildings at Grange Farm included within the Order limits. The buildings will not be demolished as part of the Proposed Development, and the existing farmyard area and buildings could be used as a temporary construction compound area, as shown on the ***Works Plans***.

Future Baseline

12.2.29 The ALC system is based on a climate data set from 1950 – 1980, to enable comparative assessments and to provide longevity to surveys. In the absence of a review of the ALC methodology, the ALC grade across the Order limits is not expected to change.

12.2.30 Soil condition can change over time. The general health of soils is influenced by many factors, including the Soil Organic Carbon levels within the soil. The British Society of Soil Science booklet "Soil Carbon" (2021) [**Ref 12-7**], reproduced in ***Appendix 12.7***, explains that soils with a greater Soil Organic Carbon level have a more stable structure and are less prone to runoff and erosion, have greater water infiltration and penetration, increased biological activity and improved nutrient supply compared to similar soils with a smaller Soil Organic Carbon (SOC).

12.2.31 The industry's knowledge of the effects of long-term arable farming, using inorganic compounds to fertilise the crop production, is incomplete at the current time (Safeguarding Our Soils: a strategy for England, Defra (2009)) [**Ref 12-8**]. The strategy notes that soils have degraded over the last 200 years due to intensive agricultural production, with three main threats (erosion by wind and rain, compaction and organic matter decline). There are indications that soil health will vary over time, probably degrading through reducing SOC from continuous arable cropping, but that soil health can be enhanced by changes to farming practices and management. This can involve changing practice in respect of straw incorporation, addition of organic matter, bringing grassland into the rotation etc. Therefore, the soils may change over time, depending upon management decisions taken by the occupiers.

12.2.32 Farm businesses are prone to changes over short periods of time, affected by many external variables including management choice, family changes, economic pressures, the availability of labour, advances in machinery, developments in crop genetics, and the personal wishes of those choosing how land is managed. These changes can be sudden and dramatic but cannot be predicted in advance. The future baseline is expected to include the land being managed for agricultural or biodiversity use, but the nature and size of businesses carrying out the farming or land management activities may change.

12.3 Embedded Mitigation

12.3.1 The general distribution of land quality across the Order limits, and the layout and operation of the farm businesses, was established early in the design process. Following a semi-detailed ALC in 2021 the areas of better quality land were mapped.

12.3.2 These results have influenced the layout of the Proposed Development. In particular the design has evolved to reduce the distribution of panels across land identified as ALC Grade 2, with all fields that consist entirely of Grade 2 removed from the Solar PV Site, secured through the ***Works Plans***.

12.3.3 The design and layout seeks to minimise the need for any disturbance to agricultural land of BMV quality, particularly Grade 2, aiming so far as is reasonably practical to locate Solar Stations on land of poorer quality. Additionally, so far as is practicable, access tracks will make use of existing access tracks within the Order limits. The exact position of Solar Stations and access tracks will be determined at the detailed design stage, but adhering to the Design Guidance as set out in the Design and Access Statement [***EN010127/APP/7.3***] to avoid BMV land so far as is practicable.

12.3.4 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 [**Ref 12-10, Ref 12-11, Ref 12-12, Ref 12-15** and **Ref 12-16**], will be adhered to during the construction phase of the Proposed Development. The outline Soil Management Plan (oSMP) [**EN010127/APP/7.12**] incorporates these practices and identifies those areas within the Solar PV Site which are more susceptible to soil damage when wet and advises on the time periods when soils are suitable for being handled or trafficked.

12.3.5 Whilst the potential impact on soils during the operational phase are expected to be minimal, the outline ***oOEMP*** [**EN010127/APP/7.7**] requires that good practice will be employed to ensure that any works (such as the maintenance of the PV Modules and the management of the land underneath the PV Arrays) will be undertaken in a manner that avoids damage to the soil resource, so far as possible.

12.3.6 Within the Order limits 239ha will continue to be farmed, unencumbered by any infrastructure or PV Arrays. Large areas within the Solar PV Site will continue to support agriculture and will be farmed by way of sheep grazing, or fodder production, with associated land management of the grassland as necessary. The design has been chosen to enable agricultural use for example minimum height of the panels being 0.8m to allow sheep to move freely underneath the PV Arrays, secured through the Parameter set out in ***Appendix 5.1***.

12.3.7 The Proposed Development design has evolved in consultation with the landowners, who have entered their land voluntarily. The design and the layout have all been developed to minimise adverse effects on land management and to minimise construction disruption to the farms that are included in the Proposed Development.

12.4 Potential Effects

12.4.1 This section describes the potential effects on land, soils and agricultural land use during the construction, operation and decommissioning phases of the Proposed Development. The embedded mitigation measures described in **Section 12.3** above, and in ***Chapter 5 (Project Description)*** of this ES, have been considered as part of the Proposed Development, when considering the potential effects.

12.4.2 The methodology is set out in ***Appendix 12.2***. The sensitivity of receptors and the magnitude of potential impacts are considered in order to establish the significance of the impacts.

12.4.3 As set out in ***Appendix 12.2***, in respect of agricultural land quality the ALC assessment does not consider land use change. The ALC methodology considers the potential agricultural use of land rather than the current land use. Natural England's Technical Information Note TIN049 [**Ref 12-3**] notes that "*the Classification is concerned with the inherent potential of land under a range of farming uses. The current agricultural use, or intensity of use, does not affect the ALC grade*". The IEMA Guide considers the "*permanent, irreversible loss of one or more soil functions or soil volumes (including the permanent sealing or land quality downgrading)*" of agricultural land. The assessment is therefore focused on the potential use of land rather than its current use.

12.4.4 Matters related to current land use, e.g. whether or not land is farmed for cereal production, whether that is for animal feed, biofuel or human consumption, and the effects on national food security, are land use management factors not affecting soils or ALC grade. The land use and crop productivity implications are described in the operational phase.

12.4.5 The greatest potential for adverse effects on land and soil is during the construction and decommissioning phases, when physical works are required to install or remove the PV Arrays and related infrastructure. During the operational phase there is limited need for access to the PV Arrays except for routine checks and maintenance. Within the context set out above, notably that irrespective of the Proposed Development a farmer could manage the land for non-food production, on a low-input or organic basis, or for rewilding.

12.4.6 The ALC grade can be affected by works, but those works generally have to be intrusive. Compaction, for example, would have to be significant and incapable of being restored by subsoiling or normal agricultural land management, for example, before it would affect ALC grade. Therefore, generally the ALC grade is only affected by physical moving of soils, e.g. trenchwork, and then only if the restoration is poor.

12.4.7 Further, narrow trenches are not likely to result in ALC downgrading. The ALC system takes a wider view. Sampling densities are normally one per hectare for a detailed survey, and small areas (e.g. narrow trenches across a field) would not be separately identified in ALC even if they were poorer quality. The ALC Methodology notes that a degree of variability within a discrete area is to be expected, and this only becomes a limitation resulting in a downgrading from the predominant grade where soil and site conditions vary significantly and repeatedly over short distances and impose a practical constraint on cropping and land management such that a "pattern" limitation is said to exist.

Construction

12.4.8 The potential for adverse effects on agricultural land (both on the soils and the land quality) is greatest during the construction phase through the following activities, in their normal order of commencement:

a. the construction and use of temporary construction compounds;

b. the construction of access tracks and Solar Stations;

c. the installation of PV Arrays;

d. the trenching of electrical cabling;

e. site fencing;

f. the Onsite Substation.

12.4.9 A description of the typical process of constructing a solar farm is set out in ***Appendix 12.8***, in so far as it relates to agricultural land. This describes each of the key construction phases, and the potential effects of these works on agricultural land quality and soils. Whilst not a definitive description of exactly how the Proposed Development will be built, it provides a robust starting point for the assessment of the likely effects of the Proposed Development.

12.4.10 **Temporary construction compounds**. At the start of the construction phase the areas of agricultural land required for the temporary construction compounds and access will be stripped of topsoil, a suitable membrane will be spread and stone or matting will be laid down.

12.4.11 These are areas where the land will be used temporarily for the duration of the construction process. The topsoil will be removed and a matting laid across the temporary construction compound site, onto which stone is spread. This prevents intermixing of soils with the temporary stone surface.

12.4.12 The topsoil removed during the construction process will be placed temporarily in a low level bund or bunds on land outside the compound. These bunds are short-term storage areas for the topsoil, which will be used in restoration of these areas once construction is complete.

12.4.13 The temporary construction compounds will have no adverse long-term effect on soils or agricultural land quality. As these are temporary areas and the land grade will not be affected by the works, the initial ALC grade is not important.

12.4.14 These areas will all be restored to their original ALC grade. Therefore, the effect is negligible, temporary and not significant.

12.4.15 **Access tracks and Solar Stations**. As described in ***Appendix 12.8***, the topsoil from these areas will be removed at construction phase, for storage throughout the operational phase and replacement at the decommissioning phase.

12.4.16 For the purposes of this assessment, in light of a time limit not being proposed for the consent these areas are considered as though they are permanently sealed. This consideration is notwithstanding that successful restoration back to current land quality is capable of occurring at the decommissioning phase through the measures as set out in the ***oSMP*** and oDEMP [**EN010127/APP/7.8**].

12.4.17 The successful restoration of these small areas at decommissioning depends upon there being topsoil available for replacement. Topsoil will have been removed at the construction phase and will have been stored adjacent to the track or in shallow storage mounds during the operational phase. Topsoil mounds will be shaped to repel water, and kept free of woody vegetation, in accordance with the measures set out in the ***oSMP***. They will be of a size whereby soil does not become anaerobic. Detailed guidance on the successful creation and management, and moving, of soil is set out in the Construction Code of Practice for the Sustainable Use of Soils on Construction Sites (Defra, 2009).

12.4.18 The access tracks and Solar Stations will involve land areas by ALC grade as shown below in **Table 12-4**. This is based on a design width including verges of 4m for the access tracks and an area of 100sqm per Solar Station.

Table 12-4: Access Tracks and Solar Station Areas

ALC Grade	Area (ha)
Access Tracks	

ALC Grade	Area (ha)
2 Very good	0.4
3a Good	2.2
3b Moderate	4.2
4 Poor	0.3
Total	**7.1**
Solar Stations	
2 Very good	0.1
3a Good	0.3
3b Moderate	0.5
4 Poor	0
Total	**0.9**

12.4.19 These areas will be treated, for the purpose of this ES, as sealed over. The effect of tracks and fixed equipment is therefore an impact of minor magnitude, including soils of very high sensitivity, and overall an adverse impact of moderate significance, calculated as follows: the most significant impact is the sealing of 0.5ha of Grade 2, which is a minor adverse magnitude effect on a resource of very high sensitivity, which is a moderate adverse significance (the range is moderate or large for up to 5ha, hence moderate is the appropriate assessment level).

12.4.20 The ***oDEMP*** requires the areas of Solar Stations and access tracks (if the farmer no longer requires them) 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, as least initially, following decommissioning.

12.4.21 **Installation of PV Arrays**. The potential likely methodology for installing Mounting Structures is set out in ***Appendix 12.8***. 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. They are inserted into the ground using a pneumatic hammer action, which pushes the legs straight down into the soil to the correct depth.

12.4.22 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.

12.4.23 The process of panel legs being inserted into the ground is shown on Insert 12.5 below, taken from ***Appendix 12.8***.

Insert 12.5: Photo of Team Inserting Legs

Insert 12.6: Photo of Legs Inserted in a Field

12.4.24 As a consequence, the soil profile is not changed. Therefore, the soil resource, and the inherent agricultural land quality, is not affected.

12.4.25 The installation process requires vehicular access to the land. Typically the post-inserting machinery is smaller than farm machinery (as shown in Insert 12.5 above), and the legs and panels are transported on trailers typically 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. The ***oSMP*** sets out guidance on the timing of works. The installation of panels will generally be avoided when soils are saturated and therefore most susceptible to damage. As set out in the ***oSMP***, this will vary depending upon the soil type. In a normal year this means that machinery activity on the lighter soil types (Elmton 1 and Elmton 3, Sherborne) will have to be carefully managed between mid-December and mid-March, and on the wetter soil types (Denchworth, Fladbury) between mid-November and early/mid-April. All soils have medium resilience to structural damage however.

12.4.26 The ***oSMP*** 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.

12.4.27 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.

12.4.28 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 PV Modules;
(iv) a tractor and trailer and fore-end loader to bring out and as needed help lift off the PV Modules, for bolting onto the framework of the Mounting Structures.

12.4.29 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, as illustrated on Inserts 12.7 and 12.8.

Insert 12.7: Panels Under Construction

Insert 12.8: Panels Constructed

12.4.30 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.

12.4.31 This is illustrated in the following two photographs (Insert 12.9 and Insert 12.10), 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.

Insert 12.9: Light Surface Damage

Insert 12.10: Restoration of Light Surface Damage

12.4.32 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.

12.4.33 The principle of this approach has been accepted in recent solar farm decisions. For example, in EN010101 Little Crow Solar the Secretary of State agreed (4.50) with his Inspector (ER 4.10.39) that the effect would be:

- "*short term, reversable, local in 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 of grass*".

12.4.34 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*".

12.4.35 Consequently, the areas of the PV Arrays are not sealed-over, downgraded or irreversibly affected. There will be a land-use / management change, discussed under the farm business economic section below, but the agricultural land will otherwise not be adversely affected. The assessment conclusion is therefore that the effects of the Proposed Development are of negligible significance.

12.4.36 **Trenches**. Cables are required to connect the PV Strings to the Solar Stations and then to the Onsite Substation. Cabling for the Strings is above ground, attached to the Mounting Structures, but at the end of each String a buried cable will connect to the Solar Station.

12.4.37 As set out in ***Appendix 12.8***, the installation of buried cabling requires soils to be disturbed. The trenches required are typically narrow, 30 – 40cm, but in places up to 1 metre wide. As set out in the ***oSMP***, topsoil will be removed to a depth of about 30cm and placed on one side of the working area. The subsoil will then be removed to the required depth, and placed on the other side of the working area so that it does not mix with topsoil. Once the cable has been laid, the subsoil is put back first, and consolidated with the bucket, and the topsoil is then replaced.

12.4.38 This process therefore involves a temporary disturbance to the soil, but with the profile replaced to the same order that existed before the trench

was dug, the soils will readily recover and there will be no diminution of soil function.

12.4.39 The successful installation of cables without diminution to soil structure depends upon carrying out the work when the soil conditions are suitable. This therefore means avoiding work when the soils are wet, normally between November and February, or during or following prolonged rainfall, as set out in the ***oSMP***.

12.4.40 As with the installation of the Mounting Structures, the trenching works may encounter areas within fields even when conditions are good, where the soil conditions are locally less favourable, such as wet hollows in a field. So far as practicable, if such conditions are identified then trenching should be delayed until the soils dry out. However, if there are localised areas of sub-optimal soil conditions, the long-term effect of the trenching will be limited. Soils will usually settle and recover, even in wet areas, within a season or two, and the effect of a narrow trench will not significantly adversely affect the soil qualities or functions of a wider area beyond the width of the trench.

12.4.41 Therefore, the installation of cables will not result in significant adverse effects on soils. It will not result in any change to the ALC grade. The effect is of negligible significance.

12.4.42 **Site fencing and CCTV Camera**. Site fencing and CCTV cameras involves the inserting of posts into the soil at suitable intervals. This process requires a fence-post knocker, usually mounted on the back of a tractor or a specialist tracked fencing machine, which pneumatically knocks the post into the soil to the required depth. As such there is no requirement for any digging or mixing of soils. Consequently soils and land quality are not affected.

12.4.43 As with all operations taking place across farmland, the use of machinery to carry fence posts to the required area, and to knock in the posts, can cause localised minor damage to soil if carried out when the soil is not sufficiently dry for the type of machinery being used. The timing of these operations will therefore avoid periods when the ground is wet, or otherwise if ground conditions are unsuitable following prolonged rainfall, as set out in the ***oSMP***.

12.4.44 Consequently, there is no sealing or downgrading of agricultural land from the fencing works.

12.4.45 **Onsite Substation.** The substation field, which is larger than the area involved for construction, involves an area of 6.4 ha. The footprint of the Onsite Substation footprint is about a third of this, but for the purposes of this assessment the whole field is considered and is treated as being developed (and for the same reasons given above, on a permanent basis, even though the Onsite Substation will be removed during the decommissioning phase). This area falls within the ALC grades set out in **Table 12-5**.

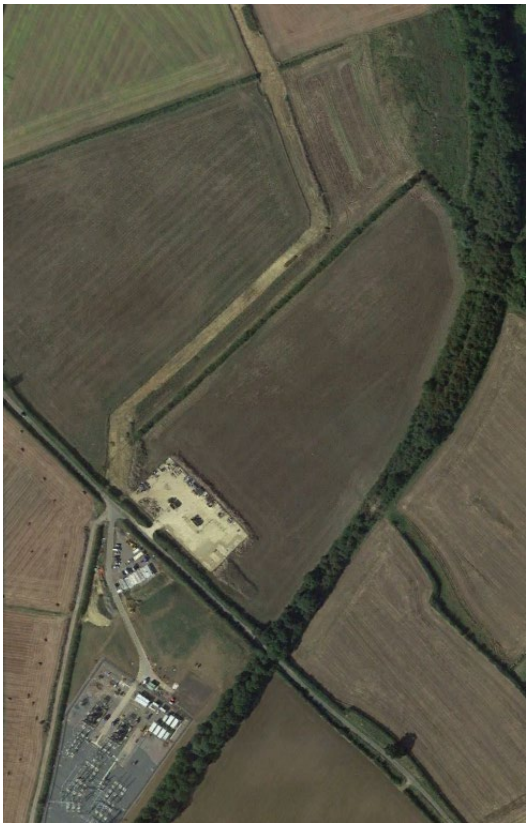
Table 12-5: ALC of Substation

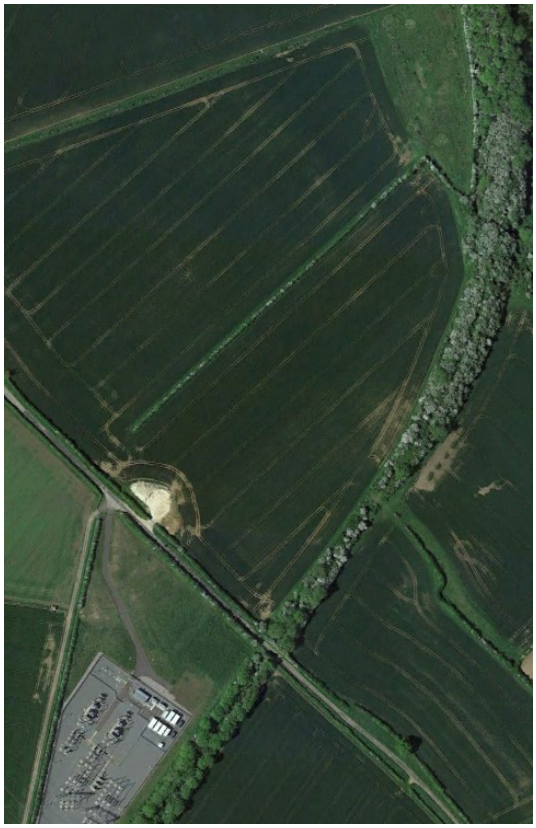
ALC Grade	Area (ha)
Grade 2 very good	0
Subgrade 3a good	1.2
Subgrade 3b moderate	5.2
Total	**6.4**

12.4.46 The Onsite Substation area contains an area of land previously used as a works compound for the National Grid Ryhall Substation and is shown below. The restoration of the majority of the temporary compound, and the

trenchworks to the adjacent land for buried cabling, is evident between the two photographs (Insert 12.11 and 12.12).

Insert 12.11 and Insert 12.12: Location of Proposed Onsite Substation (2016 and 2021)





12.4.47 The loss of 1.2ha of subgrade 3a is an impact of minor magnitude on a resource of high sensitivity, leading to an adverse impact of slight to moderate significance. 1.2ha is at the lower end of the 0-5ha range of magnitude, so the effect is assessed as slight. As noted above, notwithstanding this assessment, it should be noted that the land will eventually be handed back for agricultural purposes when the Onsite Substation is decommissioned.

12.4.48 **Farm Businesses:** There is the potential for adverse, short-term localised effects on farm businesses during construction, such as the closure of field

gateways, the requirement for farm vehicles to have to make detours to access some fields, or delays in moving around the farm. None of these would be significant and all would be short term.

12.4.49 The longer-term effects on farm businesses are considered in the operational phase assessment.

Summary of Construction-Phase Impacts.

12.4.50 The potential construction phase impacts involve works that do not result in any long-term adverse effects on soils or agricultural land quality, including:

a. temporary construction compounds and access tracks;

b. the installation of PV Arrays;

c. trenches into which cabling is buried;

d. the erection of site fencing and CCTV cameras.

12.4.51 There will be effects on soils and agricultural land, for at least the duration of the operational phase, which are impacts from construction. These are the areas involved with:

a. the access tracks and Solar Stations; and

b. the Onsite Substation.

12.4.52 The areas of agricultural land involved for these effects are set out in **Table 12-6** below.

Table 12-6: Areas Affected

ALC Grade	Area in Ha	
	Tracks and Solar Stations	**Onsite Substation**
2	0.5	0
3a	2.5	1.2
3b	4.7	5.2
4	0.3	0
Total	**8.0**	**6.4**

12.4.53 Therefore, the quantum of land involved during the construction phase can be measured as follows.

Table 12-7: Areas Involved in Construction

Construction component	Description of effect	Area affected		
		Area (ha)	**BMV (ha)**	**Non-BMV (ha)**
Access tracks and Solar Stations	Loss of land for the duration of the Proposed Development	8.0	0.5ha Grade 2, 2.5ha sub-grade 3a, Total 4.2ha.	5.0
Onsite Substation	Permanent loss of land	6.4	1.2	5.2

12.4.54 The construction phase impacts can then be summarised and assessed as follows.

Table 12-8: Construction Phase Effects

Effect	Description	Sensitivity	Magnitude	Significance
Permanent sealing of agricultural land	0.5ha of Grade 2 3.7ha of subgrade 3a	Very High And High	Minor	Moderate
Damage to sensitive soils	No sensitive soils damaged	Medium	Negligible	Slight
Effects on farm businesses	No significant effects during construction	Medium	Negligible	Neutral or Slight

Operation

12.4.55 There is no requirement for any physical works affecting agricultural land or soils during the operational phase.

12.4.56 This section therefore considers:

(i) potential effects on land management and farm businesses during the operational phase;
(ii) potential effects on or benefits to soil structure and health during the operational phase; and
(iii) land-use planning considerations resulting from reduced intensity agricultural use during the operational phase.

12.4.57 **Potential Effects of Land Management**. The land under and around the PV Arrays will be kept in grassland use and farmed by the grazing of sheep or production of fodder. Depending upon the grazing regime, there may be periodic need for some mowing or topping of grassland, but this will be normal agricultural activity and should have no adverse effect on soils. There will be no effect on agricultural land quality.

12.4.58 The land will be managed, and this could include with the grazing of 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.

12.4.59 The following photographs (Insert 12.13 – 12.16) show sheep grazing under panels. Sheep, being shy creatures, are difficult to film as they tend to run away. The farmers in these cases cited a stocking density similar to organic grassland sheep farming, which is what this is.

Insert 12.13 - 12.16: Sheep Grazing under Panels

12.4.60 There will be no effect on agricultural land quality, which is not changed by land use or the intensity of land use.

12.4.61 Retained agricultural land within the Mitigation and Enhancement Areas, as set out within the ***oLEMP***, will continue to be farmed. There will be no

effect on such land, except for the provision of skylark plots which will have a negligible impact on farming operations.

12.4.62 As set out in ***Appendix 12.6***, none of the occupying farm businesses will cease. All have considerable areas of land that extend beyond the Solar PV Array areas. All farms will continue as active, viable, full-time farms. Therefore, the effects of all four farms can be assessed, using the methodology, as a minor effect on a resource of medium sensitivity, which is an impact of slight significance.

12.4.63 **Potential Benefits for Soils**. There is the potential for 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%.

12.4.64 The role of soil organic carbon in soils is complex, as described in the British Society of Soil Science Note "Soil Carbon" [**Ref 12-7**], reproduced at ***Appendix 12.7***. 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 [20, 21]. Even small increases in SOC can markedly influence and improve these properties [22]".

12.4.65 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 and the benefits for the soil from reversion to grassland are

clearly stated as being beneficial, which is significant. The effects on soils are therefore beneficial. The effects are negligible under the ES methodology, however, because these soils are identified in the IEMA Guide as of medium resilience to soil damage and soil structural damage can be avoided or ameliorated. Long-term there are benefits for the soil.

12.4.66 **Implications of Land-Use Change**. Comments were received in response to the PEIR from RCC to the effect that the consequential effect of removing land from food production for the duration of the operational phase needs to be considered. The IEMA Guide (section 8.3.3) [**Ref 12-1**] recognises that impacts such as land-use change, the proportion of a holding affected by land take, access and severance, and impacts on farm buildings could all be reported in the Land and Soils impact sections or as social and economic impacts.

12.4.67 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 other factors such as disease control and limitations, personal choices, rotational limitations and economic conditions (cost of fertilisers, value of crops etc) all influence the choice of cropping, and hence the type of agricultural use (eg cereals, sheep, grass).

12.4.68 If a landowner makes a choice to produce crops, then the agricultural land quality can influence productivity. Productivity (ie yields) is not only influenced by land quality, however. Yields (ie 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.

12.4.69 A farmer could legitimately farm the land on a low-input or organic basis. If they did so yields would drop significantly.

12.4.70 As set out in Natural England's TIN049 [**Ref 12-3**], the ALC system considers the inherent potential, rather than the current use or intensity of use. Therefore, land use, cropping choice or yield are not relevant to land quality considerations.

12.4.71 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 Solar PV Site in a national and regional context.

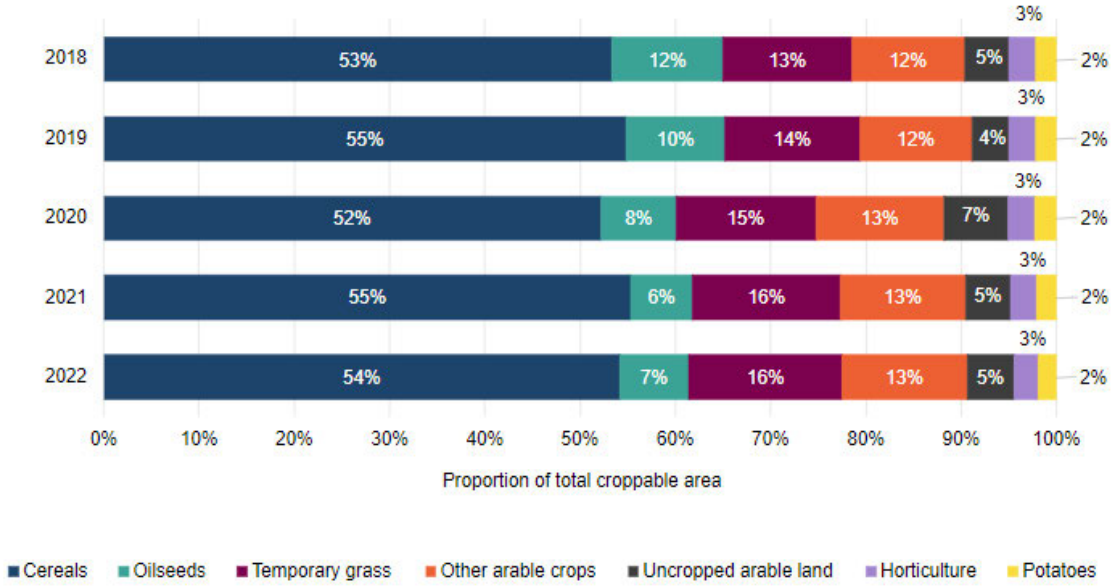
12.4.72 Within the Solar PV Site and within the field margins, where arable cropping will not be possible for the duration of the operational phase, there is of the order of 531ha of mostly arable land. That is considered initially in the national and regional context, in terms of field use and economics.

12.4.73 The utilised agricultural area (UAA) of England in 2022 (Agricultural Land use in England at 1 June 2022, Defra, [**Ref 12-13**]) was 8.9 million hectares. This accounts for 69% of the total area of England.

12.4.74 The total croppable cereals area is about 54% of UAA, and that area has remained broadly similar for a number of years.

12.4.75 There are annual fluctuations between different crops, shown on the Insert 12.17 below. The area of uncropped arable land remains at about 5%.

Insert 12.17: Total Croppable Area at 1st June



12.4.76 The 'Provisional Cereal and Oilseed Production Estimates for England 2022' [**Ref 12-9**] estimate that total cereal production in England increased by 9.4% to almost 21 million tonnes in 2022. This was driven by increase in wheat production, up 12% due principally to an 11% increase in yield.

12.4.77 There is no policy for increasing UK food production from arable crops. The Government Food Strategy (Secretary of State for Environment, Food and Rural Affairs, June 2022) set out at 1.2.3 that "*our aim is that farmers will broadly maintain domestic production at current levels as we deliver our climate and environmental goals*".

12.4.78 In that context, the 817ha of agricultural (mostly arable) land within the Order limits would be capable of producing, at an average of 8.6 t/ha, of the order of 7,000 tonnes of wheat. In reality the production would be less because wheat would be grown in rotation with lower-yielding barley and break crops, which could include grassland leys. See the rotations described in ***Appendix 12.8***.

12.4.79 Assuming a three year rotation of 2 wheats and a break crop of barley or oilseed rape for the purposes of this exercise (areas rounded to nearest 5ha), the potential production from 817 ha within the Order Limits is set out in **Table 12-9**.

Table 12-9: Potential Production (Order limits)

Crop	Area (ha) (nearest 5ha)	Yield (t/ha)	Production (t) (nearest 10t)
Wheat	550	8.6	4,730
Barley	135	7.3	990
Oilseed rape	135	3.5	470
Total	**820**	**-**	**6,190**

12.4.80 This is a small contribution to the England-wide total of 21 million tonnes of cereals and 1.2 million tonnes of oilseed rape production in 2022 (Defra, 10/10/22).

12.4.81 There are large areas (approximately 239ha) that will be retained for agricultural use including arable. For the assessment, the more realistic assessment should be taken using the Solar PV Site and field margins. These cover an area of 531ha (see Table 12.1). Of this, 216ha is BMV agricultural land. The potential production from this area (ie BMV and non-BMV) is proportionately less. Again taking an average of 8.6t/ha yield of wheat and a three-year rotation, the approximate production from this area is set out in Table 12-10.

Table 12-10: Potential Production (Solar PV Array and field margins)

Crop	Area (ha)	Yield (t/ha)	Production (t) (nearest 10t)
Wheat	351	8.6	3,020

Crop	Area (ha)	Yield (t/ha)	Production (t) (nearest 10t)
Barley	90	7.3	660
Oilseed rape	90	3.5	310
Total	**531**	**-**	**4,000**

12.4.82 So far as the Applicant is aware there is no research that identifies yield differences between BMV and non-BMV land. In this case the land is mostly Subgrade 3a and 3b, where yield differences are probably limited.

12.4.83 A crude estimate can be made of the incremental yield increase from the 216 ha of BMV within the Solar PV Array and field margin Area (35ha Grade 2, 181ha sub-grade 3a). Using the John Nix Pocketbook for Farm Management [**Ref 12-14**], average yields of wheat are 8.6t/ha, and high yields are 10.0t/ha. There are uplifts for barley and oilseed rape. Applying those uplifts to the 216 ha of BMV in the PV Array areas, the incremental benefit of the BMV in terms of production, with the above rotation, would be of the order of 250 tonnes as set out in **Table 12-11**.

Table 12-11: Increased Production from BMV Areas

Crop	Area BMV (ha)	Increased Yield (t/ha)	Increased Production (t)
Wheat	144	1.4	202
Barley	36	0.95	34
Oilseed rape	36	0.5	18
Total	**216**	**-**	**254**

Source: John Nix Pocketbook for Farm Management 2023, 53rd Edition, September 2022

12.4.84 Therefore, the economic effect of solar panels on the Solar PV Array and field margin area is of the order of 250 tonnes of cereal and oilseed production compared to the panels being located only on non-BMV land.

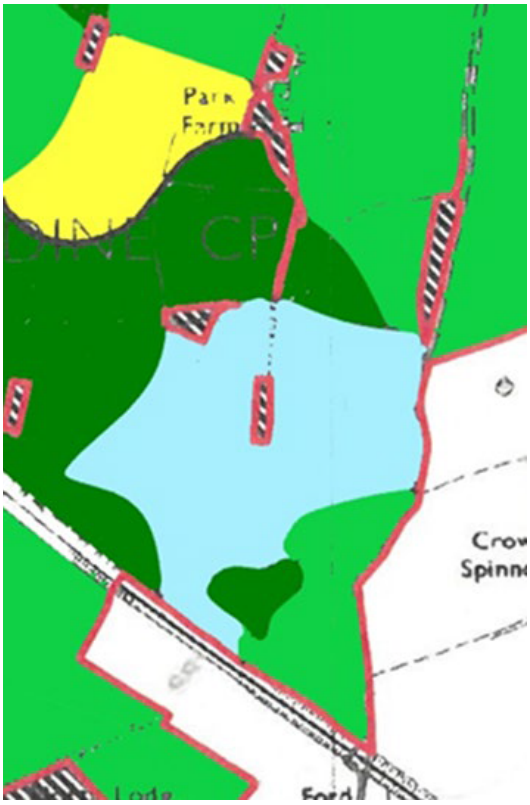
12.4.85 In that context it is also important to consider the ability to farm BMV land separately to non-BMV land. As part of the embedded mitigation, secured through the **Works Plans**, fields which consist entirely of Grade 2 are retained for arable production (should the landowner wish). The fields within the Solar PV Area are mostly a mix of subgrades 3a and 3b. There are limitations for agricultural use.

12.4.86 Areas near the river are affected by flooding. This is evident in the aerial images dated 30th May 2021 (Insert 12.18). These areas are mostly excluded from the Solar PV Site Area.

Insert 12.18: Flood-damage Near the River

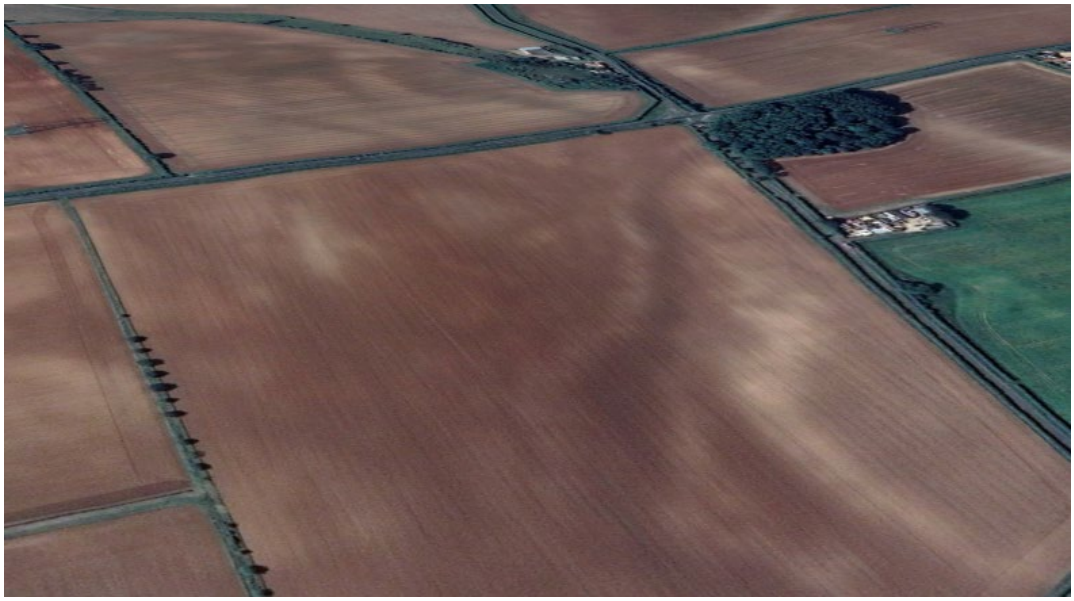
12.4.87 There is only one area of mostly Grade 2 within the Solar PV Site area. This is shown below (Insert 12.19) and compared to an aerial image dated 14th September 2020 (Insert 12.20). The variability of the soils is evident when crop cover has not established. Detailed ALC across this area reveals the pattern.

Insert 12.19 and 12.20: Central Part of Order limits (ALC and Aerial Image)



12.4.88 These variables of soil affect crop production and yield. The following aerial images (Insert 12.21 and 12.22) from September 2020, where a clear soil pattern is evident in the soils, is clearly visible in drought stress in the drone image provided by the landowner in May 2022.

Insert 12.21 and 12.22: Aerial Image Sept 2020 & Drone Image May 2022



12.4.89 This significant inter-field variability is also very obvious in a field in the central southern part of the Proposed Development, which is shown on Insert 12.23.

Insert 12.23: Arable Field

12.4.90 This exercise shows that the land is suited to cereal production, and oilseed production, but that it is not easy land to farm. There are variabilities across the land, and in practical terms the field-scale cropping and time of operations is dictated by the most limited land in each field.

12.4.91 In practical terms there is little between the subgrade 3a or 3b land, and the limited amounts of Grade 2 retained within the area for the Solar PV Site are similarly constrained in practical terms. Agricultural production will not be lost. The land under and around the panels will be farmed, being used for the production of sheep or fodder. This is a physically feasible land use option. Therefore, there will be continued agricultural use of the Solar PV Site.

12.4.92 In respect of potentially reduced production from BMV agricultural land for the duration of the operational phase, should that be relevant within the Solar PV Site, BMV agricultural land amounts to 216 ha.

12.4.93 Food production is not identified as an environmental consideration. It is an economic and land use consideration that has been considered in this chapter in light of the public interest in this topic and comments from RCC.

12.4.94 Agricultural use, potentially involving food production, can continue. Food production will be able to continue, through uses such as fodder and sheep farming and use of the Mitigation and Enhancement Areas. The areas that are occupied by the Solar PV Site and field margins will create a negligible impact in economic and land use terms.

12.4.95 In a wider land use change sense, which are considered as part of EIA methodology, there will be significant changes in day-to-day operations of the farms involved as they will have to change enterprises. This is a farming change, however, and is not of itself significantly adverse. None of the farms will be significantly adversely affected, in that the ongoing viability of all holdings will continue, as set out in ***Appendix 12.6***. Whilst there will be changes to day-to-day farm management and operation over part of all the farms, this is not necessarily negative. Income streams will be possible, and farm viability would not be adversely affected.

12.4.96 The farms involved will benefit from a secure land rental income. They, and other farmers in the area, may also benefit from income from the land management required for the Solar PV and Mitigation and Enhancement Areas.

12.4.97 Nor should there be any reduction in agricultural labour needs. By way of comparison, as set out in **Table 12-12**, the estimated amount of labour per hectare per year from a winter wheat crop is between 10 and 14 hours, whereas low density sheep grazing would be 28 – 32 hours. Overall, therefore, the effect is considered to be a minor magnitude of impact.

Table 12-12*:* Labour Comparison

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

12.4.98 Consequently, agricultural labour overall will increase as a result of the Proposed Development, if all the land were to be grazed.

Summary

12.4.99 The effects of the operation phase are set out in **Table 12-13**.

Table 12-13*:* Assessment of Operation Phase Effects

Effect	Description	Sensitivity	Magnitude	Significance
Sealing or downgrading of agricultural land	No additional adverse effects on agricultural land	Very high to low	Negligible	Neutral or Slight
Damage to sensitive soils	No additional effects on soils	Medium	Negligible	Neutral or Slight
Effects on farm businesses	Significant changes to full-time farm businesses	Medium	Minor	Slight

12.4.100 Therefore, the operation effects are as follows:

(i) overall the impacts on agricultural land quality are negligible during the operational phase;
(ii) overall the impacts on soils will be slight beneficial;
(iii) the impacts on agricultural businesses and agricultural labour will be beneficial.

Decommissioning

12.4.101 Decommissioning methodologies will be covered by a DEMP. By following the DEMP and adhering to the principles set out earlier in this Chapter and the ***oDEMP***, the removal of the infrastructure should be possible without any significant adverse effect on soils.

12.4.102 The following description reviews the potential for disturbance to soils or agricultural land quality from removal of the infrastructure:

(i) **temporary decommissioning compounds and access**. If there is a requirement to create temporary decommissioning compounds for the decommissioning phases, these will be constructed and restored in a similar manner to those at the construction phase, and there should be no long-term adverse effects on soils or land quality;
(ii) **removal of access tracks**. The access tracks will be removed towards the end of the decommissioning phase, once the PV Arrays and other infrastructure have been removed. The works will involve removing the track material, which can be dug up and hauled out by machinery standing on the tracks. The area under the former track will then be loosened, when the conditions are dry, probably using a crawler tractor with a subsoiler tine, to lift and shatter any compaction. The topsoil, which will have been stored onsite, will then be returned and the land cultivated;

(iii) **PV Arrays**. The PV Arrays are decommissioned by being disconnected, then unbolted and removed, using fore-end loaders and tractors with trailers. The removal of the legs will then be carried out using an operation essentially the reverse of the installation process. It may be necessary to "rock" the legs initially to break the surface tension between the leg and soil, and then they can be pulled out pneumatically. The hole that is left will be small and will naturally fill in once the soil returns to field capacity in the following autumn due to soil expansion as the soil gets wet;

(iv) **Trenches**. The trenches are generally below the depth to which agricultural cultivation machinery will reach, and accordingly they can generally be left in the ground. The cables are laid in ducts, so the cabling itself can be removed and recycled, leaving only the duct. Where cables are shallower or need to be removed, the soil will be dug out in sequence and returned following removal of the cables;

(v) **Site Fencing and CCTV**. The removal of site fencing will require the taking down and removal for recycling of the wire, then the removal of the wooden poles normally involving loosening by rocking the poles, then lifting out with a chain and fore-end loader tractor.

12.4.103 There is the potential for the soil to be adversely affected by vehicular movement during the decommissioning process, depending upon the timing of the works. The ***oSMP*** sets out guidance on the timing of works, which will vary depending upon the soil type. In a normal year this means that machinery activity on the lighter soil types (Elmton 1 and Elmton 3, Sherborne) will have to be carefully managed between mid-December and mid-March, and on the wetter soil types (Denchworth, Fladbury) between mid-November and early/mid-April. All soils have medium resilience to structural damage however. The ***oSMP*** 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.

12.4.104 Unrestricted agricultural land management could resume following removal of the panels and infrastructure. The appropriate land use will need to be determined at the decommissioning stage in consideration of many factors, including land ownership and management considerations, policy and support payments, and prevailing economic conditions. This will be a land-use matter for the landowners.

12.4.105 Consequently the impacts from decommissioning are negligible, as there will be no significant sealing-over or downgrading of agricultural land.

12.5 Proposed Additional Mitigation

12.5.1 No further mitigation is proposed.

12.6 Residual Effects

12.6.1 The residual effects are captured in **Table 12-14**.

12.7 Monitoring Requirements

12.7.1 As a consequence of there being no significant adverse effects anticipated during the operation phase, no ongoing monitoring is required.

12.8 Cumulative Effects

12.8.1 Matters related to current land use, e.g. whether or not land is farmed for cereal production, whether that is for animal feed, biofuel or human consumption, or its development for renewable energy, are land use management factors not affecting soils or ALC grade. Food production is not identified as an environmental consideration. It is an economic and land use consideration that has been considered in this chapter in light of

the public interest in this topic and comments from RCC, therefore the cumulative effect has not been considered.

12.8.2 The effect on agricultural land associated with the Proposed Development is reversible in nature, unlike built development. Therefore, other potential developments as identified on the 'Long List' (***Appendix 2.4*** of this ES [**EN010127/APP/6.2**]), do not influence the decisions of individual landowners, and the use of other land, whether it is of BMV quality or not, would be due to other schemes, and is not considered cumulatively.

12.8.3 The Proposed Development would not result in any irreversible or permanent loss of agricultural land, and therefore there are no cumulative effects associated with other projects.

12.9 Conclusion

12.9.1 The Order limits is shown on the published provisional ALC maps as land of undifferentiated Grade 3 good to moderate quality land, and as falling in the low likelihood of BMV category. On the published maps this is some of the poorest land in the area, which has a higher-than-average proportion of BMV agricultural land. ALC survey has identified that the proportion of BMV land is higher than on the predictive BMV maps. The layout of the PV Arrays has been amended in design and the areas of BMV where the entirety of the field is Grade 2 have been removed from the Solar PV Site area. As a result, the size of the Solar PV Area including the field margins land has been reduced. Grade 2 accounts for 6.6% of the area, with sub-grade 3a a further 34.1% generally in a complex intermixing with sub-grade 3b, such that the sub-grade 3a could not be farmed differently. It is generally recognised that the installation of the Solar PV Arrays does not adversely affect the underlying land quality.

12.9.2 Within the Order limits there will be of the order of 0.5ha of Grade 2 land affected by tracks and Solar Stations, and a further 2.5ha of Sub-grade 3a.

Collectively this amounts to a slight or moderate adverse effect on agricultural land.

12.9.3 Soils are generally of medium resilience to structural damage from being handled and moved. For most of the works there is no requirement to move or handle soils, with the works limited mostly to travel over the soils. With the appropriate precautions there will be limited effect on the soils and any adverse effects will be capable of amelioration.

12.9.4 Farm businesses will need to adapt and change enterprises, but the Proposed Development involves only part of all of the farms affected, and they will have other agricultural and income-stream opportunities such that the effects are slight or neutral. There will be a change in production as a result of the Proposed Development. However, the quantum of arable crops that are grown from the BMV land within the Solar PV Site and field margins area is of the order of 250 tonnes over and above production levels of comparable moderate quality land, so the economic and additional food production advantages of that land are modest.

12.9.5 Overall, there are no significant adverse effects on land quality, soils or farm businesses.

Table 12-14: Summary of Effects

Description of Effect/Activity	Nature of Effect	Receptor	Value of Receptor	Embedded Mitigation Measures	Magnitude of Impact	Potential Significance of Effect	Additional Mitigation Measures	Residual Effect Significance	Monitoring Requirement
Construction Phase									
Permanent sealing or downgrading of agricultural land	Permanent, adverse, direct	BMV and lower quality land	Very high – 2, High – 3a, Medium – 3b Low - 4	Areas of BMV reduced by design. Soil handling measures set out in the oSMP	Minor	Moderate	None	Moderate	None
Significant damage to soils	Temporary, adverse, direct	Soils	Medium	Soil handling measures set out in the oSMP	Negligible	Slight	None	Slight	None
Adverse effects on farm businesses	Temporary, adverse, direct	Farm businesses	Medium	oCEMP	Negligible	Negligible or slight	None	Negligible or slight	None
Operational Phase									

Description of Effect/Activity	Nature of Effect	Receptor	Value of Receptor	Embedded Mitigation Measures	Magnitude of Impact	Potential Significance of Effect	Additional Mitigation Measures	Residual Effect Significance	Monitoring Requirement
Permanent sealing or downgrading of agricultural land	Permanent, adverse, direct	BMV and lower quality land	Low to very high	None	Negligible	Negligible	None	Neutral or slight	None
Damage to soils	Temporary, adverse, direct	Soils	Medium	None	Negligible	Neutral or slight	None	Neutral or slight	None
Effects on farm businesses	Permanent, adverse or beneficial, direct	Farm businesses	Medium	None	Minor	Slight	None	Slight	None
Decommissioning Phase									
Damage to soils	Temporary, adverse, direct	Soils	Medium	Good management	Minor	Slight	None	Slight	None

12.10 References

Ref 12-1 Institute of Environmental Management and Assessment (IEMA) Guide: a new perspective on land and soil in Environmental Impact Assessment, IEMA (February 2022).

Ref 12-2 Agricultural Land Classification of England and Wales: revised guidelines and criteria for grading the quality of agricultural land, MAFF (October 1988).

Ref 12-3 Agricultural Land Classification: Protecting the best and most versatile agricultural land, Technical Information Note TIN 049, second edition, Natural England (December 2012).

Ref 12-4 Natural England (2020) Provisional Agricultural Land Classification (ALC).

Ref 12-5 Natural England (2017) Likelihood of Best and Most Versatile Agricultural Land.

Ref 12-6 The Soil Survey of England and Wales memoire Bulletin 13: Soils and their use in Eastern England, Hodge, Burton, Corbett, Evans and Seale (1984).

Ref 12-7 Soil Carbon, British Society of Soil Science (2021).

Ref 12-8 Department for Environment, Food and Rural Affairs (Defra) (2009) Safeguarding our soils: a strategy for England (September 2009).

Ref 12-9 National Statistics: Provisional cereal and oilseed production estimates for England 2022, Defra (10 October 2022)

Ref 12-10 The Construction Code of Practice for the Sustainable Use of Soils on Construction Sites, Defra (September 2009).

Ref 12-11 Building Research Establishment (2014) Agricultural Good Practice for Solar Farms.

Ref 12-12 The Institute of Quarrying (2021) Good Practice Guide for Handling Soils in Mineral Workings (July 2021).

Ref 12-13 National Statistics: Agricultural Land Use in England at 1 June 2022, Defra (29 September 2022).

Ref 12-14 John Nix Pocketbook for Farm Management, 53rd edition, The Andersons Centre (September 2022)

Ref 12-15 Good Practice Guide for Handling Soils, MAFF (April 2000)

Ref 12-16 Planning and aftercare advice for reclaiming land to agricultural use, Natural England (April 2022)