

Great North Road Solar and Biodiversity Park

Environmental Statement

Volume 4 – Technical Appendices

Technical Appendix A17.2 – Outline Soil Management Plan

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**GREAT NORTH ROAD
SOLAR AND
BIODIVERSITY PARK**

**OUTLINE
SOIL MANAGEMENT PLAN
(oSMP)**

January 2026





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1 INTRODUCTION

Purpose and Scope of the Document

- 1.1 The outline Soil Management Plan (oSMP) sets out the key principles and considerations for the handling of soils for the Development. This is an outline of a Soil Management Plan that will be required under the Development Consent Order (DCO).
- 1.2 The document therefore needs to be read as one setting out the principles.
- 1.3 The oSMP has been prepared by Tony Kernon of Kernon Countryside Consultants Ltd. It draws on a detailed Agricultural Land Classification (ALC) and soil survey carried out by Amet Property Ltd. It has been revised to accommodate comments from Natural England that there needs to be a clear commitment to restore any disturbed land to its original ALC grade.

Structure of Report

- 1.4 The OSMP sets out an outline of soil management in the various Works Areas. It covers, in particular:
- the solar PV site, including installation of PV arrays, internal tracks, internal cabling, fencing, CCTV etc. This will also cover the solar PV site;
 - the cable route corridor, some of which will run through the solar PV site;
 - the BESS and fixed infrastructure.
- 1.5 No soil disturbance is intended for Works Area 3, mitigation. No agricultural land is involved with Works Areas 6 and 7. None of these areas are therefore mentioned.
- 1.6 It is noted that cable trenches will be required in Works Area 1, 2, 4, 5, 6 and 7. These are not all described separately, but are covered in the general description and works.
- 1.7 This oSMP:
- sets out the soil resource in section 2;

- sets out the key principles of soil management and soil suitability testing in sections 3 and 4;
- sets out works in Works Area 1 and Works Area 8 in section 5;
- sets out works in Works Area 2 in section 6;
- sets out works in Works Areas 4 and 5 in section 7;
- considers the operational phase in section 8;
- considers the principles of decommissioning in section 9.

1.8 Implementation of this oSMP, and adherence to its principles, will be the responsibility of the Applicant who will appoint a competent Principal Contractor who will implement onsite.

1.9 To reduce the size of the document the appendices have been reduced.

1.10 The update also takes account of:

- Defra “Agricultural Land Classification of England and Wales: Guidelines for grading the quality of agricultural land”, updated December 2025;
- the “Solar PV on Agricultural Land” document by ISEP, published January 2026.

Objective of the Document and the Works

1.11 The objectives of the oSMP are to set out the principles for soil handling and management to minimise disturbance to soils and to ensure, and the Applicants commits to, restoration of disturbed land to the same ALC grade following construction works or at decommissioning, whichever is relevant.

2 THE SOIL RESOURCE

2.1 The soils have been assessed as part of the Agricultural Land Classification (ALC) survey carried out by Amet Property Ltd.

2.2 The survey has identified the following soils across the Order Limits. The soils in each Block are described in **Table SMP1**.

Table SMP1: Summary of Soils Identified

Block	Soils
A	<p>To the north and west – Worcester Association – slowly permeable non-calcareous and calcareous reddish clayey soils over mudstone, shallow on steeper slopes.</p> <p>Around watercourses – Compton Association – stoneless mostly reddish clayey soils affected by groundwater.</p> <p>To the southeast – Whimble 3 Association – reddish fine loamy or fine silty over clayey soils with slowly permeable subsoils and slight seasonal waterlogging.</p>
B	<p>To the west – Worcester Association – slowly permeable non-calcareous and calcareous reddish clayey soils over mudstone, shallow on steeper slopes.</p> <p>Around watercourses – Compton Association – stoneless mostly reddish clayey soils affected by groundwater.</p> <p>To the northeast – Whimble 3 Association – reddish fine loamy or fine silty over clayey soils with slowly permeable subsoils and slight seasonal waterlogging.</p> <p>To the east – Arrow Association – deep permeable coarse loamy soils affected by groundwater.</p>
C	<p>The centre of the site – Brockhurst 1 Association – slowly permeable, seasonally waterlogged reddish fine loamy over clayey soils.</p> <p>To the north west, east and south – Worcester Association – slowly permeable non-calcareous and calcareous reddish clayey soils over mudstone, shallow on steeper slopes.</p>
D	<p>To the west – Worcester Association – slowly permeable non-calcareous and calcareous reddish clayey soils over mudstone, shallow on steeper slopes.</p> <p>Around watercourses – Compton Association – stoneless mostly reddish clayey soils affected by groundwater.</p>

Block	Soils
	To the east – Arrow Association – deep permeable coarse loamy soils affected by groundwater.
E	<p>On the higher ground – Brockhurst 1 Association – slowly permeable, seasonally waterlogged reddish fine loamy over clayey soils.</p> <p>Around watercourses – Compton Association – stoneless mostly reddish clayey soils affected by groundwater.</p> <p>Between the higher ground and watercourses from about half way down the slopes – Worcester Association – slowly permeable non-calcareous and calcareous reddish clayey soils over mudstone, shallow on steeper slopes.</p> <p>The fields nearest to Eakring – Hodnet Association – reddish fine and coarse loamy soils with slowly permeable subsoils and slight seasonal waterlogging.</p>
F	<p>Most of this site – Worcester Association – slowly permeable non-calcareous and calcareous reddish clayey soils over mudstone, shallow on steeper slopes.</p> <p>Around watercourses – Compton Association – stoneless mostly reddish clayey soils affected by groundwater.</p> <p>Around Kneesall Lodge and either side of the A616 – Salop Association – slowly permeable seasonally waterlogged reddish fine loamy over clayey, fine loamy and clayey soils.</p> <p>While there are a variety of different soil types identified across the various parts of the site they are fairly consistent, being slowly permeable reddish clayey soil across most of the fields with the areas closest to the A1 recorded as being deep coarse loamy soils.</p>
G	<p>To the west – Worcester Association – slowly permeable non-calcareous and calcareous reddish clayey soils over mudstone, shallow on steeper slopes.</p> <p>Around watercourses – Compton Association – stoneless mostly reddish clayey soils affected by groundwater.</p> <p>To the east – Arrow Association – deep permeable coarse loamy soils affected by groundwater.</p>

2.3 Soils are shown in the following photographs purely to illustrate soil characteristics and to indicate colours and the boundary between topsoils and subsoils. The field parcel numbers are reproduced in **Appendix SMP1**. These are the Works Plans with field parcels identified.

2.4 The land classification results are set out on five plans in **Appendix SMP2**. Typical soils are shown in the following photographs.

Photos 1 – 3: Grade 2 Soils, Parcel 199, reddish clayey soils



Photos 4 and 5: Subgrade 3a in Parcel 79, reddish fine loamy soils



Photos 6 and 7: Subgrade 3b, Parcel 199, reddish clayey soils affected by groundwater



Photos 8 and 9: Subgrade 3b in Parcel 244, reddish clayey soils over mudstone



Photos 10 and 11: Subgrade 3b in Parcel 16, deep permeable loamy soils over sand



- 2.5 The Agricultural Land Classification methodology was updated in December 2025 but the updates have not amended the grading identified.

3 KEY PRINCIPLES OF SOIL MANAGEMENT

Guidance

- 3.1 Soil management principles are set out in a number of documents, but those of most relevance are:
- Code of Practice for the Sustainable Use of Soils on Construction Sites, Defra (2009);
 - Working with Soil Guidance Note on Benefitting from Soil Management in Development and Construction, British Society of Soil Science (v 3 January 2022);
 - Good Practice Guide for Handling Soils in Mineral Workings, The Institute of Quarrying (July 2021) (extracts in **Appendix SMP3**);
 - Building on Soil Sustainability: principles for soils in planning and construction, Cornwall Council and others (September 2022);
 - Planning and aftercare advice for reclaiming land to agricultural use, Natural England (April 2022), especially in respect of soil bund management;
 - Solar PV on Agricultural Land: essential components of Environmental Assessments and Reports, ISEP (January 2026).

Overview

- 3.2 For much of the installation process (Works Area 1) there is no requirement to move or disturb soils. Soils will need to be moved and disturbed to create temporary working compounds, and to create the tracks and small fixed infrastructure bases. Soils will need to be disturbed to enable cables to be laid (Works Area 1 and 2), but the soils will be reinstated shortly after they are lifted out (i.e. this is a swift process).
- 3.3 For those areas where soil needs to be disturbed to create the bases for the substation and some fixed equipment (within Works Area 1 and Works Areas 4 and 5), the soil will be stored in suitably-managed conditions. The soil needs to be looked after because it will be needed at the decommissioning phase to restore the land under the bases back to agricultural use.

3.4 For the cabling (principally within Works Area 1 and Works Areas 2 but also within other Works Areas) trenches will be required, and when dug topsoil and subsoil should be kept separate. It will be evident where topsoil becomes subsoil. In most places the topsoil is about 30cm – 35cm deep, with a gradation to a lighter-coloured subsoil, as shown in the photographs in section 2 describing the soil resource.

3.5 Purely for illustration the following pit, and soil profile, from some of the Subgrade 3b land within the Site shows the clear distinction between topsoil and subsoil. Operatives should familiarise themselves with this distinction.

Photos 12 - 15: Pit showing topsoil and subsoil distinction



- 3.6 Temporary works, to create construction compounds (Works Area 1) and temporary access (Works Area 8) will be short term. Where soil needs to be disturbed, it should be stored carefully for replacement in the same areas.

Principles on Timing

- 3.7 For the majority of the Development soils do not need to be disturbed. The effects on agricultural land quality and soil structure are therefore limited to the effects of vehicle passage. Therefore, the key consideration is to ensure that soils are passed over by vehicles (trafficked) when the soils are in a suitable condition, and that if any localised damage or compaction occurs (which is common with normal farming operations too), it is ameliorated suitably, such as by light cultivation prior to re-seeding.
- 3.8 The key principles for successfully avoiding damage to soils are:
- timing;
 - retaining soil profiles;
 - avoiding compaction;
 - ameliorating compaction.

Timing

- 3.9 The most important management decision/action to avoid adverse effects on soils is the timing of works. If the construction work takes place when soil conditions are sufficiently dry, then damage from vehicle trafficking and trenching will be minimal.
- 3.10 Vehicle travel over soils creating limited impact is shown below. This is good practice and is to be aimed-for, so far as possible.

Photo 16: Soils Suitable for Trafficking



- 3.11 Poor practice is shown below. If this type of soil disturbance occurs it can be rectified, as set out below, but as a point of principle if soils are rutting as shown in Photo 17 they are not well suited to being trafficked. Work should, so far as possible, be delayed until soils dry out.

Photo 17: Soils not Suitable for Trafficking [NOTE: This is a photograph showing poor practice and does not relate to any of the Applicant's sites]



- 3.12 The heavier silty-clay and clayey soils identified in section 2, which are widespread across the western parts of the Order Limits, will be most susceptible to this type of damage. Minimising travel over those soils from November to March in most years is recommended, but in wet years this period could be extended. Guidance on limiting or avoiding soil damage in these areas is given in section 5.

3.13 The lighter soils of the eastern area of the Order Limits are less prone to damage, and can be worked for much of the year, generally requiring extra care in the December to February period. However, as these areas are intermixed with heavier soils, separate working practices are not considered to be feasible. Soils from Parcel 16, which is proposed only for mitigation but the photos are used to illustrate the sandier soils, are shown below. These can be worked for much of the year.

Photos 18 and 19: Pit and soils showing clear colour distinction



3.14 As a general rule any activity that requires soil to be dug up and moved, such as cabling works, should be minimised during the winter. Soils handled when wet tend to lose some of their structure, and this results in them taking longer to recover after movement, and potentially needing restorative works (e.g. ripping with tines) to speed recovery of damaged soil structure. The period when soils are most likely to be saturated, and therefore assessing soils before works commence is important (see below), as shown below.

Table SMP2: Unsuitable Period for Working with Soils

Soil Type	Likely Period When Soil Suitability Tests Are Important
Subgrade 1, 2 and 3a	November to March (December to February in dry years)
Subgrade 3b	November to March (December to February in dry years)

- 3.15 Works within these periods may be able to take place, but it will be necessary to carry out soil suitability tests more frequently as there will be times within those periods when soils will be too wet to handle.
- 3.16 Soil handling/assessment guidelines are set out in section 4.
- 3.17 The equipment used to construct solar farms is generally lightweight, as explained later in section 5. It is unlikely that deep compaction will be caused, even with travel in suboptimal conditions. If access is needed to areas when ground conditions are not suitable, it may be possible to lay temporary surfacing (as described in section 5) or to use very low ground pressure machinery, to enable access and work without significant disturbance to soils. These mitigation measures could allow access. Soils should not be moved, however, when unsuitably wet.
- 3.18 In localised instances where it is not possible to avoid undertaking construction activities when soils are wet and topsoil damage occurs then soils should be recovered by normal agricultural management, using normal agricultural cultivation equipment (subsoiler, harrows, power harrows etc) once soils have dried adequately for this to take place. There may be localised wet areas in otherwise dry fields, for example, which are difficult to avoid.
- 3.19 **Retaining Soil Profiles.** The successful installation of cabling at depths of >60cm requires a trench to be dug into the ground. Topsoils depths vary across the Order Limits but the coverage is generally about 30cm, with subsoils below that being generally similar to depth. As set out in the BRE Agricultural Good Practice Guidance for Solar Farms (BRE, 2014) at page 3:

“When excavating cable trenches, storing and replacing topsoil and subsoil separately and in the right order is important to avoid long-term unsightly impacts on soil and vegetation structure. Good practice at this stage will yield longer-term benefits in terms of productivity and optimal grazing conditions”.

- 3.20 In those areas where the soil is dug up (especially for trenching or creating access tracks (Works Areas 1 and 2), the soils should be returned in as close to the same order, and in similar profiles, as it was removed.
- 3.21 **Avoiding Compaction.** It is stressed that the objective of the oSMP is to avoid causing compaction. Compaction by normal machinery is very unlikely to affect land quality, but it results in the need for physical ameliorating with consequent cost implications. It should be avoided wherever possible.
- 3.22 This oSMP sets out when soils should generally be suitable for being trafficked. There may be periods within this window, however, when periodic rainfall events result in soils becoming liable to damage from being trafficked or worked. In these (likely rare) situations, work should only continue with care, to minimise structural effects on the soils, until soils have dried, usually within 48 hours of heavy rain stopping.
- 3.23 **Ameliorating Compaction.** If localised compaction occurs during construction, it should be ameliorated. This can normally be achieved with standard agricultural cultivation equipment, such as subsoilers (if required), power harrows and rolls.
- 3.24 The amount of restorative work will vary depending upon the localised impact. Consequently, where the surface has become muddy, for example in the photograph below, this can be recovered once the soil has dried, with a tine harrow and, as needed, a roller or crumbler bar.

Photos 20 and 21: Inter-row Localised Soil Disturbance and Subsequent Restoration



- 3.25 If there are any areas where there has been localised damage to the soils due to vehicle passage, for example, a low wet area within a field which despite best efforts could not be avoided, this should be made good and reseeded at the end of the installation stage, when conditions are suitable. This is illustrated below

Photo 22: Localised Restoration



- 3.26 The soils across the Order Limits, provided they have dried sufficiently, will readily restore. The ruts need to be harrowed level when the ground is dry, and then they will naturally restore.
- 3.27 Accordingly the ground surface should be generally levelled prior to any seeding or reseeded.

Commitment

- 3.28 The objective of good soil management is to ensure that any soil disturbed, is not downgraded. Accordingly through implementation of a Soil Management Plan the Applicant commits to not causing any downgrading of agricultural land quality by the construction, operation and decommissioning activities.

4 SOIL SUITABILITY TESTS

- 4.1 The soils across the Order Limits are generally able to be worked (i.e. physically moved) between April and October. Avoiding the November to March period if possible is recommended. Vehicle traffic will normally need to be avoided between November/December and February/March, depending upon rainfall.
- 4.2 The heavier clayey soils are most susceptible to traffic damage when wet. They will therefore need to be assessed after prolonged rain, depending upon the activities proposed.
- 4.3 Guidance on determining soils suitability to be handled is set out in the Good Practice Guide for Handling Soils, **Appendix SMP3**.
- 4.4 If you can roll soil into a ball or a sausage easily and the soil holds that shape, it is too wet to travel over or move soils. This is illustrated in the photographs below.

Photos 23 to 24: Soils too wet to handle



Field 261, November 2024



Field 47, November 2024

- 4.5 If the soils once rolled then cannot be held in this manner and break or crumble, as shown below, they are likely to be suitable for being handled. See the test methodology in **Appendix SMP3**.

Photos 25 and 26: Soils suitably dry to handle (not from this site)



- 4.6 The following soils, not from the Order Limits, show another example where soils crumble and are suitable for being moved and handled.

Photos 27 and 28: Suitably Dry Soils



- 4.7 As described in the Good Practice Guide (**Appendix SMP3**), sandy soils are normally impossible to roll into a thread. Instead an Examination Test must be used, rolling the soils into a ball to see if the sample darkens when squeezed indicating excess water. If it does not, as the example below (from Parcel 16) shows, it is suitable for being handled.

Photos 29 and 30: Examination Test, Parcel 16



- 4.8 Please note that there is a typing error on the extract in **Appendix SMP3**. Sandy soils are impossible to roll into a thread, not possible as stated at the bottom of Table 4.2.

5 WORKS AREAS 1 AND WORKS AREA 8

- 5.1 This section covers:
- (i) temporary access works;
 - (ii) construction compounds;
 - (iii) solar arrays and on-site trenching;
 - (iv) internal cabling;
 - (v) internal tracks;
 - (vi) site fencing;
 - (vii) underfield drainage.

Temporary Access

- 5.2 Typical short-term access can be provided by removable trackways, such as shown below.

Photos 31 and 32: Removeable Temporary Trackways



Construction Methodology of Construction Compound

- 5.3 Temporary construction compounds will be created at the start of construction and reinstated at the end.
- 5.4 Construction compounds are built by either matting over the top of the topsoil, or by stripping topsoil and storing it on the edge of the site. A matting is then laid down, and typically stone imported and levelled, as shown below.

Photo 33: Newly-laid Construction Compound (Elsham-Lincoln Pipeline)



5.5 The matting prevents the stone from mixing with the subsoil, as shown below.

Photo 34: Matting



5.6 Topsoil if removed will need to be stored short-term, such as shown below. If soils are still wet when moved, the storage should be no higher than 1m, but otherwise temporary storage can be up to 3m in height. The soils need to be sufficiently dry to handle. The works will be scheduled to start when soils are dry.

Photo 35: Topsoil Storage Example



- 5.7 Guidance on determining soils suitability to be handled is set out in the Good Practice Guide for Handling Soils, **Appendix SMP3** and in section 5.
- 5.8 As described in this oSMP, most of the soils across the Order Limits will be suitable for being moved for much of the year. However, after prolonged periods of rain, especially in the November to March period, the advice in section 4 on assessing suitability should be followed. Generally, the programme seeks to avoid working the soils in this period.
- 5.9 The topsoils will be stripped to a depth of 30cm, and placed in short-term storage in locations not at risk of flooding. Short term storage of soil is shown above. If the soil is likely to be stored for in excess of six months then, depending upon timing, it should be seeded with grass. This binds the soil together and minimises erosion.
- 5.10 Therefore if the construction compounds are not to be removed before the wet weather (normally November to March), the bunds should be seeded with grass, as per the example below, at a suitable time of the year. The compound can then be reinstated after April the following year.

Photo 36: Grass-seeded Soil Storage



- 5.11 The removal of the construction compound should be timed for dry weather. That will be before November or in the following spring (typically from April).
- 5.12 The base area should be loosened when soils are dry and the topsoil then spread over the site to the original depth. This should be lightly cultivated.

Solar PV Arrays

- 5.13 Installation of Solar PV Arrays can taken place once soils are sufficiently dry for light vehicle traffic, unless low ground pressure machinery or temporary surfacing has been used.
- 5.14 The layout includes a network of access tracks and in most cases once legs have been installed, only small numbers of vehicle movements will be needed between each string of panels.
- 5.15 The machinery normally used is small, lightweight and tracked, and damage to soils will generally be minimal.

Insert 1 and Photo 37: Example of Leg Piling and Panel Moving Equipment



5.16 Any surface disturbance will be limited, will not result in deep compaction, and can be ameliorated easily in the spring, as described above.

5.17 It is very unlikely that trafficking during construction when soils are relatively dry will result in compaction sufficient to require amelioration. However, if rutting has resulted the soil should be levelled by standard agricultural cultivation equipment such as tine harrows, once the conditions suit, and prior to seeding. This can be done with standard agricultural machinery, or with small horticultural-grade machinery such as is shown below.

Photos 38 and 39: Horticultural Machinery



5.18 The objective is to get the surface to a level tilth for seeding/reseeding as necessary, as was shown earlier.

5.19 Grass growth will then recover or establish rapidly.

Internal Cabling Works

- 5.20 Cabling is done mostly with either a mini digger or a trenching machine. The cable routing areas are shown on the plans. Trenches will be at varying depths. Topsoil should be placed on one side (0-30cm) and subsoil on the other (below 30cm).

Insert 2: Machinery Used (extract from BRE Good Practice Guidance)



Cable trenching, showing topsoil stripped and set to one side, with subsoil placed on the other side ready for reinstatement (photo courtesy of British Solar Renewables)

- 5.21 It is important that topsoils are placed separately to the subsoils, and that they are then put back in reverse order, i.e. subsoils first.
- 5.22 All trenching work will be carried out when the topsoil is dry and not plastic (i.e. it can be moulded into shapes in the hand).
- 5.23 The top 30cm will be dug off and placed on one side of the trench, for subsequent restoration. There is no need to strip the grass first.
- 5.24 If dry and lumpy the subsoils will be pressed down by the bucket to speed settlement. If the soils are settling well no pressing-down is required.
- 5.25 The topsoil will then be returned onto the top of the trench. It is likely, and right, that the topsoil will sit a few centimetres higher than the surrounding level. This should be left to allow it to settle naturally as the soils become wetter.

- 5.26 If there is a surplus of topsoil this may be because the lower subsoils were dry and blocky and there are considerable gaps in the soil. These will naturally restore once the lower soils become wet again. If the trench backfilling will result in the soil being more than 5-10cm proud of surrounding levels, which is unlikely but possible, the topsoil should not be piled higher. It should be left to the side, and the digger returned to add back the surplus soil once the trench has settled and add the rest of the topsoil onto the trench at that point.
- 5.27 Any excess topsoil should not be piled higher than 5 – 10cm above ground level.
- 5.28 If considered appropriate, a suitable grass seed mix could be spread over any parts of the trenches that would seem likely to benefit from extra grass. Seeding should take place at a suitable time of the year, being the spring or autumn.

Tracks and Small Fixed Equipment

- 5.29 Track construction involves removing the topsoil, normally to a depth of 30cm, and placing it to the side of the track (therefore enabling easy return to the same place on decommissioning). A geotextile membrane is then spread over the upper subsoil, and the track surface is laid onto this.
- 5.30 The small areas of fixed equipment will stand on a similarly-constructed hardstanding or concrete foundations, requiring some removal of soil to create the foundation.
- 5.31 Soil stripping should be carried out in accordance with Defra's "Construction Code of Practice for the Sustainable Use of Soils on Construction Sites" (Defra, 2009). The removed soil should be stored in bunds in accordance with the Construction Code of Practice.

Site Fencing and Cameras

- 5.32 Fence designs can vary, but they all involve a post being inserted into the ground. Pole mounted internal facing closed circuit television (CCTV) systems

are also likely to be deployed around the perimeter of the operational areas. Access gates will be of similar construction and height as the perimeter fencing.

- 5.33 The site fencing is likely to be metal mesh or deer fencing. This can be erected at any time, if soil conditions allow. The following photographs show fencing installed early in the process.

Photos 40 and 41: The Fencing



- 5.34 Similarly CCTV poles are inserted in the same way.

Photos 42 and 43: CCTV Poles and Fencing



- 5.35 If the movement of vehicles is not causing significant rutting (i.e. more than 10cm), then fencing could be erected outside of the key working period.
- 5.36 Any rutting that results from fencing should be made good with standard agricultural equipment.

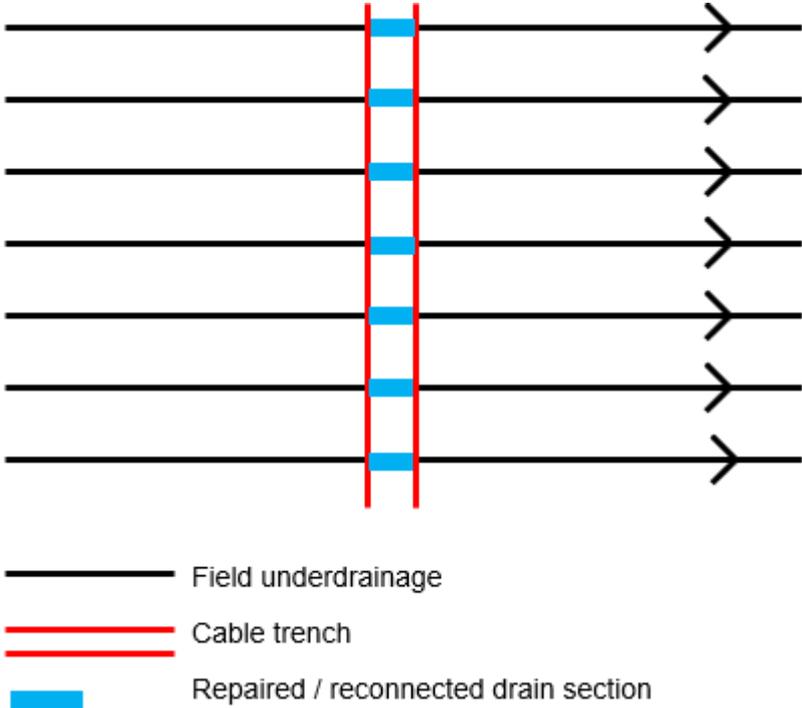
Drainage Works

- 5.37 There is the potential for parts of the site to have in place underfield drainage schemes. At the outset, prior to construction, all efforts will be made with landowners to identify historic maps and records of any known underfield schemes.
- 5.38 The extent to which there is the potential for an adverse effect will depend upon a number of factors including:
- the depth of drainage;
 - the direction and spacing of any underdrainage;
 - the extent to which the underdrainage is operational;
 - the type of works being undertaken.
- 5.39 Further detailed investigation of the drainage will be needed before construction. Scanning for clay and plastic pipe field drainage is not possible, and the depth of drainage is not known.
- 5.40 The Agricultural and Horticultural Development Board advisory guide “Field Drainage Guide: principles, installations and maintenance” (2024) notes that given good maintenance a useful life of a system is at least 20 years, but some systems can last many decades longer (page 4 refers).
- 5.41 The key consideration in minimising the effects on under-field drainage is to identify the location and depth of the drainage. Page 11 sets out a methodology for identifying the location of field drainage.
- 5.42 The land classification system assumes that **“where limitations can be reduced or removed by normal management operations or improvements, for example cultivations or the installation of an appropriate underdrainage scheme, the land is graded according to the severity of the remaining limitations”**.
- 5.43 Consequently any adverse effects on field drainage will not result in a downgrading or change to the ALC grading of the Order Limits.

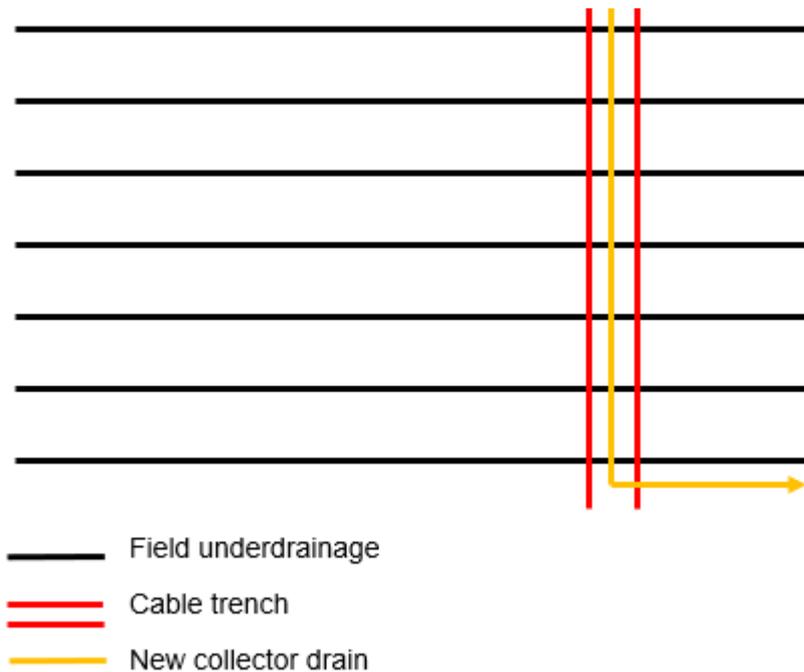
5.44 The installation of cabling will be supervised by an experienced advisor. He or she will know where to expect drainage, and will be able to identify if drainage pipes are broken as either clay pipe fragments or plastic pipe will be evident in the material dug out.

- 5.45 Those areas affected by cable damage should be repaired in one of two ways:
- (i) either the individual drains will be reconnected with new sections across the pipe, as illustrated below;
 - (ii) or a collector drain will be laid along the cable trench and will then connect, at a low point, to a new drainage pipe to take water away.

Insert 3: Drainage System Repair Option



Insert 4: Drainage System Repair Option



5.46 Drains affected by piling will be repaired locally, if required.

5.47 The purpose of under-field drainage is to help crop growth and to extend the time that land can be accessed. Drainage allows earlier and later access to the land, and evens out the drainage across the land to help with cultivations etc.

5.48 Allowing the land to drain less rapidly does not affect the operation of the solar farm. Vehicular access is normally only needed in the summer months, when panels are cleaned. Having under-field drainage working is not, therefore, important unless there are areas of standing water due to broken drainage.

5.49 Localised wet areas where drainage has been impeded such that surface puddling occurs, will be repaired with new sections of plastic drainage pipes dug around the blocked section to connect the old system.

6 CABLE WORKS (WORKS AREA 2)

6.1 The works will involve:

- (i) temporary construction compounds, such as the example below. These may be shared with those for the solar PV arrays;

Photo 44: Example of a temporary construction compound



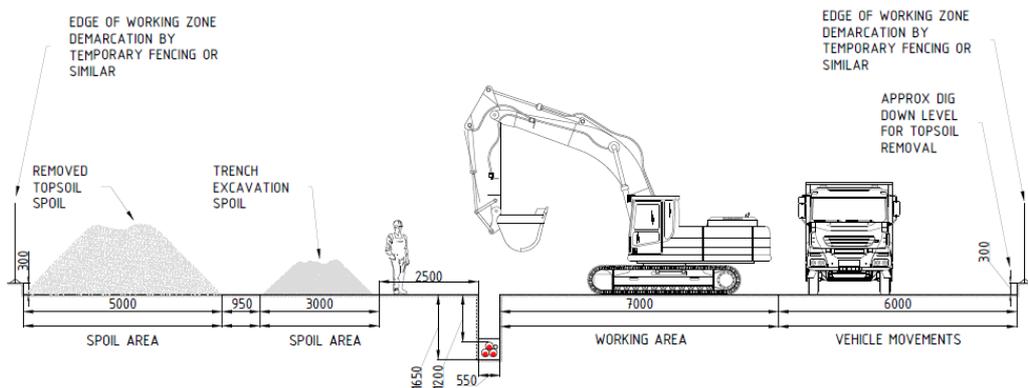
- (ii) the potential stripping of topsoil across the working width, to be stored temporarily in a bund, as per the example below. In some cases the working width may not need to be stripped;

Photo 45: Example of a temporary bund (example shown for a water pipeline project)



- (iii) the trench will then be dug, with the subsoil placed separately to the topsoil. An example is shown below, but the details will be determined prior to survey works;

Insert 5: Example of soil storage



- (iv) the cable is then laid into the trench, possibly with some material as protection against stones etc.
- (v) following cable installation, the subsoil will then be replaced in the trench;
- (vi) subsequently the topsoil will be replaced across the working width, following the soil handling and management principles to be set out in the SMP, and the land returned to the landowners for continued farming.

Photo 48: Topsoils Having Been Returned for Restoration

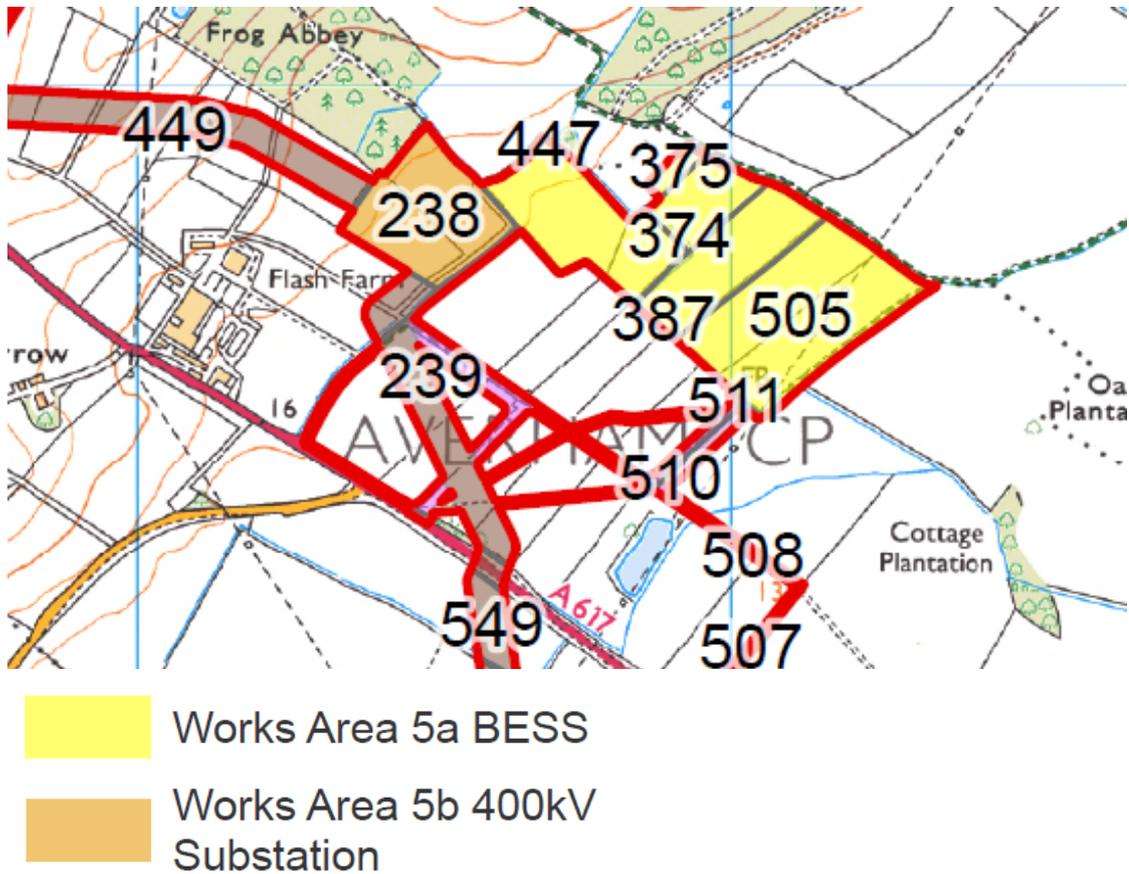


- 6.2 Similar works are expected across arable and grassland areas. Working widths will vary, narrowing for gaps through hedgerows or widening for deeper excavation areas (eg for boring under transport routes or watercourses). These trenches removed may also extend into Works Areas 1, 2, 4, 5A, 5B, 6 and 7.
- 6.3 Any effects on drainage will be assessed as described in section 5.

7 SUBSTATION AND BESS (WORKS AREAS 4, 5A, 5B)

- 7.1 The substation and BESS are at the southern end of the site, as shown on Insert 6.

Insert 6: Substation and BESS



- 7.2 This is an area of mixed Subgrade 3a and 3b quality. The soils are slowly permeable reddish clayey soils.
- 7.3 The works include removing the topsoil, for storage, and in places removal of some of the subsoil. Bases, and in places foundations will be built. The whole area will be restored on decommissioning.
- 7.4 The key is to remove and store the topsoil when conditions are right, following the principles set out in the oSMP. Long-term storage against the guidance in the Defra Construction Code of Practice for the Sustainable Use of Soils (2009) and the Institute of Quarrying Good Practice Guide for Handling Soils in Mineral

Works guidance will ensure that soils remain in good condition for the duration of the operational period.

- 7.5 Subsoil must be stored separately to the topsoil.
- 7.6 Details of the location and size of the soil storage will be presented in the SMP, including annual maintenance of the bunds, once details of the construction works are finalised.

8 OPERATIONAL PHASE: LAND MANAGEMENT

Solar PV Arrays

- 8.1 The land around the Solar PV Arrays will be managed including potentially by the grazing of sheep.
- 8.2 Panels grazed by sheep tend to be free of weeds, as shown below.

Photo 47: Sheep Grazing Under Panels



- 8.3 Any localised weed control by hand can be carried out at the appropriate time of the year.

Ongoing Maintenance

- 8.4 There are many different cleaners on the market, some tractor based and some operated from smaller machines, such as below.

Photo 48: Cleaning of Solar Arrays



- 8.5 The normal cleaning period is early summer, so that panels are clean for the maximum light period, so damage is unlikely.
- 8.6 If vehicles, including farm vehicles, cause ruts in the soil these will naturally repair in time, especially as the land is grazed by sheep and their feet are excellent at levelling land. Alternatively, a light harrow or rolling will restore the ruts, when the soil is still soft enough to roll but hard enough to not rut more.

Photo 49: Ruts Caused by Vehicles



- 8.7 If vehicles have caused rutting it is probably, as per the example above, only localised. In the photograph above this is a wet spot, and on the land either side of the ruts within the row there is no evidence of wheel indentation. If these areas are not levelled they will tend to sit with water in them.
- 8.8 Localised, small rutting should be repaired by either treading-in the edges with feet, by light rolling or harrowing, or adding a small amount of soil simply to fill-in the depression so that water does not collect there.
- 8.9 Deeper rutting will require either light harrowing in the drier period, or some soil adding, or both, before reseeding.

Emergency Repairs

- 8.10 For the duration of the operational phase there should be only localised and infrequent need to disturb soils, such as for repair of a cable. Any works involving trenching should be carried out, ideally, when the soils are dry but

recognising that any works will be those of emergency repair, that may not be possible.

- 8.11 Accordingly if new cabling is needed and has to be installed in wet periods, it can be expected that the trench will look unsightly initially, such as the example below.

Photo 50: Trench During Wet Period



- 8.12 Any area disturbed should be harrowed or raked level once the soils have dried, and be reseeded. These areas will be small, and this can probably be done by hand.

9 DECOMMISSIONING PRINCIPLES

- 9.1 Reference should be made to the Outline Decommissioning and Restoration Plan [EN010162/APP/6.4.5.6].
- 9.2 Given the length of time before decommissioning it is likely that the ALC methodology will have been amended by then. Further, unless we are successful in reducing global carbon emissions, climate change may have altered the seasons and rainfall patterns. Therefore, this guidance is prefaced with a requirement for a suitably qualified soil scientist to revisit the Order Limits prior to decommissioning, and to update the guidance and timing. The objective is to remove panels and restore all fixed infrastructure areas to return the land to the same ALC grade and condition as it was when the construction phase commenced.

Removal of Panels

- 9.3 A qualified soil scientist should advise prior to decommissioning time. The effects of climate change by the time of decommissioning may mean that these dates are no longer applicable.
- 9.4 Once the panels have been unbolted and removed, the framework will then be a series of legs, as shown below.

Photos 51 and 52: The Framework



- 9.5 These will be removed by low-ground pressure machines, in a reverse operation to the installation. These machines will provide a pneumatic tug-tug-tug vertically upwards. This will break the seal between soil and leg, and once that surface tension is released the leg will come out easily.
- 9.6 The legs will be loaded onto trailers and removed.
- 9.7 There will be no significant damage to the soils, and no significant compaction.

Removal of Cables

- 9.8 Cables buried less than 1 metre deep will be removed. This is likely to need a trench to be dug. This will be done with either a mini digger or a trenching machine.
- 9.9 The type of machinery used for trenching is shown below, taken from the BRE National Solar Centre “Agricultural Good Practice Guidance for Solar Farms” (2013).

Insert 7: Machinery Used for Trenching



Cable trenching, showing topsoil stripped and set to one side, with subsoil placed on the other side ready for reinstatement (photo courtesy of British Solar Renewables)

- 9.10 Once the trench has been backfilled it should be left for cultivation with the rest of the field post removal of panels.

Removal of Fixed Infrastructure

9.11 Switchgear, such as that shown below, will need to be removed.

Photo 53: Switchgear



9.12 Low ground pressure vehicles, and cranes, will be needed to lift the decommissioned units onto trailers, and removed from site. An example is shown below.

Insert 8: Example of Low Ground Vehicles



Case Steiger Quadtrac used to deliver inverters and other heavy equipment to site under soft ground conditions (photo courtesy of British Solar Renewables)

9.13 Any concrete bases will need to be broken up. This will most likely involve breaking with a pneumatic drill to crack the concrete, after which it should be dug up and loaded onto trailers and removed.

- 9.14 The ground beneath the base may then benefit from being subsoiled, to break any compaction. This should be done by standard tractor-mounted equipment, such as the following examples.

Inserts 9 and 10: Example of Tractor Mounted Equipment



Tracks

- 9.15 The tracks will be the last fixed infrastructure removed. The tracks will have been used for vehicle travel during the decommissioning stage. The tracks will also be used for removal of material from the tracks themselves, which will be removed from the furthest point first.
- 9.16 The stone will be removed and any matting removal. The base will then be loosened by subsoiler or deep tine cultivators, depending on specific advice given by the soil expert at the time following an analysis of soil compaction and condition.

Reinstatement of Soils

- 9.17 Topsoil from the storage areas will then be returned and spread to the depth removed. The area will then be cultivated, probably in combination with the whole of each field.

Fences and Gates, and CCTV Cabling

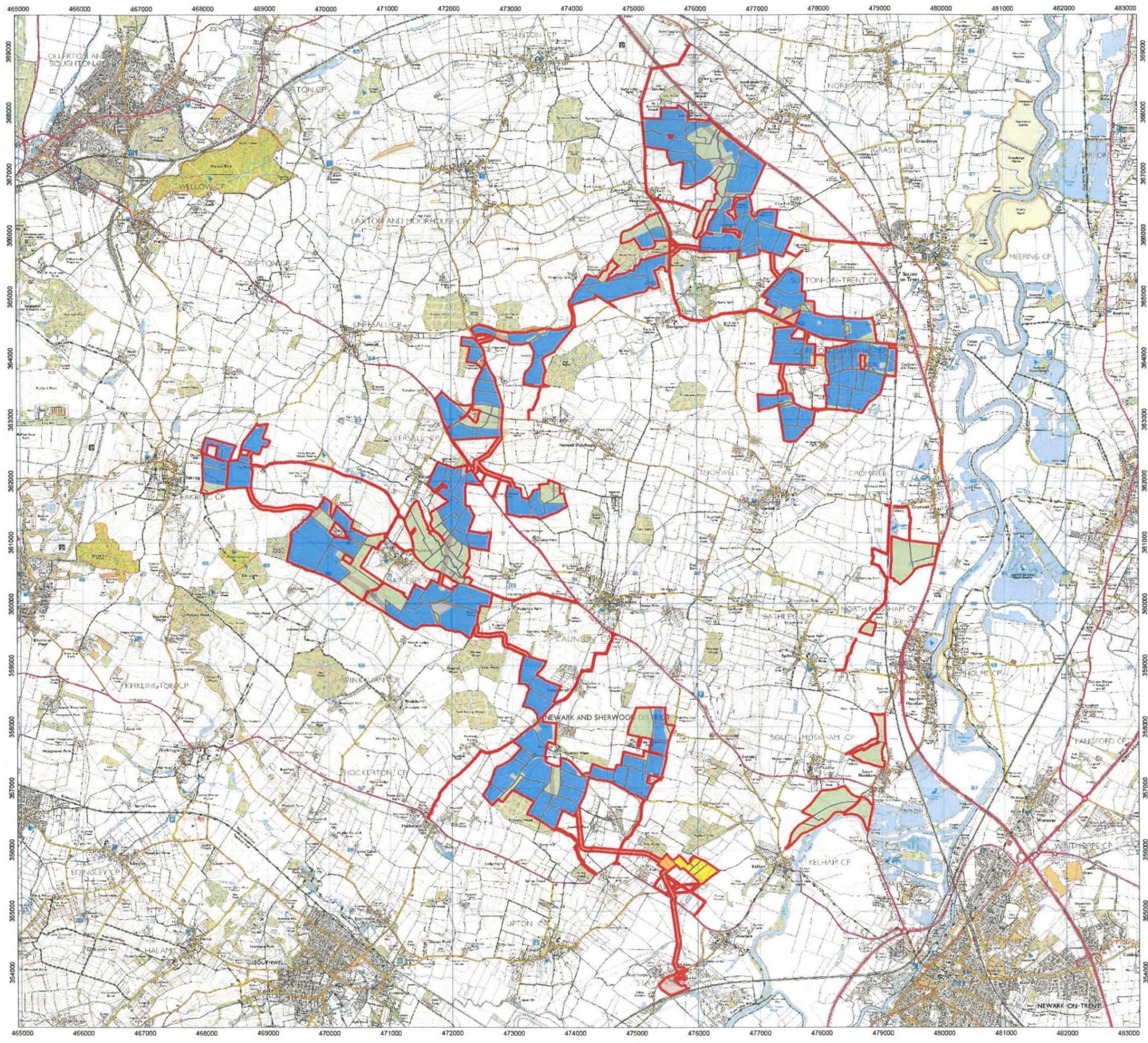
- 9.18 The cabling be removed in the summer months, after the panels have been removed. This will involve a tractor and trailer. The CCTV cabling is shallow buried and will probably pull out without the need for trenching, but if required trenches will be dug, as described above, and replaced in order once the cables have been removed.

9.19 Fences and gates will be rocked by machinery and pulled out. The holes are generally small and will fill in easily, but the bucket could be used to loosen the surface so that soil fills the void, if there is a risk of injury from the small holes.

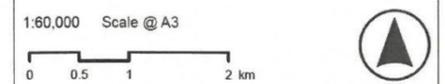
Cultivation

9.20 The fields will be handed back to the farmers. Whether they are handed back as grassland or sprayed off and cultivated, will be determined in discussions with each landowner.

Appendix SMP1
Field Parcel Numbers



- Order Limits
- Field Boundaries
- Works Areas**
- Works Area 1 Solar PV
- Works Area 1 Solar PV
- Works Area 2 Cable
- Works Area 3 Mitigation
- Works Area 4 Substations
- Works Area 5a BESS
- Works Area 5b 400kV Substation
- Works Area 6 National Grid Substation
- Works Area 7 Staythorpe BESS Connection

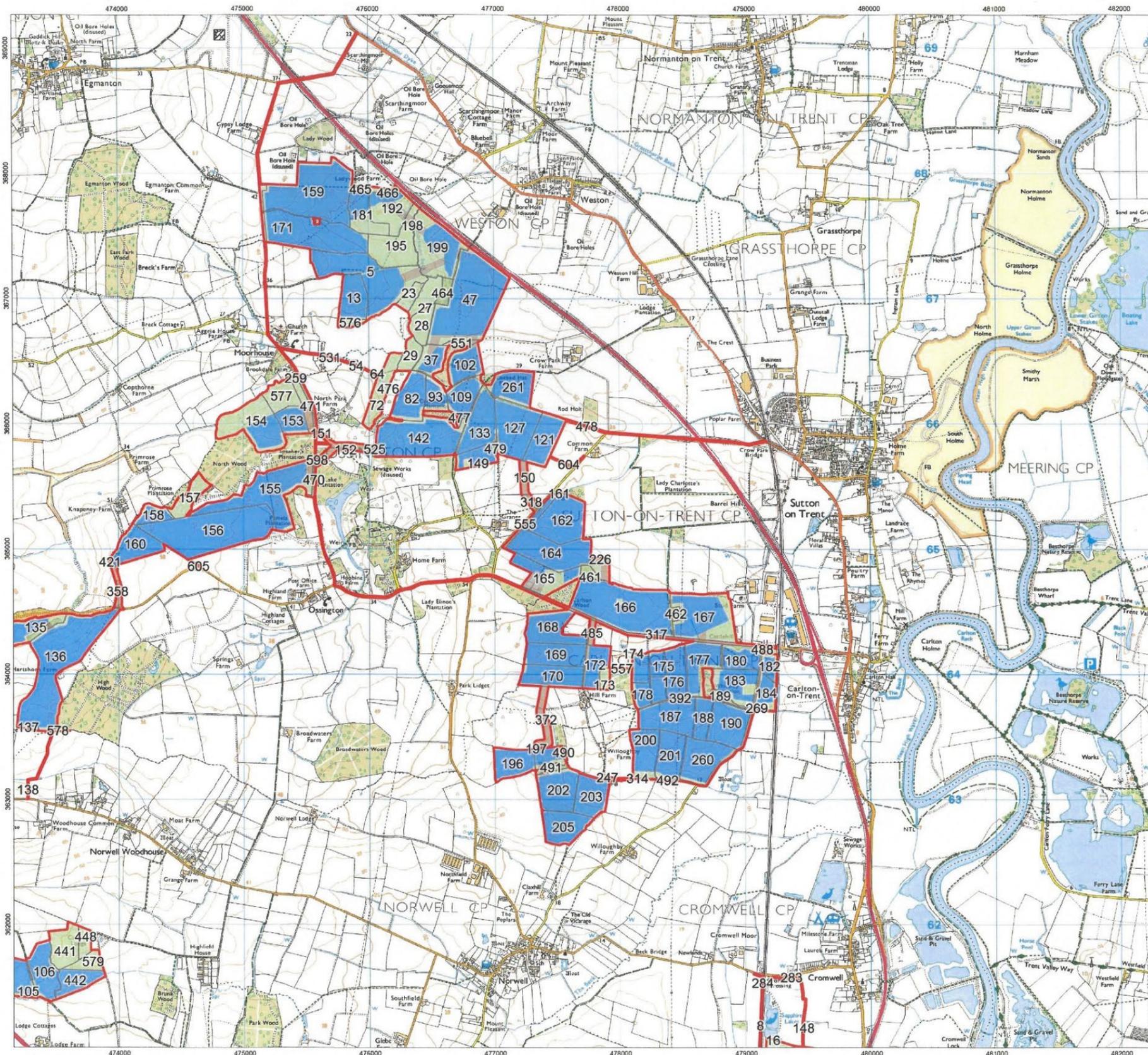


Ref: 026-ES-5.1 Date: 07/05/2025

**Works Areas
Figure 5.1**

**Great North Road Solar and
Biodiversity Park
Environmental Statement**

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- Order Limits
- Field Boundaries
- Works Area 1 Solar PV**
- Works Area 1 Solar PV
- Works Area 2 Cable
- Works Area 3 Mitigation
- Works Area 4 Substations
- Works Area 5a BESS
- Works Area 5b 400kV Substation
- Works Area 6 National Grid Substation
- Works Area 7 Staythorpe BESS Connection
- Works Area 8 Access



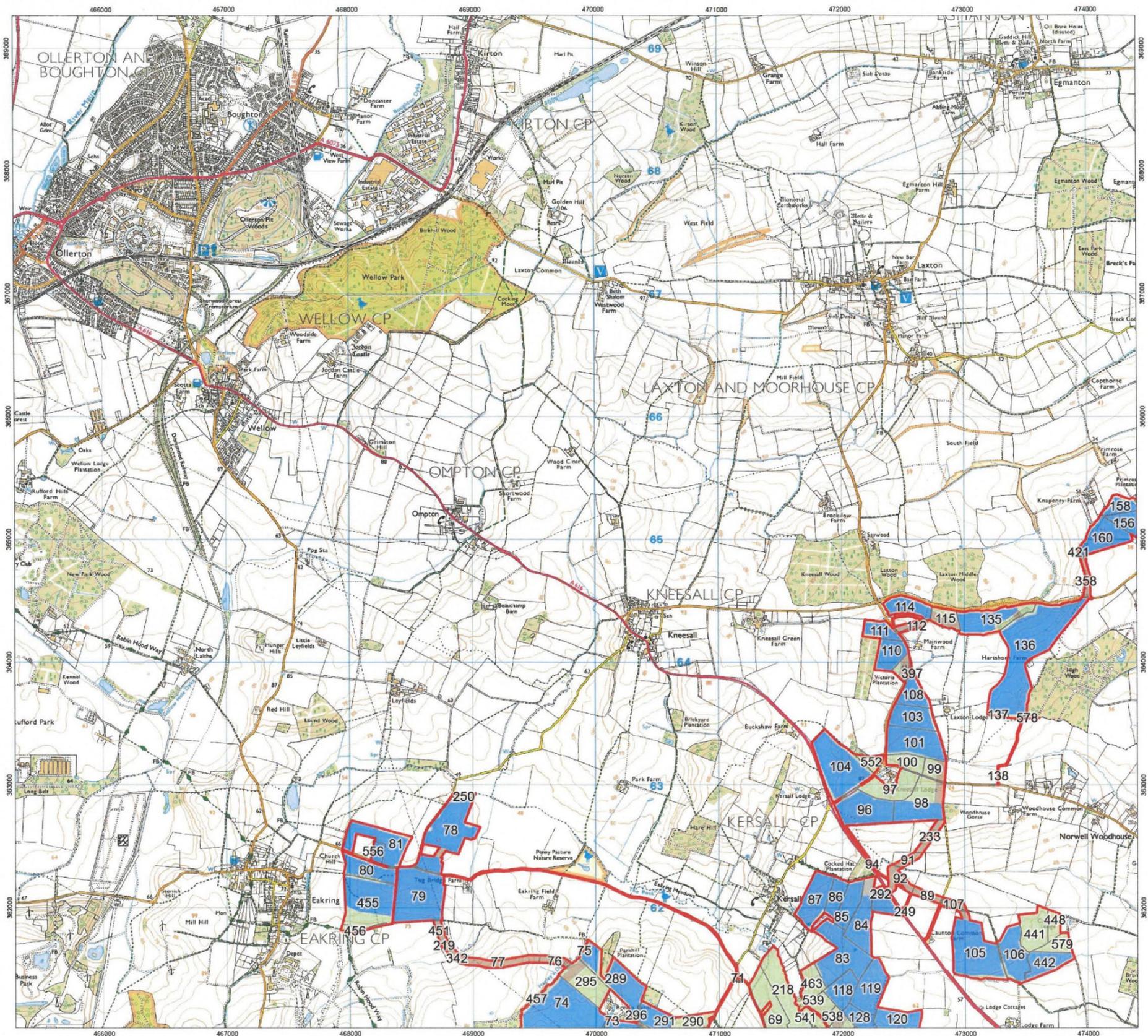
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Ref: 026-ES-5.1 Date: 07/05/2025

**Works Areas
Figure 5.1NE**

**Great North Road Solar and
Biodiversity Park
Environmental Statement**

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- Order Limits
- Field Boundaries
- Works Area 1 Solar PV**
- Works Area 1 Solar PV
- Works Area 2 Cable
- Works Area 3 Mitigation
- Works Area 4 Substations
- Works Area 5a BESS
- Works Area 5b 400kV Substation
- Works Area 6 National Grid Substation
- Works Area 7 Staythorpe BESS Connection
- Works Area 8 Access



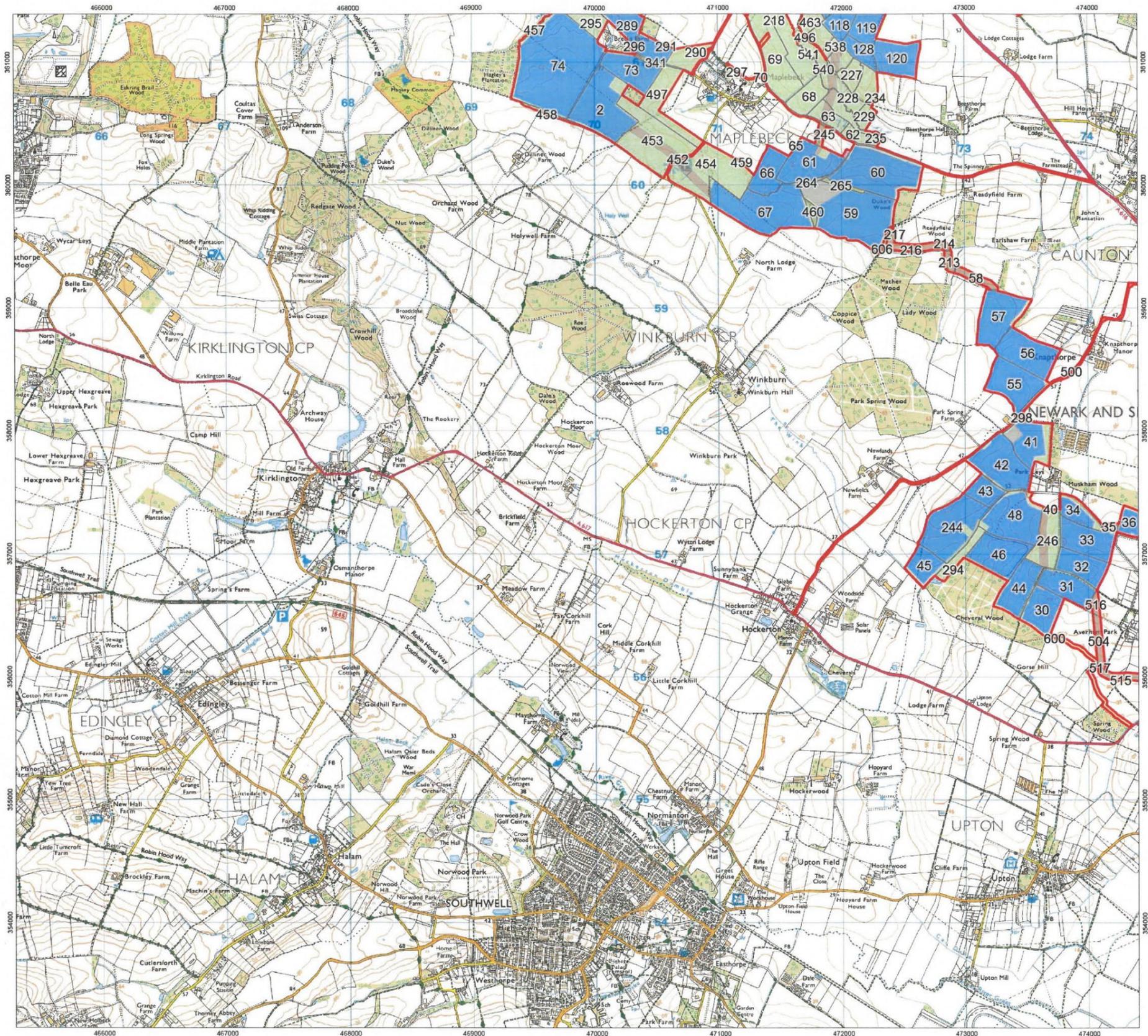
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Ref: 026-ES-5.1 Date: 07/05/2025

**Works Areas
Figure 5.1NW**

**Great North Road Solar and
Biodiversity Park
Environmental Statement**

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- Order Limits
- Field Boundaries
- Works Area 1 Solar PV**
- Works Area 1 Solar PV
- Works Area 2 Cable
- Works Area 3 Mitigation
- Works Area 4 Substations
- Works Area 5a BESS
- Works Area 5b 400kV Substation
- Works Area 6 National Grid Substation
- Works Area 7 Staythorpe BESS Connection
- Works Area 8 Access



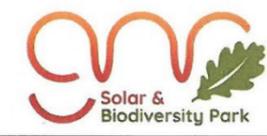
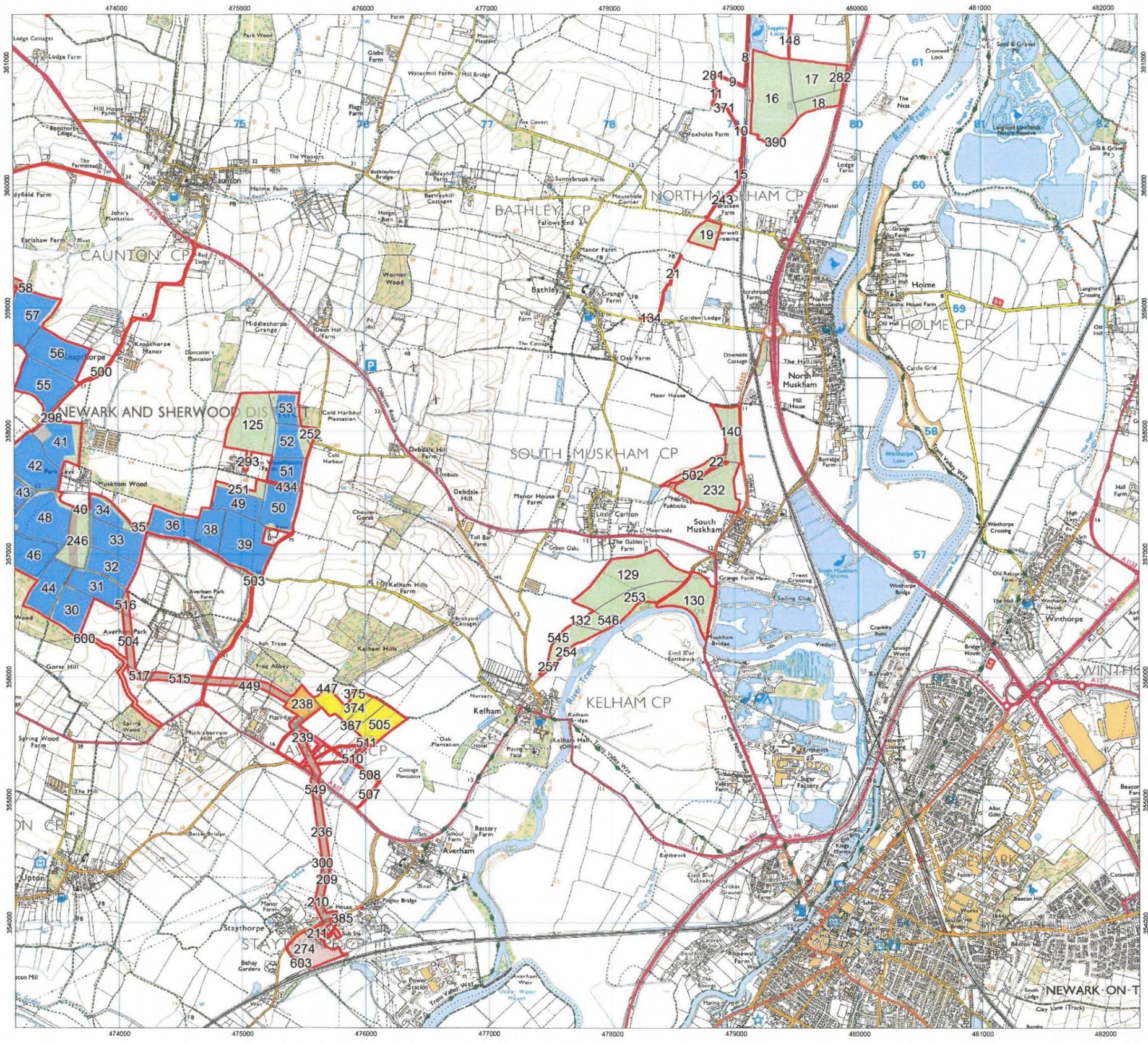
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Ref: 026-ES-5.1 Date: 07/05/2025

**Works Areas
Figure 5.1SW**

**Great North Road Solar and
Biodiversity Park
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- Order Limits
- Field Boundaries
- Works Area 1 Solar PV
 - Works Area 1 Solar PV
 - Works Area 2 Cable
 - Works Area 3 Mitigation
 - Works Area 4 Substations
 - Works Area 5a BESS
 - Works Area 5b 400kV Substation
 - Works Area 6 National Grid Substation
 - Works Area 7 Staythorpe BESS Connection
 - Works Area 8 Access



1:30,000 Scale @ A3
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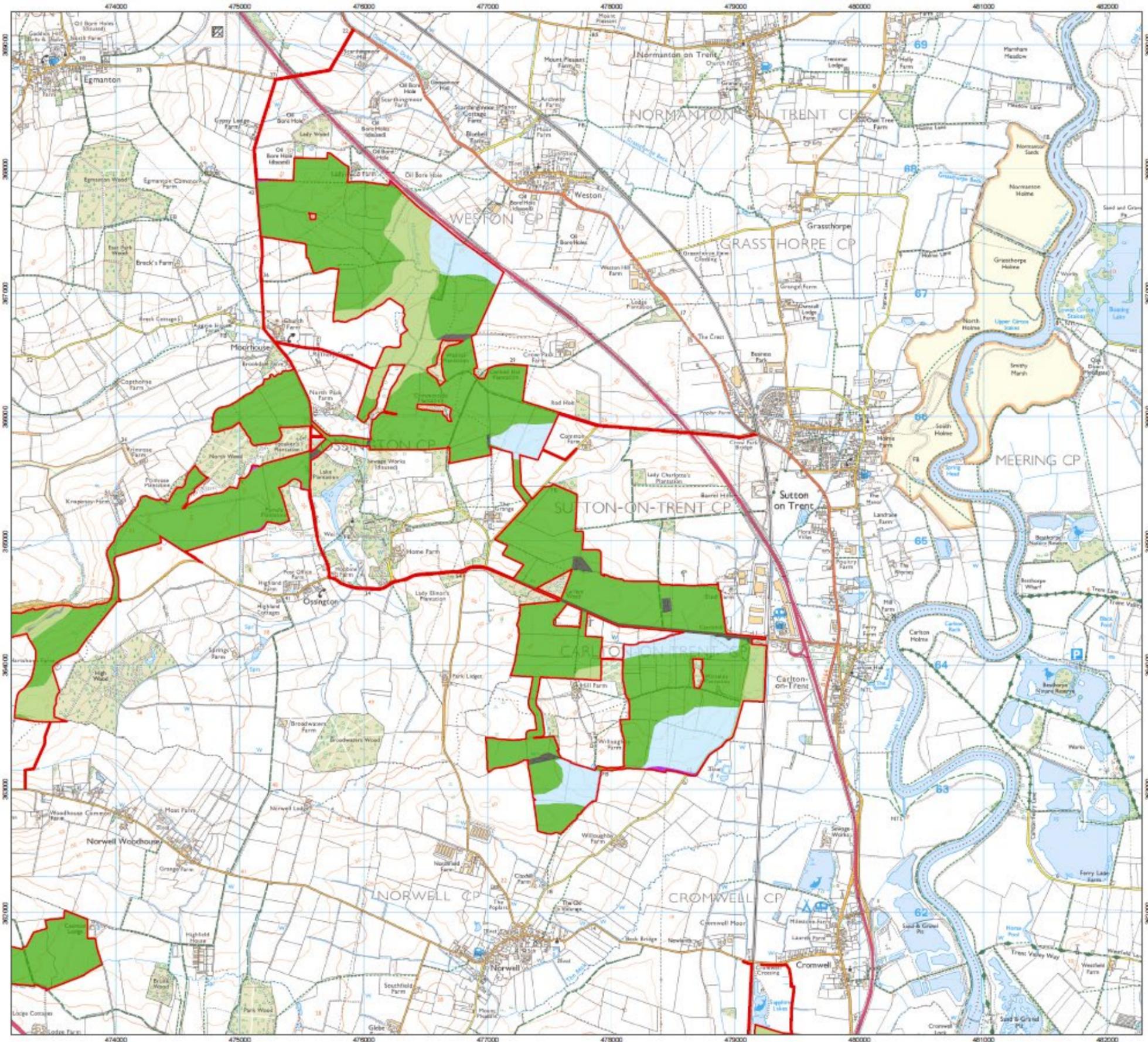
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**Works Areas
Figure 5.1SE**

**Great North Road Solar and
Biodiversity Park
Environmental Statement**

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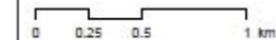
Appendix SMP2
ALC Plans



- Order Limits
- Agricultural Land Classification - Survey Results**
- Grade 2 - Very Good
- Grade 3a - Good
- Grade 3b - Moderate
- Grade 4 - Poor
- Non Agricultural
- Unsurveyable
- Unsurveyed



1:30,000 Scale @ A3



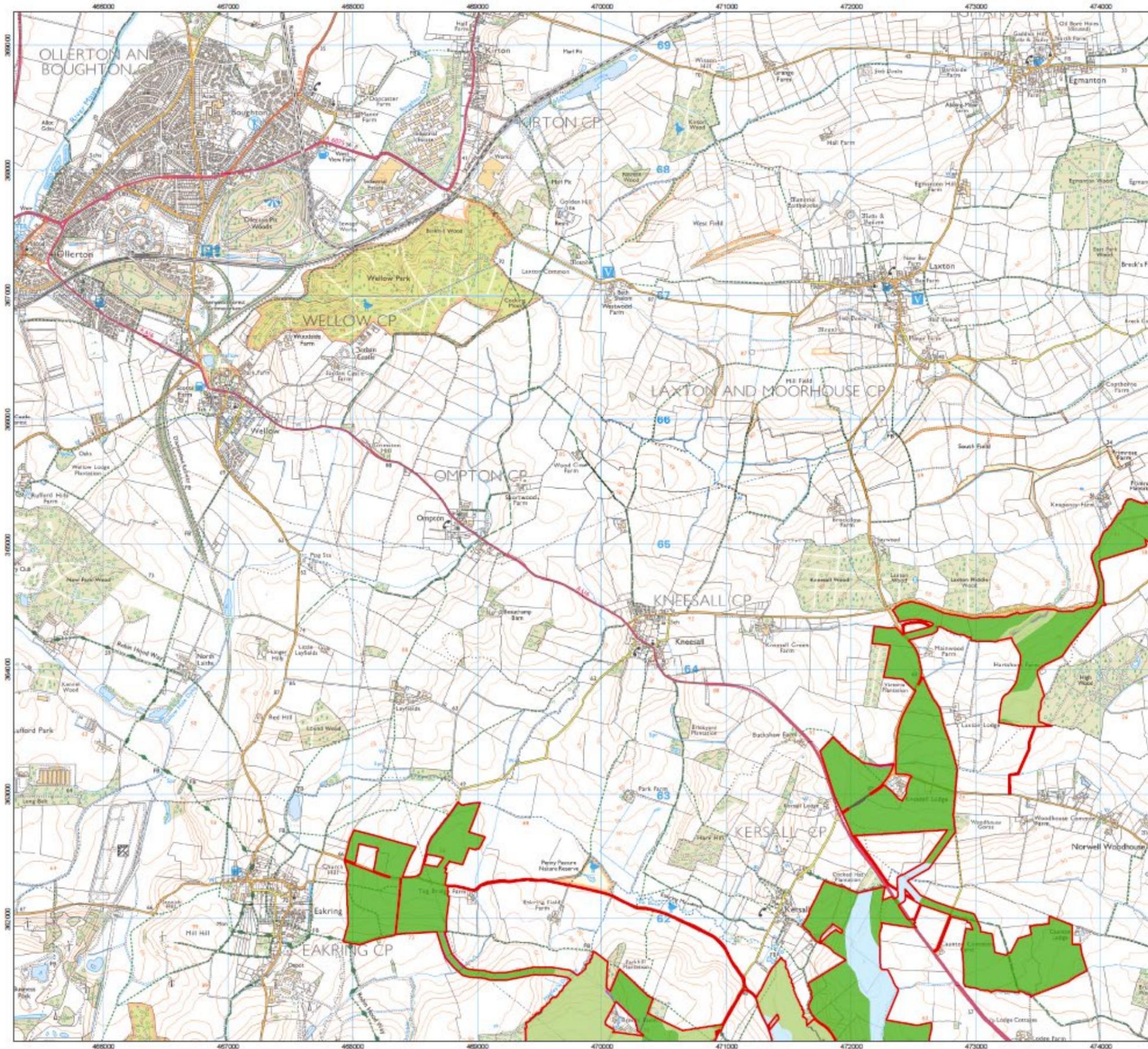
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Date: 04/06/2025

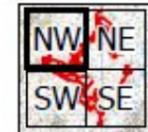
Agricultural Land Classification and Work Areas
Figure 17.5NE

Great North Road Solar and Biodiversity Park
Environmental Statement

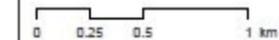
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- Order Limits
- Agricultural Land Classification - Survey Results**
- Grade 2 - Very Good
- Grade 3a - Good
- Grade 3b - Moderate
- Grade 4 - Poor
- Non Agricultural
- Unsurveyable
- Unsurveyed



1:30,000 Scale @ A3



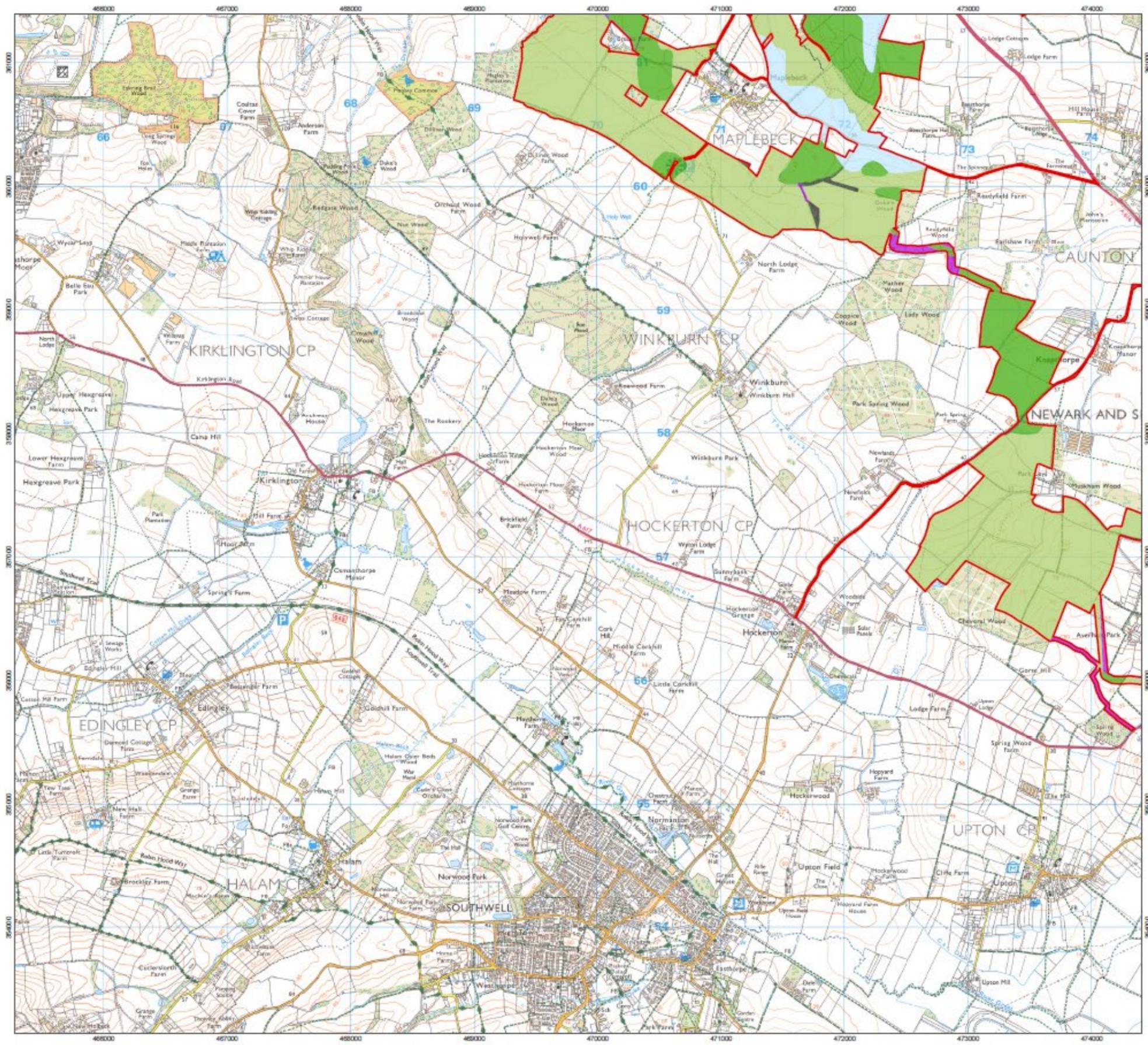
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Date: 04/06/2025

Agricultural Land Classification and Work Areas
Figure 17.5NW

Great North Road Solar and Biodiversity Park
Environmental Statement

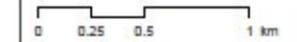
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- Order Limits
- Agricultural Land Classification - Survey Results**
- Grade 2 - Very Good
- Grade 3a - Good
- Grade 3b - Moderate
- Grade 4 - Poor
- Non Agricultural
- Unsurveyable
- Unsurveyed



1:30,000 Scale @ A3



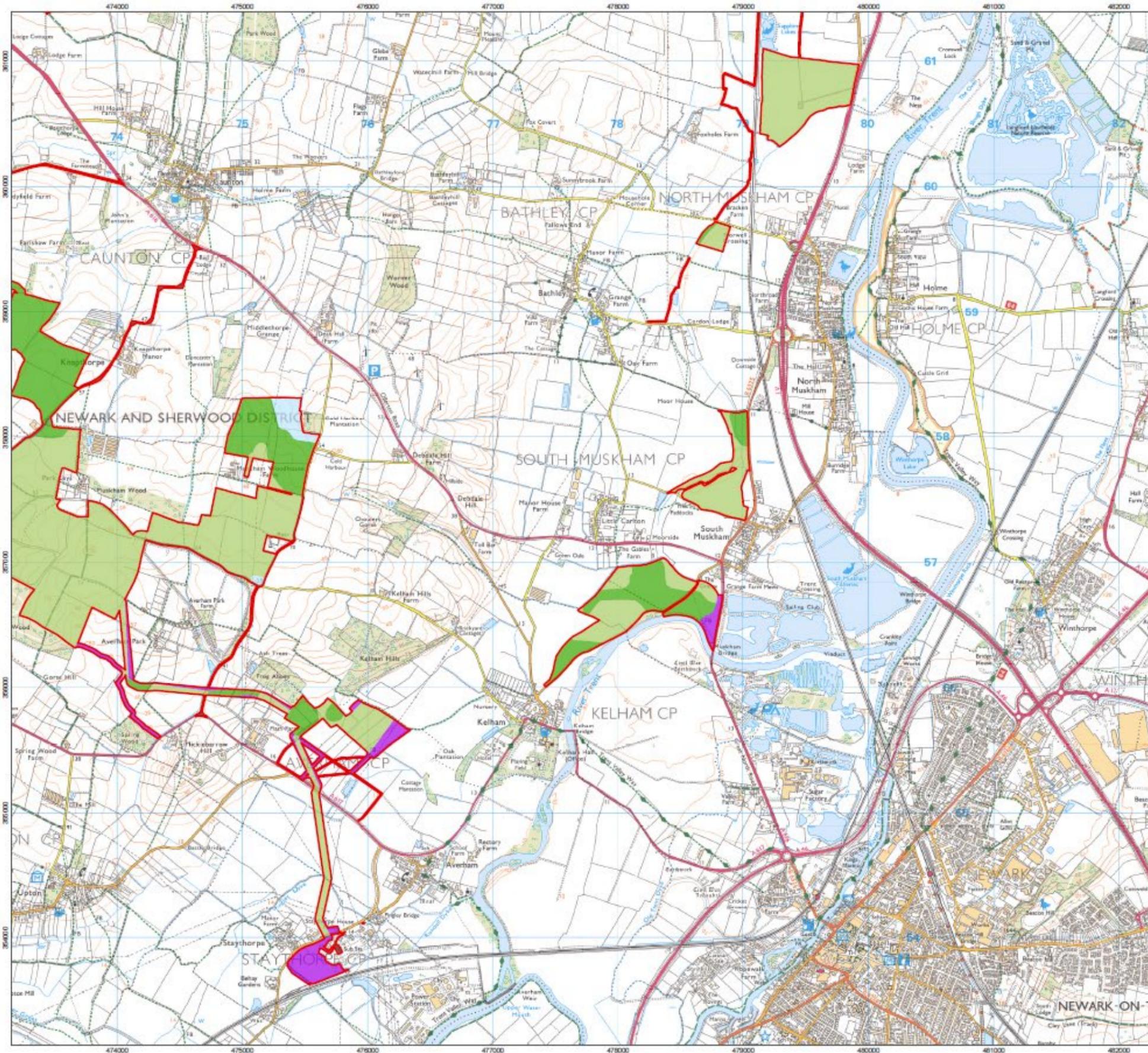
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Date: 04/06/2025

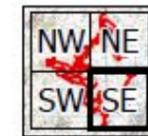
Agricultural Land Classification and Work Areas
Figure 17.5SW

Great North Road Solar and Biodiversity Park
Environmental Statement

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- Order Limits
- Agricultural Land Classification - Survey Results**
- Grade 2 - Very Good
- Grade 3a - Good
- Grade 3b - Moderate
- Grade 4 - Poor
- Non Agricultural
- Unsurveyable
- Unsurveyed



1:30,000 Scale @ A3

0 0.25 0.5 1 km



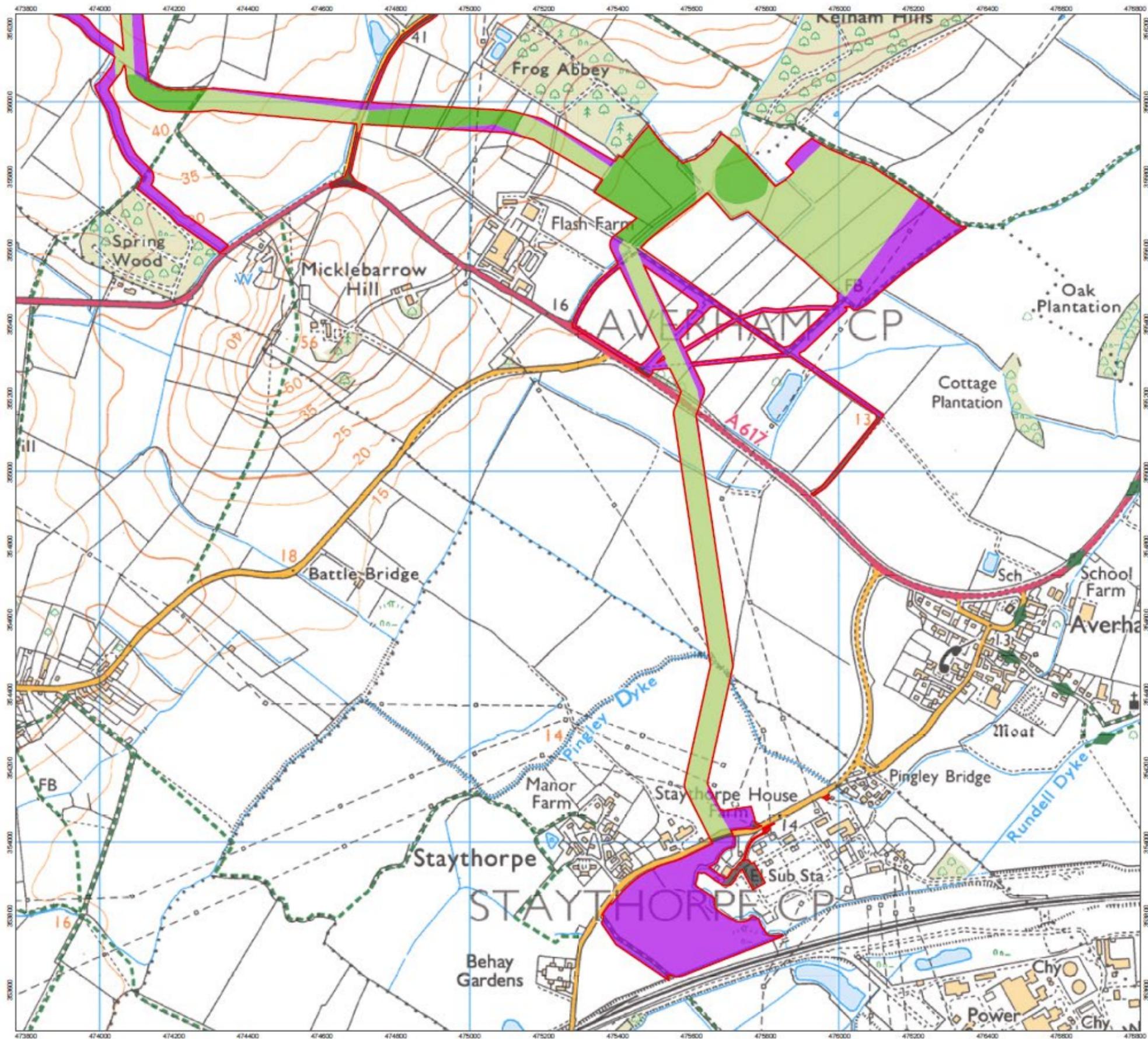
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Date: 04/06/2025

Agricultural Land Classification and Work Areas
Figure 17.5SE

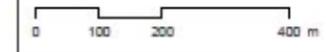
Great North Road Solar and Biodiversity Park
Environmental Statement

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- Order Limits
- Agricultural Land Classification - Survey Results
- Grade 2 - Very Good
- Grade 3a - Good
- Grade 3b - Moderate
- Grade 4 - Poor
- Non Agricultural
- Unsurveyable
- Unserved

1:10,000 Scale @ A3



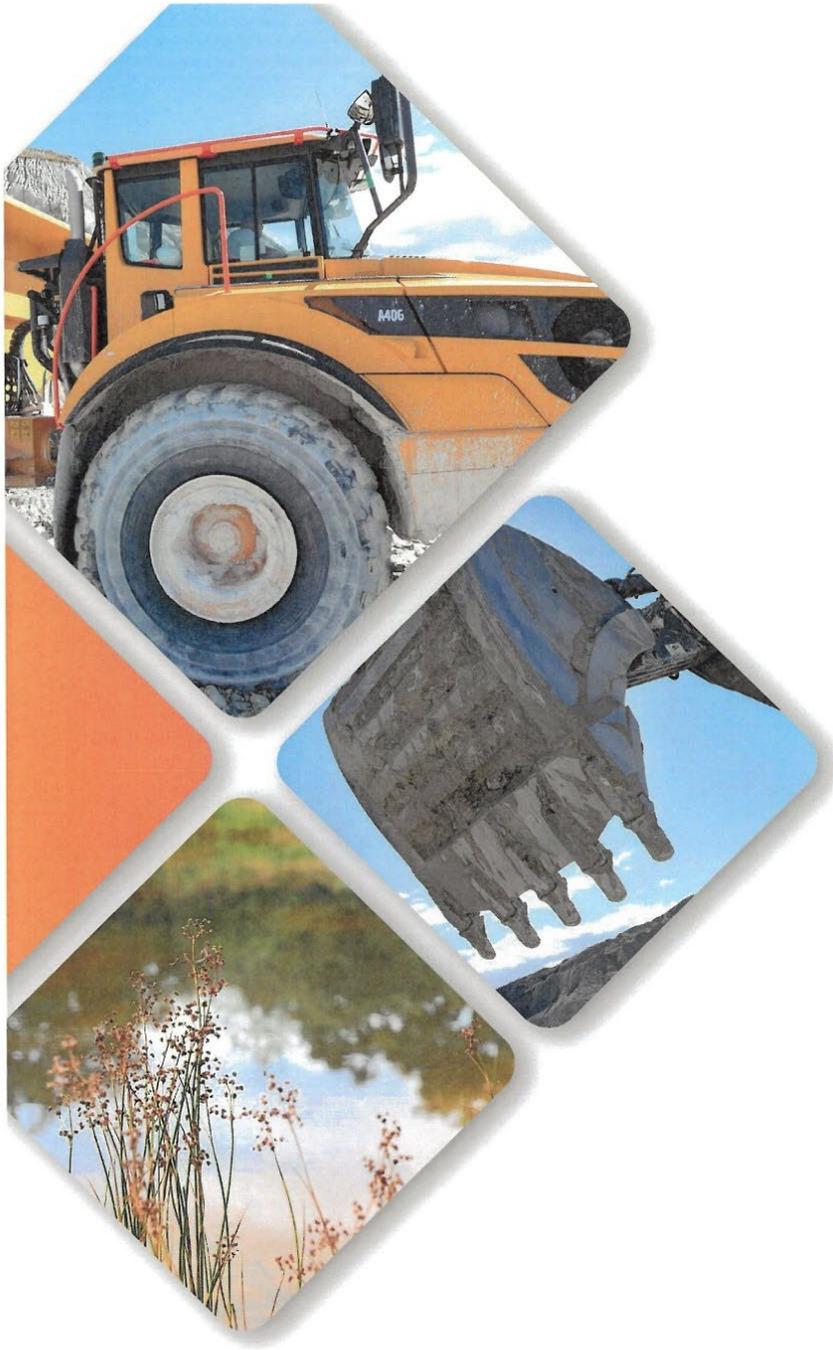
Ref: 026-ES-17.6 Date: 05/06/2025

Agricultural Land Classification and Work Areas (Work no.5a, BESS) Figure 17.6

Great North Road Solar and Biodiversity Park Environmental Statement

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Appendix SMP3
Institute of Quarrying Field Tests
for Soils Suitability



IQ

The Institute
of Quarrying

Good Practice Guide for Handling Soils in Mineral Workings

Supplementary Note 4 Soil Wetness

Soil wetness is a major determinant of land use, and environmental and ecosystem services in the UK. It is also a factor in the occurrence of significant compaction arising from handling soils with earth-moving machines and the practices used (Duncan & Bransden, 1986).

Relative soil wetness can range from the waterlogged to moist (mesic) or dry (xeric) depending on rainfall distribution and depth to a water-table and duration of waterlogging. In the UK, soil wetness is largely seasonal with higher evapo-transpiration rates potentially exceeding rainfall in the summer resulting in the soil profile becoming drier where there is vegetation. Whilst soil wetness is largely weather system and equinox (climate) driven, it varies with geographical and altitudinal locations, and importantly the physical characteristics of the soil profile, such as texture structure, porosity, and depth to the water-table and topography including flood risk (MAFF, 1988). The Soil Wetness Class is based on the expected average duration of waterlogging at different depths in the soil throughout the year (days per year), and can be determined by reference to soil characteristics and local climate (MAFF, 1988). The likely inherent wetness and resilience status of a soil should be indicated in the SRMP (see **Part 1, Table 2 & Supplementary Note 1**), reflecting potential risks for soil handling such as low permeability, permanently high groundwater, or a wet upland climate.

Wet soils can also be a result of other circumstances. For example, the interception of water courses, drainage ditches and field land drains. Where these occur, the provisions are to be made in the SRMP to protect the soils being handled and the operational area.

Soils, when in a wet condition generally have a lower strength and have less resistance to compression and smearing than when dry. Lower strength when soils are wet also affects the bearing capacity of soils and their ability to support the safe and efficient operation of machines than when in a

dry state.

In terms of resilience and susceptibility to soil wetness, the clay content of the soil largely determines the change from a solid to a plastic state (the water content at which this occurs is called the 'plastic limit' (MAFF, 1982)). This is the point at which an increasing soil wetness has reduced the cohesion and strength of the soil and its resistance to compression and smearing.

Whilst coarse textured sandy soils are not inherently plastic when wet, they are still prone to compaction when in a wet condition. Hence, handling all soils when wet will have adverse effects on plant root growth and profile permeability, which may be of significance for the intended land use and the provision of services reliant on soil drainage and plant root growth. It may be less so in other circumstances where wet soil profiles, perched water tables and ponding are the reclamation objectives, though drainage control, for example to control flooding, may still be important in these contexts.

In cases of permanently wet soils, such as riverine sites, upland or deep organic soils where there is a persistent high water-table throughout the seasons within the depth of soil to be stripped and/or the soil profile remains too wet, a strategic decision has to be made to be able to proceed with the development of the mineral resource. This may mean alternative and less favourable soil handling practices have to be agreed with the planning authority.

Predicting & Determination of Soil Wetness

There are well established methods to predict and determine soil wetness of undisturbed and restored soil profiles (Reeve, 1994). The challenge has been the prediction of the best time for soil stripping. Models based on soil moisture deficits and field capacity dates for a range of soil textures can provide indicative regional summaries (**Table 4.1**) that can help with planning operations at broad scale but cannot be relied upon in practice for deciding operationally whether to proceed on the ground given the actual variation in weather events from year to year and within years.



Soil Clay Content	Climatic Zones		
	1	2	3
Soil Depth <30cm			
<10%	Mid Apr - Early Oct	Late Mar – Early Nov	Late Mar – Early Dec
10 -27%	Late May - Early Oct	Early May – Early Nov	Early Apr – Early Dec
Soil Depth 30-60cm			
<10%	Late Apr - Early Oct	Mid Apr – Early Nov	Early Apr – Early Dec
10-27%	Late May - Early Oct	Early May – Early Nov	Early Apr – Early Dec
>27%	Late June – Early Oct	Early June – Early Nov	Late May – Early Dec
Soil Depth >60cm			
<10%	Late Apr - Early Oct	Mid Apr – Early Nov	Early Apr – Early Dec
10-18%	Late May - Early Oct	Early May – Early Nov	Early Apr – Early Dec
18-27%	Late June – Early Oct	Early June – Early Nov	Late May – Early Dec
>27	Mid July – Mid Sept	Early July – Mid Oct	Late June – Mid Oct

Table 4.1: Indicative on-average months when vegetated mineral soils might be in a sufficiently dry condition according to geographic location, depth of soil and clay content

The timing of most soil handling operations takes place between April and September. Although in western (Zone 1) and central (Zone 2) areas it typically can be a later start in May with an earlier termination in August. Whilst the return to climatically 'excess rainfall' is later in the eastern counties (Zone 3) and can be as late as November/early December, there is a need to maintain transpiring vegetation to keep the soils being handled in a dry as possible condition and to establish new vegetation covers as soon as possible (on replaced soils and storage mounds). Hence, soil handling operations generally need to be completed no later than the end of September (Natural England, 2021), unless appropriate provisions can be assured.

Where data is available, more realistic local and real-time predictions can be made, however, because weather patterns and events differ between and within years, and soils can vary locally in their condition. Experience has shown that the most practical approach for operations is to inspect the site and soils in question near to/at the time when soil handling is to take place. Professional soil surveyors can advise on the best time for soil handling (stripping, storage & replacement) and carry out site assessments of soil wetness condition prior to the start of operations.

A Practical Method for Determining Soil Wetness Limitation

During the soil handling season (see Table 4.1 above), prior to the start or recommencement of soil handling soils should be tested to confirm they are in suitably dry condition (Table 4.2). The 'testing' during operations can be done by suitably trained site staff and reviewed periodically by the professional soil surveyors.

The method is simply the ability to roll intact threads (3mm diameter) of soil indicating the soils are in a plastic and wet condition (MAFF, 1982; Natural England, 2021). Representative samples are to be taken through the soil profile and across the area to be stripped. It is the best available indicator of soils being too wet to be handled and operations should be delayed until a thread cannot be formed. For coarse textured soils which do not roll into threads, a professional's view as to soil wetness and the risk of compaction may have to be taken.

Table 4.2: Field Tests for Suitably Dry Soils

Soil tests are to be undertaken in the field. Samples shall be taken from at least five locations in the soil handling area and at each soil horizon to the full depth of the profile to be recovered/replaced. The tests shall include visual examination of the soil and physical assessment of the soil consistency.

i) Examination

- If the soil is wet, films of water are visible on the surface of soil particles or aggregates (e.g. clods or peds) and/or when a clod or ped is squeezed in the hand it readily deforms into a cohesive 'ball' means **no soil handling to take place**.
- If the sample is moist (i.e. there is a slight dampness when squeezed in the hand) but it does not significantly change colour (darken) on further wetting, and clods break up/crumble readily when squeezed in the hand rather than forming into a ball means **soil handling can take place**.
- If the sample is dry, it looks dry and changes colour (darkens) if water is added, and it is brittle means **soil handling can take place**.

ii) Consistency**First test**

Attempt to mould soil sample into a ball by hand:

- Impossible because soil is too dry and hard or too loose and dry means **soil handling can take place**.
- Impossible because the soil is too loose and wet means no soil handling to take place.
- Possible - Go to second test.

Second test

Attempt to roll ball into a 3mm diameter thread by hand:

- Impossible because soil crumbles or collapses means soil handling can take place.
- Possible means no soil handling can take place.

N.B.: It is possible to roll most coarse loamy and sandy soils into a thread even when they are wet. For these soils, the Examination Test alone is to be used.

A Rainfall Protocol to Suspend & Restart Soil Handling Operations

Local weather forecasts of possible rainfall events during operations and the occurrence of surface lying water have been used to advise on a day-to-day basis if operations should stop (Natural England, 2021). Single events such as >5mm/day in spring and autumn months, and >10mm/day in the summer have been suggested as more precise triggers for determining soil handling operations (Reeve, 1994). However, in practice the following generic guidelines are often used:

- In light drizzle soil handling may continue for up to four hours unless the soils are already at/near to their moisture limit.
- In light rain soil handling must cease after 15 minutes.
- In heavy rain and intense showers, handling shall cease immediately.

In all of the above it is assumed that soils were in a dry condition. These are only general rules, and it is at the local level decisions to proceed or stop should be based on the actual wetness state of the soils being handled. After the above rain event has ceased, the soil tests in **Table 4.2** above should be applied to determine whether handling may restart, provided that the ground is free from ponding and ground conditions are safe to do so. There can be extreme instances where soil horizons have become very dry and are difficult to handle resulting in dust and windblown losses. In these conditions the operation should be suspended. The artificial wetting of extremely dry soils is not usually a practice recommended but has been successful in some cases.

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