Preliminary Environmental Information Report

Volume 3: Technical Appendices

Appendix 14.3: Outline Soil Management Plan

APPENDIX 14.3

Outline Soil Management Plan

HELIOS RENEWABLE ENERGY PROJECT, HIRST COURTNEY, NORTH YORKSHIRE

OUTLINE SOIL MANAGEMENT PLAN

September 2023

KERNON
COUNTRYSIDE CONSULTANTS LIMITED

HELIOS RENEWABLE ENERGY PROJECT, HIRST COURTNEY, NORTH YORKSHIRE

OUTLINE SOIL MANAGEMENT PLAN

September 2023

Authorised By APK 09/23

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Appendices

1 INTRODUCTION

1.1 This document provides an outline Soil Management Plan (oSMP) for the Helios Renewable Energy Project (hereafter referred to as 'the Proposed Development').

Purpose of this document

1.2 The objective of the oSMP is to identify the importance and sensitivity of the soil resource and to provide specific guidance to ensure that there is no significant adverse effect on the soil resource as a result of the Proposed Development.

1.3 The oSMP is structured as follows:

(i) section 2 sets out the scope of the oSMP;

(ii) section 3 describes the soil resources and characteristics;

(iii) section 4 sets out key principles;

(iv) sections 5 - 8 set out the soil management requirements for key aspects of the Proposed Development:

- section 5: construction compounds;
- section 6: access tracks and fixed equipment;
- section 7: battery store and substation;
- section 8: the solar arrays;
- section 9: on-site trenching;

(v) sections 10, 11, and 12 set out operational phase management and the principles required for decommissioning, although that goes beyond the requirements of the condition.

1.4 Soils are an important resource. The Environment Agency estimates that UK soils currently store about 10 billion tonnes of carbon, equal to about 80 years of greenhouse gas emissions[1]. Yet many biological processes and soil functions are thought to be under threat. 4 million hectares are at risk of compaction, including grassland areas. Therefore soils need to be managed so as not to damage or lose those important functions.

[1] State of the Environment: Soils, Environmental Agency (2019)

2 SCOPE OF THE OSMP

2.1 This oSMP sets out:

- a description of the soil types and their resilience to being trafficked;
- an outline description of proposed access routes and details of how access will be managed to minimise impacts on soils;
- a description of works and how soil damage will be minimised and ameliorated;
- a methodology for monitoring soil condition, and criteria against which compliance will be assessed;
- and an outline of how soil will be protected at decommissioning.

2.2 The installation of the solar panel framework, and the assembly of the panels, does not require the movement or disturbance of soils. Those works should not, therefore, result in localised disturbance or effects on soils or agricultural land quality. The oSMP however particularly covers vehicle movements and related impacts, as those could result in compaction.

2.3 Trenching works to connect the panels to the infrastructure do have the potential to cause localised effects on soils. Localised damage will be minimised by good practice. This oSMP sets out soil resilience, best practice and monitoring criteria. It considers the effect of trenching works as they might affect water run-off.

2.4 In localised areas there is a need for access tracks or bases for infrastructure and equipment. In those localised areas soil will need to be stripped and moved, for stockpiling for subsequent restoration. This oSMP sets out:

- a description of the soil types and their resilience to being stripped and handled;
- an outline map showing the areas proposed for being moved, soil thickness and type;
- a methodology for creating and managing stockpiles of soil;
- an outline methodology for testing soils prior to restoration, and a methodology for respreading and ameliorating compaction at restoration.

2.5 This oSMP considers the construction phase and immediate aftercare, and the decommissioning phase, especially to set principles to avoid creating compaction.

2.6 There will be some long-term storage of soil for restoration uses at the decommissioning phase. This oSMP sets out how any soil removed at construction for future restoration (eg of the tracks) will be stored on site and labelled for subsequent return.

3 SOIL RESOURCES AND CHARACTERISTICS

Climatic Conditions

3.1 The climatic data for the area, using the climate data set for ALC, is set out in the Agricultural Land Classification (ALC), the text of which is reproduced at **Appendix KCC1**. This shows annual rainfall of 605mm across the site.

3.2 Soils are at field capacity, ie replete with water, for usually 126 days per year, which will be mostly between mid-December and late March. This is the period when soils are most susceptible to damage because they are saturated.

Agricultural Land Quality and Soils

3.3 A soil survey and ALC survey was carried out across the area in March 2022.

3.4 The text and key plans are set out in **Appendix KCC1**.

3.5 The soils are described in the ALC as follows.

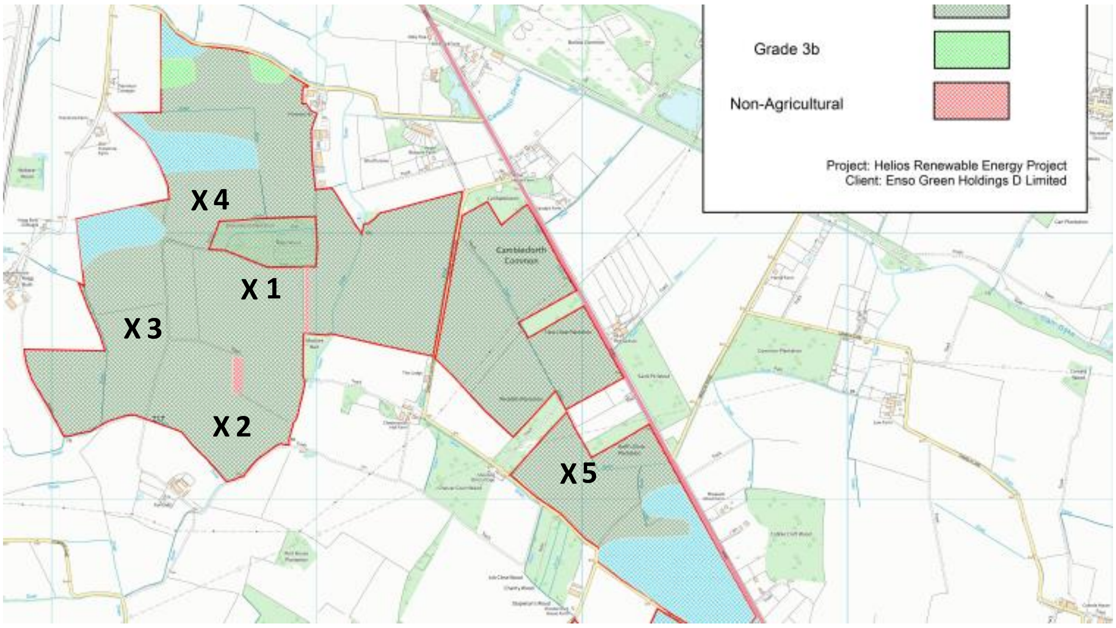
Insert 1: Description from the ALC

3.2.1 The majority of the land to the southwest of Camblesforth is identified as Everingham Association – Deep stoneless permeable fine sandy soils some with bleached subsurface horizon. The very eastern tip of the block is identified as Newport 1 Association – Deep well drained sandy and course loamy soils. A small area to the southeast of Hagg Bush House is identified as Sessay Association – Fine and course loamy often stoneless, permeable soils affected by groundwater.

3.2.2 The majority of the block to the north of Hirst Courtney is identified as Sessay Association – Fine and course loamy often stoneless, permeable soils affected by groundwater. A small area to the south of the block is identified as Wick 1 Association – Deep well drained course loamy and sandy soils locally over gravel.

3.6 The northern part of the site is mostly Subgrade 3a. This is shown below, followed by photographs of soil pits as identified. Further photographs are provided in the ALC report. It can be seen in all the photographs that the soils are sandy and free draining. The photographs were taken between 13th and 14th February 2023.

Insert 2: ALC of the Northern Part, with Photo Locations



3.7 These are illustrated below.

Location 1

Location 1

Location 2

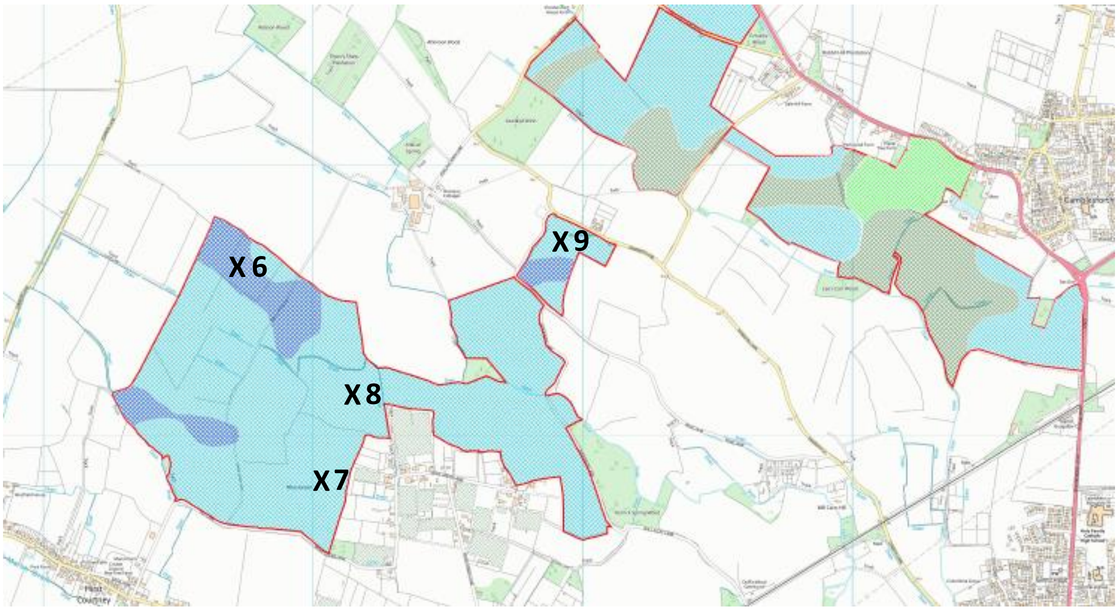
Location 3

Location 4

Location 5

3.8 The southern part of the site is mostly Grade 2, with some patches of Grade 1.

Insert 3: ALC of the Southern Part, with Photo Locations



3.9 These soils are shown below.

Location 6

Location 6

Location 7

Location 7

Location 8

Location 9

3.10 It is evident from the photographs that the soils are mostly sandy. This means that they are less susceptible to being affected by compaction, and are accessible for long periods of the year, without risk of structural damage.

4 KEY PRINCIPLES

Overview

4.1 For much of the installation process 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, but those soils will be reinserted shortly after they are lifted out (ie this is a swift process).

4.2 For those small areas where soil needs to be disturbed to create tracks and bases, the soil will be stored in suitably-managed bunds on the site. The soil needs to be looked after because it will be needed at the decommissioning phase to restore the land under the tracks and bases back to agricultural use.

4.3 It is unlikely that subsoil will need to be removed to create the shallow tracks and bases, but if subsoil does need to be moved and stored, it will be stored separately to the topsoil, and clearly marked.

4.4 For the majority of the proposed 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. This is agricultural land, so it is already subject to regular 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.

4.5 The key principles for successfully avoiding damage to soils are:

- timing;
- retaining soil profiles;
- avoiding compaction;
- ameliorating compaction; and
- retaining and storing soils for subsequent reuse.

Timing

4.6 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.

4.7 The installation process should take place, at least in terms of track creation and panel installation, between late March and early to mid-December in a normal year. Accordingly the panels and trenches should mostly, if not all, be installed before the soils become saturated, typically in mid-December. Final commissioning works are unlikely to create much need to traffic over the land, and so are not restricted.

4.8 The soils are relatively resilient to vehicle passage for much of the year. Under the ALC the field capacity period, ie the days in the year when soils are saturated, is about 126 days per year. The ALC identifies limited opportunities for landwork between mid-December and late March.

4.9 The soils are generally resilient, and any damage from vehicle trafficking can generally be made good by mechanical husbandry once the soils start to dry in the spring.

4.10 Between mid-December and late March there is an increased risk of creating localised damage to soil structure from vehicle passage. There are obviously a great number of variables, such as recent rainfall pattern, whether the ground is frozen or has standing water, inevitable variations in soil condition across single fields, and the size and type of machinery driving onto the land. However landwork in this period is most likely to result in the need for restorative works post installation and, it is planned, will be avoided.

4.11 Weather can be unpredictable, so there needs to be scope for variation. A dry late winter and early spring, for example, will result in different conditions to a very wet February and March. Tractors were accessing the land without damage in February 2023, for example.

4.12 If the installation is timed to start in March, it is recommended that a soil surveyor be engaged prior to commencement to check the suitability of the soils and advise if any areas should be avoided when works first commence. In some years this will not be necessary, because soils are evidently dry. But this is England and each season is different.

4.13 As a general rule any activity that requires soil to be dug up and moved, such as cabling works, should be minimised during that period. 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 (eg ripping with tines) to speed recovery of damaged soil structure.

4.14 In localised instances where it is not possible to avoid undertaking construction activities when soils are wet and topsoil damage occurs then soils can 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.

Determining if Soils are Suitable

4.15 Advice on assessing soil suitability is set out in the Institute of Quarrying notes on Table 4.2, reproduced in **Appendix KCC2**.

4.16 Basically 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 photograph below.

Insert 4: Indication of When Soils are Too Wet

4.17 Across the site in February 2023 only one area was noted where an area of clayey soils were too wet for travel. The topsoil was capable of being rolled, as shown below.

Insert 5: Grade 2 West Soils in the Southwest

4.18 The majority of the soils across the site are sandy or sandy loam, and they are not susceptible to structural damage.

Inserts 6 and 7: Sandy and Sandy Loam Soils

Retaining Soil Profiles

4.19 The successful installation of cabling at depths of 60-80cm requires a trench to be dug into the ground. Topsoils vary across the site but the coverage is generally 30cm, with subsoils below that being generally similar to depth. As identified in the ALC (**Appendix KCC1**), at a few profiles the topsoil depth was down to 40cm (eg point 28) but there is an insufficiently extensive pattern to indicate that an alternative soil management guidance note is needed for those small areas.

4.20 As set out in the BRE Agricultural Good Practice Guidance for Solar Farms (extract at **Appendix KCC3**) 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**".

4.21 In those areas where the soil is dug up (trenching and for compounds and access roads), the soils should be returned in as close to the same order, and in similar profiles, as it was removed.

Avoiding Compaction

4.22 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.

Ameliorating Compaction

4.23 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.

4.24 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.

Inserts 8 and 9: Inter-row Ground Restoration

4.25 If there is any localised problem, the type of machinery involved in restoration is shown below. This shows farming and horticultural versions.

Inserts 10 - 13: Type of Machinery Involved

4.26 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. This is not uncommon: most farmers will have times when they have to travel around the farm in a tractor in conditions where the tyres make deep impacts. This can happen during harvest time, for example, especially of late crops or in very wet harvest seasons. Whilst this is avoided so far as possible, it occurs and the effects are made good when conditions are suitable.

4.27 With these soils, which are generally sandy and freely draining, these areas will readily restore. The ruts need to be harrowed level when the ground is dry, and then they will naturally restore.

4.28 Accordingly the ground surface should be generally levelled prior to any seeding or reseeding.

Retaining Soils

4.29 At decommissioning stages the areas that will form the bases for the fixed infrastructure, can be returned to agricultural use. For this to be successful, the soils must have been retained on site, properly recorded or labelled so that they can be returned to the approximate position from where they came, and stored properly for the lifetime of the scheme in an appropriately sized and managed bund.

4.30 Advice on this is set out in Defra's Construction Code of Practice, extracts from which are at **Appendix KCC4**.

4.31 No soil removed to construct the tracks will be removed from the site. It will all be stored on site for use at the decommissioning phase.

4.32 The storage bunds will be managed to prevent the growth of woody vegetation.

5 CONSTRUCTION COMPOUNDS

5.1 A temporary construction compound will need to be created at the start of construction and reinstated at the end.

5.2 The soils need to be sufficiently dry to handle.

5.3 Advice on assessing soil suitability is set out in the Institute of Quarrying notes on Table 4.2, reproduced in **Appendix KCC2**.

<u>Soil Movement</u>

5.4 Topsoils are normally stripped to a maximum depth of 30cm and placed to one side. An example is shown in the photograph below.

Insert 14: Example of Topsoil Stripping and Storage Bund (this for a pipeline)

5.5 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.

5.6 At the end of the construction process, the store will be removed. This can be seen in progress below.

Insert 15: Start of Restoration of Construction Compound

5.7 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.

5.8 Panels can then be installed over the construction compound.

6 ACCESS TRACKS AND FIXED EQUIPMENT

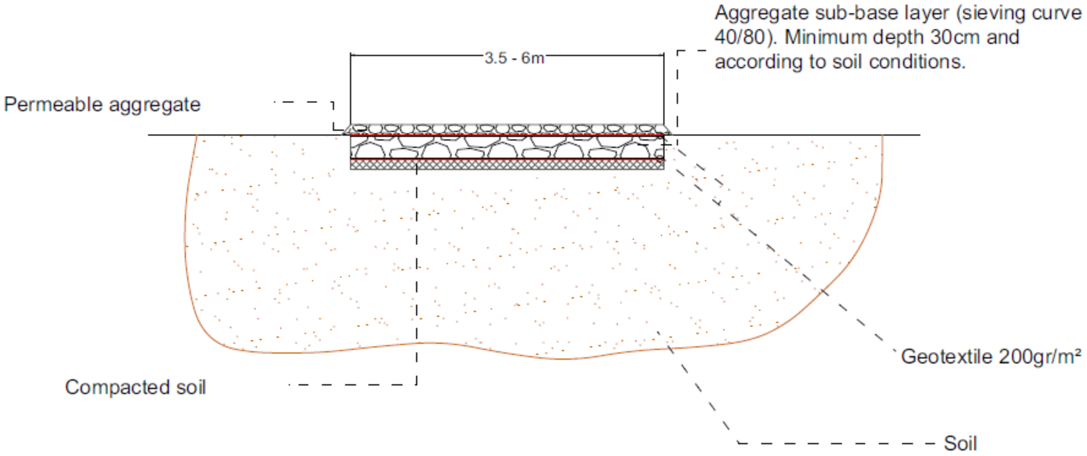
The Areas

6.1 The Access Tracks and Solar Stations are located as shown on the application Plan, reproduced at **Appendix KCC5.**

Construction Methodology

6.2 The access tracks are created by stripping off some or all of the topsoil (to a depth of 200mm) and then adding an aggregate-based surface. The aggregate will be placed onto a permeable membrane, which allows water penetration but which prevents the aggregate from mixing with the topsoils or upper subsoils. A typical cross-section is shown below.

Insert 16: Typical Cross-section of Track



6.3 The small areas of fixed equipment normally stand on a gravel base area, as shown below. As these areas will be restored in the future, the construction is carried out as follows:

(i) topsoil to c 10-15cm is removed. This will be stored in a bund no more than 3m high at an agreed location, for use in future restoration;

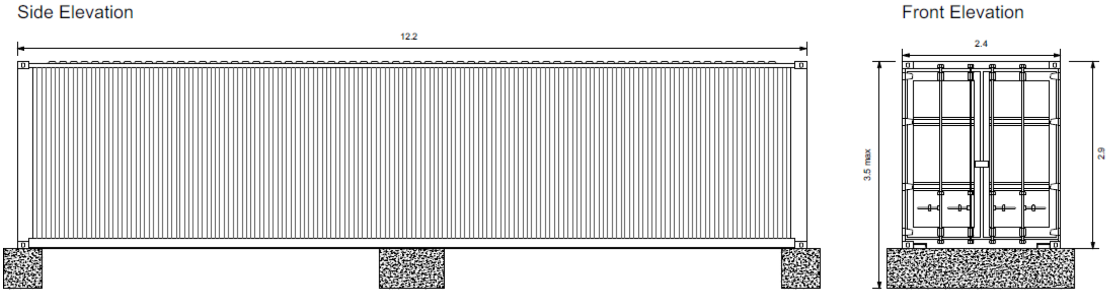
(ii) the base of stone is then added, and forming put around before concrete is poured to create the pad, or stone is added to create the pad;

(iii) the equipment is then placed on top;

(iv) further security fencing is added once the cabling and connections are complete.

6.4 An extract from the application plans, and a typical example from an operating solar farm, are shown below.

Inserts 17 and 18: Inverter/Transformer Stations



<u>Soil Management</u>

6.5 Soil should ideally be stripped in layers when the soil is sufficiently dry and does not smear. This is a judgement that is easily made. If the soils can be rolled into a sausage shape in the hand which is not crumbly, or if rubbing a thumb across the surface causes a smudged smooth surface (a smear), the soil is generally too wet to strip or move without risk of structural damage. Topsoil depths are generally about 30cm across the site, although rarely will it need to be stripped to such a depth.

6.6 Soil stripping should be carried out in accordance with Defra "Construction Code of Practice for the Sustainable Use of Soils on Construction Sites" (Defra, 2009).

6.7 The removed soil should be stored in bunds in accordance with the Construction Code of Practice, as set out in **Appendix KCC4**.

6.8 The tracks involve the movement of soils. Therefore the soils are more susceptible to damage from mechanical moving. The topsoil will, however, be stored for the duration of the operational period. Accordingly if for operational reasons it is necessary to commence the construction of tracks and bases when soils are not in optimal condition, the soil to be stored should be stored initially in bunds of maximum 1 metre high.

6.9 This will allow the soils to dry. Shallow bunds can then be moved again once they are dry into larger bunds for long-term storage.

6.10 Once the soils are sufficiently dry, typically after two or three weeks, it will be possible to move the soils to long-term storage bunds.

6.11 As a general rule soil should not be moved during or within 24 hours of heavy rain, but this will be a judgement that will need to be made at the time. If the soils are sticky (sausage test) then let them dry first, but if the soils are crumbly work can continue.

Bund Management

6.12 Long-term soil bunds should be no more than 3m in height to prevent anaerobic conditions in the base of the bund. The bund should be sown with a grass mix. This should be managed at least annually to prevent the growth of woody vegetation (eg brambles).

6.13 An example of a bund is shown below. Note: this has not yet been seeded.

Insert 19: Soil Bund Example

Reinstatement

6.14 Reinstatement of topsoil at the decommissioning phase should involve the following:

(i) removal of the stone from the track, and the matting;

(ii) subsoiling in dry conditions along the route of the track and base areas to loosen the subsoil;

(iii) replacement of dry topsoil from the bunds, levelled and cultivated;

(iv) a second light compaction alleviation, eg with a tined cultivator, if needed;

(v) sowing with a crop or grass to get rooting into the profile as soon as possible after replacement.

6.15 Further information can be obtained as follows:

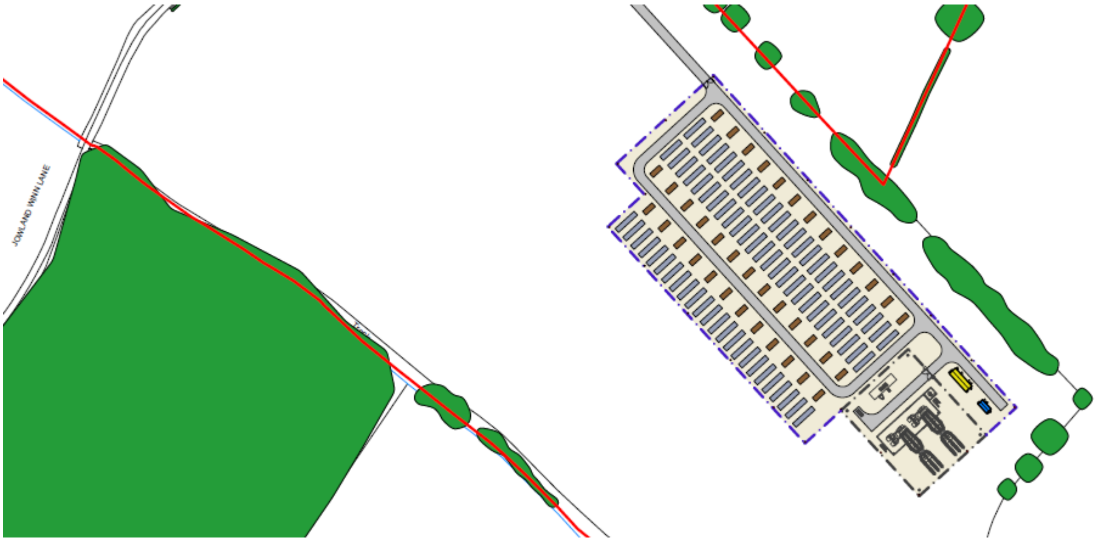
- MAFF "Good Practice Guide for Handling Soils", 2000;
- Institute of Quarrying "Good Practice Guide for Handling Soils in Mineral Workings", 2021;
- BRE "Agricultural Good Practice For Solar Farms", 2014.

7 BATTERY STORE AND SUBSTATION

The Area

7.1 This area is shown below.

Insert 20: Battery Store and Substation



Topsoil Stripping and Stockpiling

7.2 The method for soils that are suitably dry for handling is set out below. It is the same as for the construction compound. Topsoil will need to be suitably dry.

7.3 The method for stripping topsoil should follow the principles set out in Defra's Construction Code of Practice, an extract for which is shown below.

Insert 21: Soil Stripping Methodology

Method

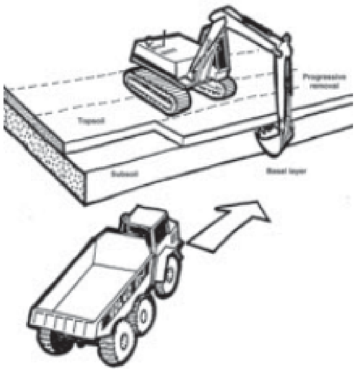
Remove surface vegetation by blading off, by scarification and raking, or kill off by application of a suitable non-residual herbicide applied not less than two weeks before stripping commences.

The method illustrated below is the preferred method for minimising damage to topsoil. It shows the transport vehicle running on the basal layer under subsoil as subsoil is also to be stripped. If only topsoil is to be stripped, the vehicle would run on the subsoil layer.

Stripping should be undertaken by the excavator standing on the surface of the topsoil, digging the topsoil to its maximum depth and loading into site or off-site transport vehicles.

Alternative stripping methods that can be shown to afford the same degree of soil protection are acceptable.

An archaeological watching brief might have to be accommodated during topsoil stripping.



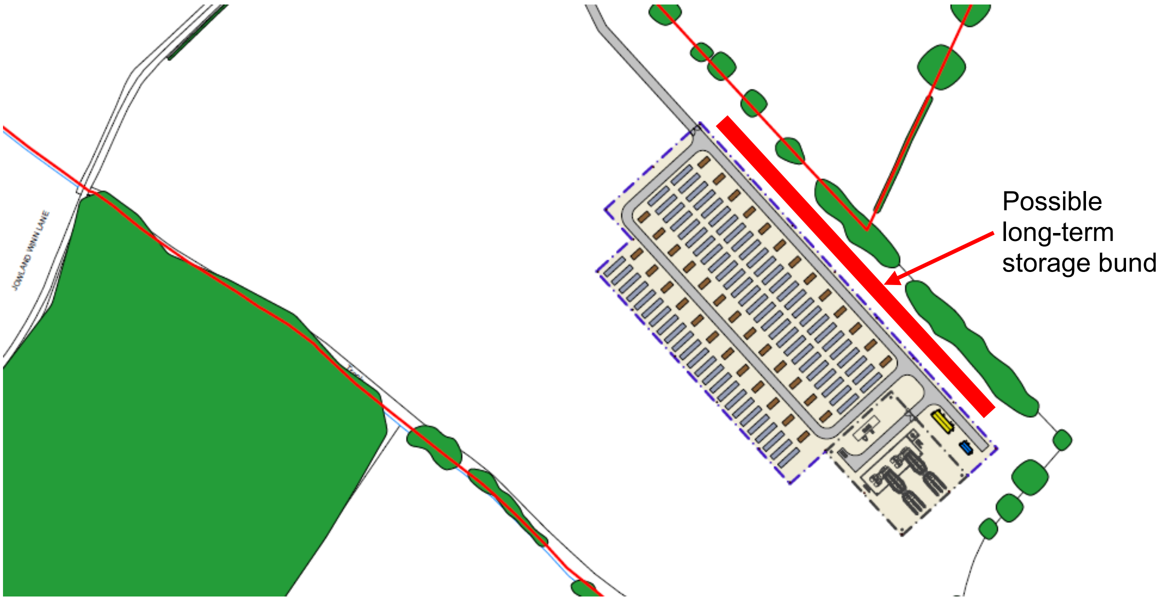
7.4 The soils on the site are generally sandy and can be moved at most times. However the mid-December to late-March period should generally be avoided.

7.5 Topsoils moved when dry can then be stockpiled in bunds up to 3-4m in height.

7.6 Topsoil storage should take place in a designated area. This will need to be an area where soils can be left undisturbed for the duration of the operation period until they are required.

7.7 Subject to construction specifics, it is suggested that topsoils are stored on the northern side of the field, as shown below.

Insert 22: Bund for Possible Surplus



Maintenance of the Bund

7.8 The bund will be maintained as described in section 11.

Restoration

7.9 Prior to restoration, a detailed SMP will be prepared by a suitably-qualified soil surveyor. This will advise in detail on timing, taking account of potential seasonal changes as a result of climate change.

7.10 The soil surveyor and SMP will advise on the need for subsoils to be loosened prior to replacement of the topsoil.

7.11 Aftercare works will be incorporated into the SMP for decommissioning.

7.12 Suitably carried out the land will restore back to ALC Grade 2.

8 SOLAR ARRAYS

<u>The Areas</u>

8.1 The PV Arrays will be distributed across the Solar PV Site as shown on the application plans.

<u>Construction Methodology</u>

8.2 The process involves the following stages:

(i) marking-out and laying out of the framework. For this a vehicle needs to drive across the field possibly with a trailer, from which the framework posts are off-loaded by hand, or by use of a Bobcat such as that shown below delivering framework posts;

Insert 23: Bobcat Delivering Framework Posts

(ii) pile driving in the framework posts. This involves a pile driver, knocking the framework posts down to a maximum 1.5m. The machinery is shown below;

Inserts 24 - 26: Pile Driving in the Framework Posts

(iii) the frame is then constructed. The frame is brought onsite, bolted together, and the panels bolted on, as per the series of photographs below.

Inserts 27 - 29: Constructing the Frame

8.3 The installation should be carried out when the ground conditions are suitable (ie the soil is not so wet that vehicles cause tyre marks, such as shown below, deeper than about 10cm when travelling across the land). This will normally be between late March and mid-December. If conditions are suitable, this stage of the installation should create no soil structural damage or compaction, as shown below.

Inserts 30 and 31: Ground After Construction

Soil Management

8.4 As discussed earlier, the sausage test, as described in **Appendix KCC2**, should be used to determine suitability of the soils for working or access. In simple terms, if the soil is so wet that vehicles cause tyre marks, such as shown below, deeper than about 10cm when travelling across the land, conditions are not yet suitable.

Insert 32: Track Marks

8.5 In most years work access to the land is not restricted between late March and mid-December. Between those periods the ground conditions will normally be resilient to vehicle trafficking.

8.6 Between mid-December and mid to late March the soils are more likely to be saturated and the propensity to being damaged, albeit in a way capable of rectification, is greatest. As a general rule, vehicular travel in these periods should be limited as much as possible. It is recognised that rainfall is the factor that wets the soils, so a dry spring will offer different conditions to a wet spring, and this may mean that soil structural damage will inevitably result.

8.7 Occasionally in this country we experience prolonged rainfall in the summer months that saturate soils. If following a rainfall incident installation is causing rutting deeper than 10cm, activity should be minimised so far as possible to allow soils to dry. With these sandy soils this is unlikely to hold up installation.

8.8 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.

Inserts 33 and 34: Horticultural Machinery

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

8.10 Grass growth will then recover or establish rapidly.

8.11 If for operational reasons trafficking of soils does cause surface damage, that can be restored. It is also unlikely to result in any structural damage long term. The photo below shows soil damage during construction. It is followed by the same view in the subsequent photo from seven years later. We have reviewed the soils and there has been no long-term soil damage or ALC downgrading.

Inserts 35 and 36: Winter Installation (2015) and Operational Site (2022)

8.12 Where there is surface damage at this level, there may be a need for shallow subsoiling to be carried out the following spring, prior to surface cultivation and seeding.

9 INSTALLATION OF ON-SITE TRENCHING

The Areas

9.1 This section refers to the cabling running within the consented area. It does not refer to the Grid Connection Cable.

Construction Methodology

9.2 Cabling is done mostly with either a mini digger or a trenching machine. Trenches will mostly be at depths of 0.8 – 0.9m where soil depth permits, although the CCTV trenching around the periphery could be shallower. An example trench, with the topsoil, placed on one side (0-20/25cm) and subsoil on the other (below 20-25cm), is shown below, and with the soil put back after cable installation.

Inserts 37 and 38: Cable Installation

9.3 It is important that topsoils are placed separately to the subsoils, and that they are then put back in reverse order, ie subsoils first.

9.4 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) (this is reproduced as **Appendix KCC3**).

Insert 39: 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)

9.5 The trenches are narrow (a maximum of 1m and usually much narrower). If the topsoil was from grassland the grass will probably recover rapidly without the need to reseed. In bare soils the trench can be cultivated with the wider area for seeding to grass post installation.

Insert 40: Grass After 4 Weeks (natural recovery)

(The photos in this section were taken on heavy, clay soils with poorly draining subsoil, and the work was photographed in July and August 2015)

<u>Soil Management</u>

9.6 All trenching work will be carried out when the topsoil is dry and not plastic (ie it can be moulded into shapes in the hand).

9.7 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.

9.8 The subsoils will then be dug out and placed on the other side of the trench, as per the example below.

Insert 41: Subsoils Dug out of the Trench

9.9 Once the cable has been laid, the subsoils will be placed back in the trench. Where there is a clear colour difference within the subsoils, so far as practicable the lower subsoil will be put back first and the upper subsoil above that, which is likely to happen anyway as the lower soil is at the top of the pile.

9.10 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.

9.11 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.

9.12 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 would return once the trench has settled and add the rest of the topsoil onto the trench at that point. With the sandy soils at this site this is not expected to be an issue.

9.13 Any excess topsoil should not be piled higher than 5 – 10cm above ground level.

9.14 If considered appropriate, a suitable grass seed mix could be spread by hand over any parts of the trenches that would seem likely to benefit from extra grass.

10 OPERATIONAL PHASE: LAND MANAGEMENT

Solar PV Arrays

10.1 The land around the Solar PV Arrays may be managed by the grazing of sheep.

10.2 Panels grazed by sheep tend to be free of weeds, as shown below.

Insert 42: Sheep Grazing Under Panels

10.3 Mechanical management is also possible, and an example is shown below.

Insert 43: Mechanical Management

10.4 Any localised weed treatment can be carried out at the appropriate time of the year using a quad-mounted sprayer, or by hand using a strimmer or knapsack sprayer.

Ongoing Maintenance

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

Insert 44: Cleaning of Solar Arrays

10.6 All the fields are wet in places, and therefore the cleaning should be timed so far as possible to avoid the December to March period for the site.

10.7 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.

Insert 45: Ruts Caused by Vehicles

10.8 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.

10.9 In some cases rutting may be deeper. The following is a very wet area (the reedy vegetation shows this) and a repair was required. This will necessitate more active repair. There are only a few small, localised areas of non-sandy soils on this site, so this is not expected to be an issue.

Insert 46: Deeper Rutting

10.10 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.

10.11 Deeper rutting will require either light harrowing in the drier period, or some soil adding, or both, before reseeding.

<u>Emergency Repairs</u>

10.12 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.

10.13 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.

Insert 47: Trench During Wet Period

10.14 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.

11 OPERATIONAL PHASE: SOIL STORAGE

11.1 The critical part of successful long-term storage of soils is to place the soils into storage bunds when the soils are dry.

11.2 Ongoing maintenance should ensure that the bunds remain free form woody vegetation (eg brambles, elder) and that the soil bunds do not erode. For this reason the bunds should be seeded with a grassland mix, as the roots of the grasses will help bind the surface and prevent water channels forming.

11.3 At least once per year the bund should be managed, ideally by mowing or strimming.

11.4 For the bund near to the substation and battery storage, where a larger bund is being created, it should be possible for a tractor with a hedge cutter attachment to travel along the edge of the bund and mow the sides. An example is shown below.

Insert 48: Mechanically Managed Soil Bund

12 DECOMMISSIONING

12.1 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 as a world, 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 site prior to decommissioning, and to update the guidance and timing.

12.2 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

12.3 A qualified soil scientist should advise prior to decommissioning time. The effects of climate change in 40 years time may mean that these dates, applicable in 2023, are no longer applicable.

12.4 Once the panels have been unbolted and removed, the framework will then be a series of framework posts, as shown below.

Inserts 49 and 50: Examples of Framework Posts

12.5 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 framework post, and once that surface tension is released the framework post will come out easily.

12.6 The framework posts will be loaded onto trailers and removed.

12.7 There will be no significant damage to the soils, and no significant compaction.

Removal of Cables

12.8 Cables buried less than 1 metre deep will be removed. This is likely to need a trench to be dug. This will be done is done mostly with either a mini digger or a trenching machine. Trenches will mostly be at depths of 0.8 – 0.9m where soil depth permits, although the CCTV trenching around the periphery could be shallower. An example trench, with the topsoil placed one side (0-20/25cm) and subsoil on the other (below 20-25cm), is shown below, and with the soil put back after cable installation.

Insert 51: Example Trench

Insert 52: Topsoil Replaced

12.9 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) (this is reproduced as **Appendix KCC3**).

Insert 53: 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)

12.10 Once the trench has been backfilled it can be left for cultivation with the rest of the field post removal of panels.

Removal of Fixed Infrastructure

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

Insert 54: Switchgear

12.12 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 55: 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)

12.13 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 can be dug up and loaded onto trailers and removed.

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

Inserts 56 and 57: Example of Tractor Mounted Equipment

Tracks

12.15 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.

12.16 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 and analysis of soil compaction and condition.

Reinstatement of Soils

12.17 Topsoil from the storage bunds will then be returned and spread to the depth removed (typically 10-15cm). The area will then be cultivated, probably in combination with the whole of each field.

Fences and Gates

12.18 This will 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 tranches will be dug, as described above, and replaced in order once the cables have been removed.

Cultivation

12.19 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.

Run-off

12.20 None of the decommissioning activities should increase the risk of run-off from the site.

APPENDIX KCC1

Agricultural Land Classification

(Text and Key Plans)

AGRICULTURAL LAND CLASSIFICATION
HELIOS RENEWABLE ENERGY PROJECT

CLIENT: ENSO GREEN HOLDINGS D LIMITED
PROJECT: HELIOS RENEWABLE ENERGY PROJECT
DATE: 12TH JUNE 2023 – ISSUE 3
ISSUED BY: JAMES FULTON MRICS FAAV

Contents

1. EXECUTIVE SUMMARY

1.1 This report assesses the Agricultural Land Classification (ALC) grading of 394.8-hectares, of land approximately 3 miles south of Selby, North Yorkshire.

1.2 The limiting factor is found variously to be topsoil texture; wetness, a combination of the climatic regime, soil water regime and texture of the top 25cm of soil; and droughtiness, based on crop adjusted available water as calculated from the soil and the climatic regime.

1.3 The land is graded as follows:

Grade 1:	**14.8 Ha**	**3.8%**
Grade 2:	**161.7 Ha**	**41.1%**
Grade 3a:	**206.5 Ha**	**52.4%**
Grade 3b:	**10.8 Ha**	**2.7%**
Total Agricultural Land surveyed:	**393.8 Ha**	**100%**
Non-Agricultural land in the survey area	**1 Ha**	

2. Introduction

2.1 Amet Property Ltd have been instructed by Enso Green Holdings D Limited to produce an Agricultural Land Classification (ALC) report on a 394.8-hectare survey area on land to the south and west of the village of Camblesforth and to the north of the village of Hirst. The survey area was originally 537.3-hectares but has been reduced as the project has progressed. The report is produced in support of a DCO application for a renewable energy project.

2.2 The report's author is James Fulton BSc (Hons) MRICS FAAV who has worked as a chartered surveyor, agricultural valuer, and agricultural consultant since 2004, has a degree in agriculture which included several modules on soils and over 10 years' experience in producing agricultural land classification reports.

2.3 The report is based on site visits conducted in March 2022. During site visits conditions ranged from full sunshine to overcast and showery. During the inspection 15 trial pits were dug to a depth of 120cm. In addition to the trial pits an augur was used to take a minimum of one sample per hectare on the survey area to a depth of 120cm with smaller trial pits at some of these locations to confirm soil structure and colour where it was not clear from the augur samples. A plan of augur points can be found at ***appendix 1***. The trial pit locations were selected as they were representative of the soils found on site. Where an augur was used to take samples soil structure was extrapolated from the locations at which trial pits were dug.

2.4 The land is level with altitudes of the sample points ranging from 4m to 9m AOD.

2.5 At the time of the survey the land use was in an arable rotation that appeared to include combinable crops and root crops.

2.6 Further information has been obtained from the MAGIC website, the Soil Survey of England and Wales, the British Geological Survey, the Meteorological Office and 1:250,000 series Agricultural Land Classification maps.

2.7 The collected information has been judged against the Ministry of Agriculture Fisheries and Food Agricultural Land Classification of England and Wales revised guidelines and criteria for grading the quality of agricultural land.

2.8 The principal factors influencing agricultural production are climate, site and soil and the interaction between them MAFF (1988)[1] & Natural England (2012)[2].

[1] MAFF (1988) - *Agricultural Land Classification of England and Wales. Revised guidelines and criteria for grading the quality of agricultural land.* MAFF Publications

[2] Natural England (2012) - *Technical Information Note 049 - Agricultural Land Classification: protecting the best and most versatile agricultural land*, Second Edition

3. PUBLISHED INFORMATION

3.1 The British Geological Survey 1:50,000 scale map identifies various bedrock and superficial geology across the survey area.

3.1.1 The bedrock geology of the block to the southwest of Camblesforth is recorded as Sherwood sandstone group – sandstone with superficial geology identified as Breighton sand formation – Sand on the majority of the survey area and small areas of Hemingborough glaciolacustrine formation – clay to the southeast of Hagg Bush House.

3.1.2 The bedrock geology of the block to the north of Hirst Courtney is recorded as Sherwood sandstone group – sandstone with superficial geology identified as Hemingborough glaciolacustrine formation – clay.

3.2 The national soils map identifies 5 soil associations within the survey area.

3.2.1 The majority of the land to the southwest of Camblesforth is identified as Everingham Association – Deep stoneless permeable fine sandy soils some with bleached subsurface horizon. The very eastern tip of the block is identified as Newport 1 Association – Deep well drained sandy and course loamy soils. A small area to the southeast of Hagg Bush House is identified as Sessay Association – Fine and course loamy often stoneless, permeable soils affected by groundwater.

3.2.2 The majority of the block to the north of Hirst Courtney is identified as Sessay Association – Fine and course loamy often stoneless, permeable soils affected by groundwater. A small area to the south of the block is identified as Wick 1 Association – Deep well drained course loamy and sandy soils locally over gravel.

3.3 The 1:250,000 series agricultural land classification mapping shows the majority of the survey area to be Grade 2 with some areas identified as Grade 3.

4. CLIMATE

4.1 Climate has a major, and in places overriding, influence on land quality affecting both the range of potential agricultural uses and the cost and level of production.

4.2 There is published agro-climatic data for England and Wales provided by the Meteorological Office, such data for the subject survey area is listed in the table below.

Figure 2.1 Agro-Climatic Data – Details at ***appendix 2***

Grid Reference	462626 426368
Altitude (ALT)	6.28
Average Annual Rainfall (AAR)	604.70
Accumulated Temperature - Jan to June (ATO)	1406.53
Duration of Field Capacity (FCD)	126.20
Moisture Deficit Wheat	109.77
Moisture Deficit Potatoes	101.59

4.3 The main parameters used in assessing the climatic limitation are average annual rainfall (AAR), as a measure of overall wetness; and accumulated temperature, as a measure of the relative warmth of a locality.

4.4 The Average Annual Rainfall and Accumulated Temperature provide no climatic limitation to grade.

4.5 With the exception of some very small areas shown to be in flood zone 1 the whole area is shown by the environment agency mapping to be in an area benefitting from flood defences. There was no evidence of any flooding within the survey area and nothing to suggest that it is a limiting factor to land grade.

5. STONINESS

5.1 There was no area within the survey where any stones were recorded. There were very occasional areas with a very small number of stones but not that would affect land grade.

6. GRADIENT

6.1 The survey area is all level with no area where gradient would affect land grade.

7. SOILS

7.1 While there is variation in the soils found in the block to the south and west of Camblesforth they largely conform to the soil association descriptions found in the national soils map. The topsoil at most sample points was identified as a loamy sand with areas of slightly lighter (sand) and heavier (sandy loam) topsoil which tended to be grouped together. Colours and structures of subsoils varied but sand was the dominant texture with some areas of loamy sand and occasionally sandy loam. There was one notable exception in the block in an area to the south of Stockshill Farm, Camblesforth where there was an area with sandy clay loam topsoil and clay subsoil very similar to soils within the Foggathorpe Association. The majority of sandy soils were identified by the lab tests as medium sand or loamy medium sand. The areas to the northeast of the site identified in field as sandy loam were found by the lab testing to be a fine sandy loam. The area identified on the soils map as Sessay Association had subsoils similar to the rest of the block but tended to have a sandy loam topsoil that at times verged on being a sandy clay loam which was noticeably heavier than the rest of the block.

7.2 The block to the north of Hirst Courtney largely consists of sandy clay loam or sandy loam topsoils, occasionally loamy sand topsoils with subsoils that are more variable than the rest of the survey area including generally medium to well-structured clay loam and sandy loam with loamy sand and sand at deeper horizons.

7.3 The soil topsoil texture can provide a limitation to land grade such that sand topsoil is not eligible to be graded grade 1, 2 or 3a and loamy sand topsoil is not eligible to be graded grade 1. This limitation is accounted for in the Table at ***appendix 4***.

Interactive Factors

8. Wetness

8.1 An assessment of the wetness class of each sample point was made based on the flow chart at Figure 6 in the MAFF guidance. The wetness class and topsoil texture were then assessed against Table 6 of the MAFF guidance to determine the ALC grade according to wetness.

9. Droughtiness

9.1 Droughtiness limits are defined in terms of moisture balance for wheat and potatoes using the formula:

MB (Wheat) = AP (Wheat) - MD (Wheat)

and

MB (Potatoes) = AP (Potatoes) - MD (Potatoes)

Where:
MB = Moisture Balance
AP = Crop Adjusted available water capacity
MD = Moisture deficit

9.2 Moisture deficit for wheat and potatoes can be found in the agro-climatic data and are as follows:

MD (Wheat) = 109.77
MD (Potatoes) = 101.59

9.3 A large proportion of the land is being used for root vegetable production with evidence of irrigation in use. The moisture balance limitation for potatoes has therefore been disregarded as it is assumed that potatoes and root crops will be irrigated and so it is only where the moisture balance for wheat provides a limitation to land grade that a limitation is said to exist. The moisture balance for each sample point can be found at ***appendix 4***.

10. Agricultural Land Classification

10.1 The Agricultural Land Classification provides a framework for classifying land according to which its physical or chemical characteristics impose long-term limitations on agricultural use. The limitations can operate in one or more of four principal ways: they may affect the range of crops that can be grown, the level of yield, the consistency of yield and the cost of obtaining it.

10.2 The principle physical factors influencing agricultural production are climate, site and soil and the interactions between them which together form the basis for classifying land into one of 5 grades; grade 1 being of excellent quality and grade 5 being land of very poor quality. Grade 3 land, which constitutes approximately half of all agricultural land in the United Kingdom is divided into 2 subgrades – 3a and 3b. A full definition of all of the grades can be found at ***appendix 5.***

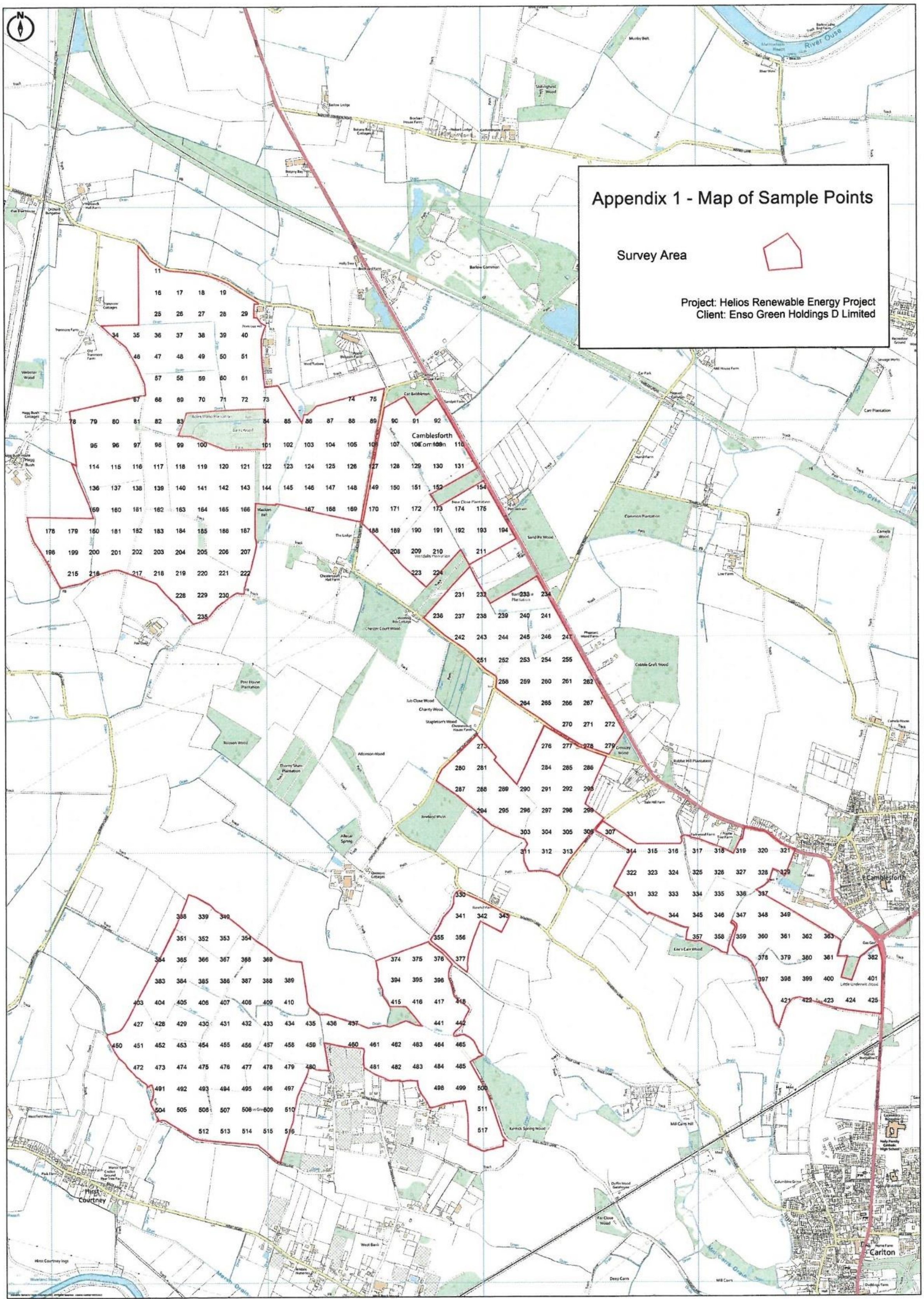
10.3 This assessment sets out that for several locations the topsoil texture limits the sand topsoil to grade 3b and the loamy sand topsoil to grade 2. At most sample points no one factor limits the grade of the land, the interaction between climate and soil result in a wetness assessment that limits the heavier land to grade 3a or grade 3b and a droughtiness assessment limits the lighter land to grade 2 or 3a. In some locations there is no limitation to land grade and so the land is Grade 1.

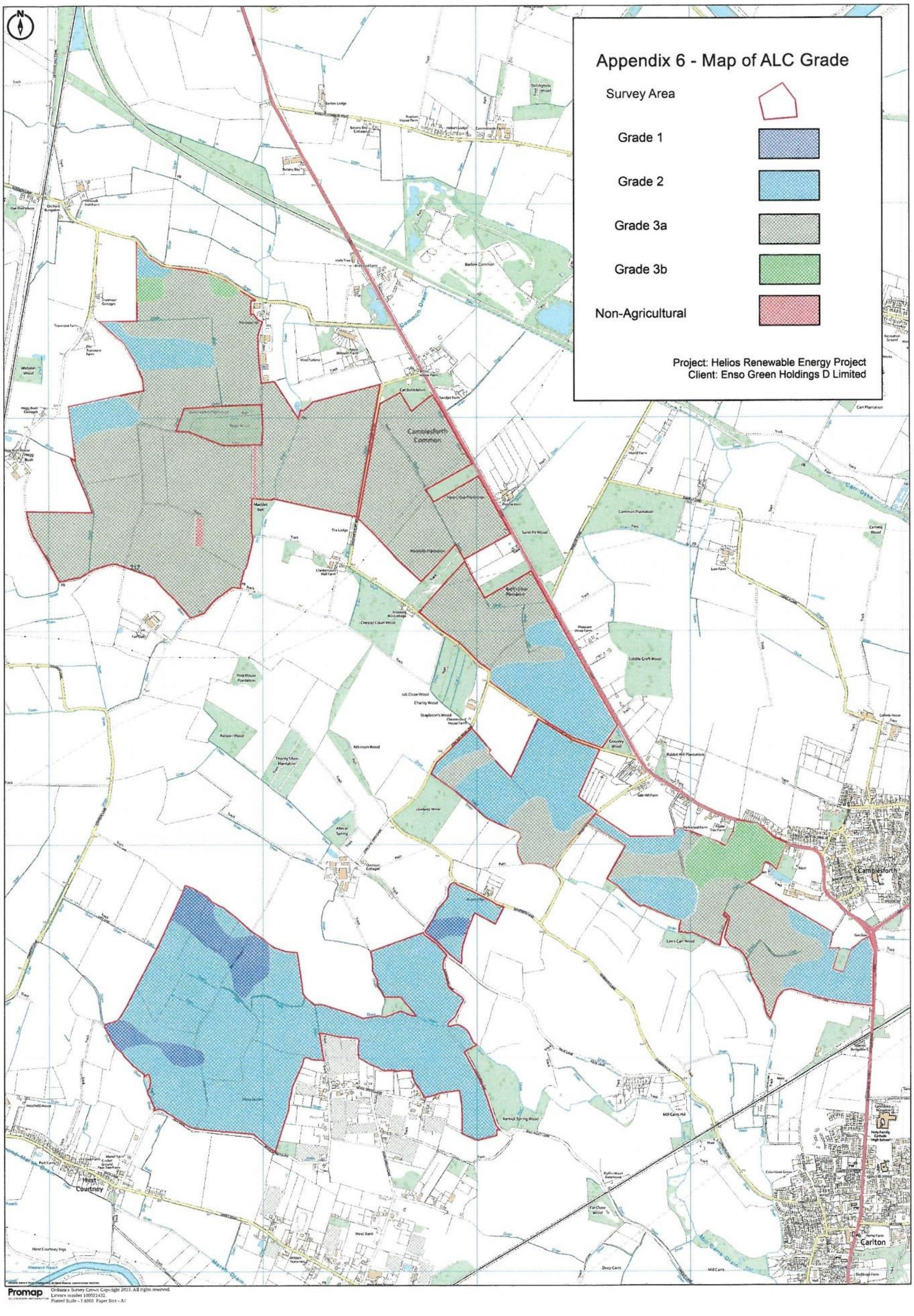
10.4 The MAFF guidance sets out that 'where soil and site conditions vary significantly and repeatedly over short distances and impose a practical constraint on cropping and land management a 'pattern' limitation is said to exist. To this end where there are individual sample points that ae different to the land around them and where these could only be farmed as a whole the area has been graded alike.

10.5 Taking into account all limitations the survey area is graded as follows:

Grade 1:	**14.8 Ha**	**3.8%**
Grade 2:	**161.7 Ha**	**41.1%**
Grade 3a:	**206.5 Ha**	**52.4%**
Grade 3b:	**10.8 Ha**	**2.7%**
Total Agricultural Land surveyed:	**393.8 Ha**	**100%**
Non-Agricultural land in the survey area	**1 Ha**	

A plan of the land grading can be found at ***appendix 6***.


Appendix 1 - Map of Sample Points
Survey Area
Project: Helios Renewable Energy Project
Client: Enso Green Holdings D Limited
River Ouse
Camblesforth
Hirst Courtney
Carlton

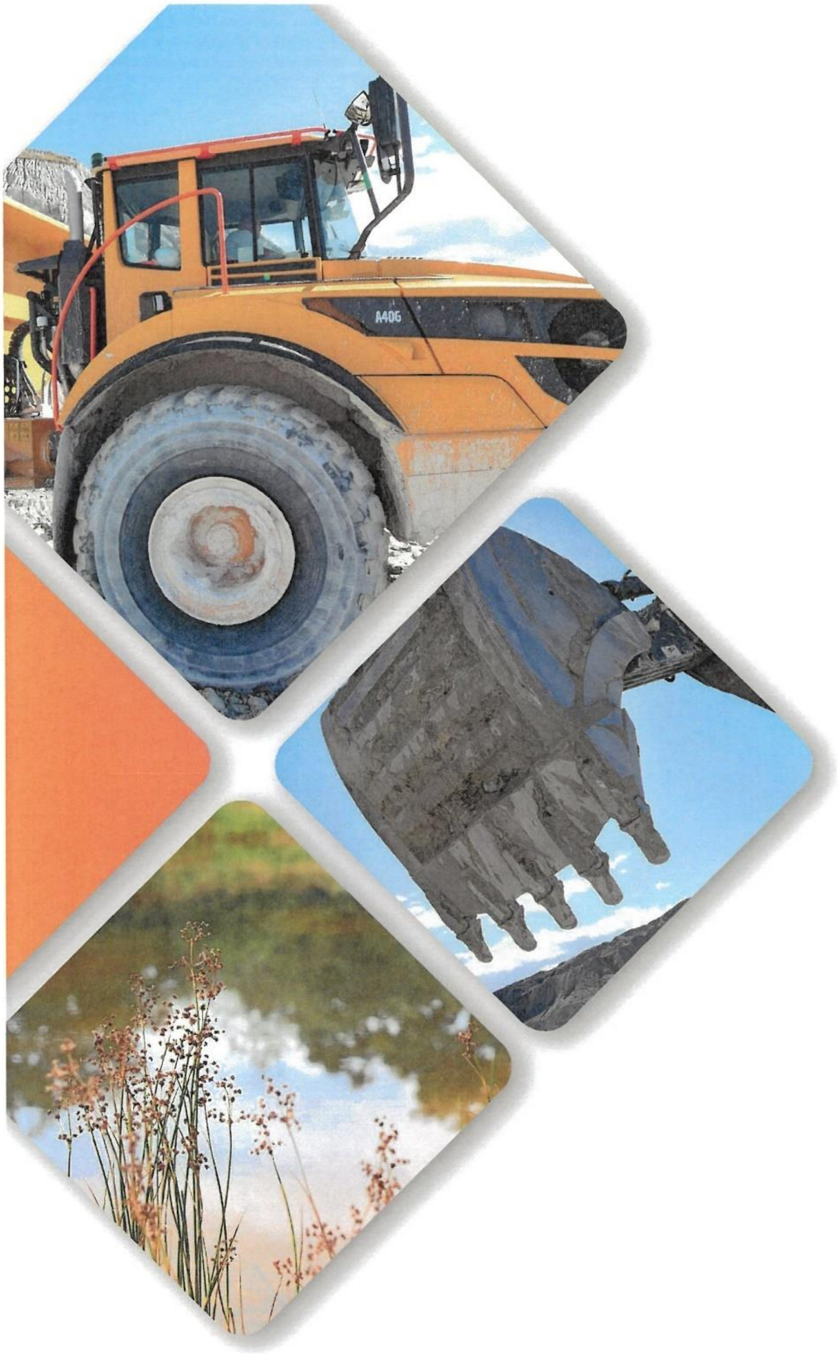

Appendix 6 - Map of ALC Grade
Survey Area
Grade 1
Grade 2
Grade 3a
Grade 3b
Non-Agricultural
Project: Helios Renewable Energy Project
Client: Enso Green Holdings D Limited
Camblesforth Common
Camblesforth
Carlton
Hirst Courtney

APPENDIX KCC2

IQ Advice on Soil 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.

	Climatic Zones		
Soil Clay Content	**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 be 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 samples is moist (i.e. there is a sligh 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 becuase the soil is too loose and wet means no soil handling to take place.
- Possible - Go to second text.

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 re-start, 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.

References

Duncan N A and Bransden B E, 1986. The effects on a restored soil caused by soil moving under different moisture contents. Applied Geography, 6, 3, pp 267-273

MAFF, 1982. Reference Book 441: Techniques for measuring soil physical properties. Her Majesty's Stationery Office, London

MAFF, 1988. Agricultural Land Classification Of England and Wales

Natural England, 2021. Planning and aftercare advice for reclaiming land to agricultural use

Reeve M J, 1994. Improving land restoration in Britain by better timing of soil movement, pp 28-37. In, Proceedings American Society of Mining and Reclamation. DOI: 10.21000/JASMR94030028

Appendix KCC3

Agricultural Good Practice Guidance for Solar Farms (2013)

bre

www.bre.co.uk/nsc

Agricultural Good Practice Guidance for Solar Farms

NFU

EUROPEAN UNION
Investing in Your Future

European Regional Development Fund 2007-2013

BRE NATIONAL SOLAR CENTRE

Principal Author and Editor Dr Jonathan Scurlock, National Farmers Union

This document should be cited as: BRE (2014) Agricultural Good Practice Guidance for Solar Farms. Ed J Scurlock

BRE National Solar Centre would like to sincerely thank colleagues from the following organisations who have made significant contributions to the development of this guidance:

British Solar Renewables · LarkEnergy · LIGHTSOURCE · NFU · Orta Solar · SOLAR TRADE ASSOCIATION · TGC renewables

With thanks to:

Marcus Dixon and Neil Macdonald of British Solar Renewables; Liza Gray of Lightsource; Julie Rankin and Amy Thorley of Lark Energy; Kate Covill of Orta Solar; Ben Cosh of TGC Renewables; Ben Thompson of Foresight Group; Simon Stonehouse of Natural England; Leonie Greene of the Solar Trade Association; and Tom Fullick, Gary Ford and Richard Wordsworth of the NFU.

With thanks to NSC Founding Partners:

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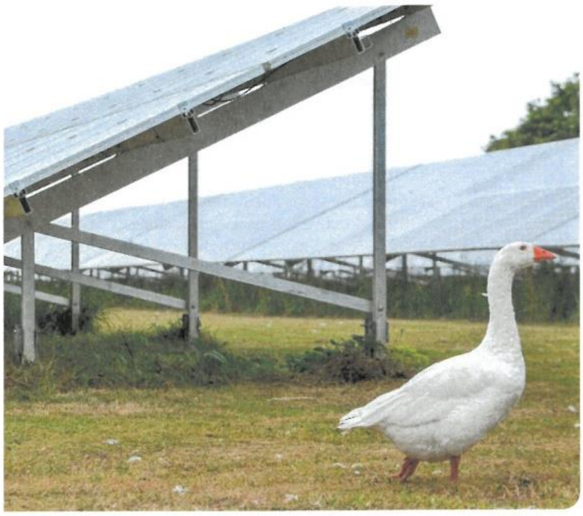
Context

This document describes experience and principles of good practice to date for the management of small livestock in solar farms established on agricultural land, derelict/marginal land and previously-developed land.

Proposed for publication as an appendix to existing best practice guidelines by the BRE National Solar Centre[1], it should be read in conjunction with BRE (2014) Biodiversity Guidance for Solar Developments (eds. G.E. Parker and L. Greene).

The guidance presented here has been developed with, and endorsed by, a number of leading UK solar farm developers and organisations concerned with agriculture and land management.



Introduction

Field-scale arrays of ground-mounted PV modules, or "solar farms", are a relatively recent development, seen in Britain only since 2011, although they have been deployed in Germany and other European countries since around 2005. In accordance with the "10 Commitments" of good practice established by the Solar Trade Association[2], the majority of solar farm developers actively encourage multi-purpose land use, through continued agricultural activity or agri-environmental measures that support biodiversity, yielding both economic and ecological benefits.

It is commonly proposed in planning applications for solar farms that the land between and underneath the rows of PV modules should be available for grazing of small livestock. Larger farm animals such as horses and cattle are considered unsuitable since they have the weight and strength to dislodge standard mounting systems, while pigs or goats may cause damage to cabling, but sheep and free-ranging poultry have already been successfully employed to manage grassland in solar farms while demonstrating dual-purpose land use.

Opportunities for cutting hay or silage, or strip cropping of high-value vegetables or non-food crops such as lavender, are thought to be fairly limited and would need careful layout with regard to the proposed size of machinery and its required turning space. However, other productive options such as bee-keeping have already been demonstrated. In some cases, solar farms may actually enhance the agricultural value of land, where marginal or previously-developed land (e.g. an old airfield site) has been brought back into more productive grazing management. It is desirable that the terms of a solar farm agreement should include a grazing plan that ensures the continuation of access to the land by the farmer, ideally in a form that that enables the claiming of Basic Payment Scheme agricultural support (see page 2).

[1] BRE (2013) Planning guidance for the development of large scale ground mounted solar PV systems. www.bre.co.uk/nsc

[2] STA "Solar Farms: 10 Commitments" http://www.solar-trade.org.uk/solarFarms.cfm

Conservation grazing for biodiversity

As suggested in the Biodiversity Guidance described above, low intensity grazing can provide a cost-effective way of managing grassland in solar farms while increasing its conservation value, as long as some structural diversity is maintained. A qualified ecologist could assist with the development of a conservation grazing regime that is suited to the site's characteristics and management objectives, for incorporation into the biodiversity management plan.

Avoiding grazing in either the spring or summer will favour early or late flowering species, respectively, allowing the development of nectar and seeds while benefiting invertebrates, ground nesting birds and small mammals. Hardy livestock breeds are better suited to such autumn and winter grazing, when the forage is less nutritious and the principal aim is to prevent vegetation from overshadowing the leading (lower) edges of the PV modules (typically about 800-900mm high). Other habitat enhancements may be confined to non-grazed field margins (if provision is made for electric or temporary fencing) as well as hedgerows and selected field corners.

Agricultural grazing for maximum production

The developer, landowner and/or agricultural tenant/licensee may choose to graze livestock at higher stocking densities throughout the year over much of the solar farm, especially where the previous land use suggested higher yields or pasture quality. Between 4 and 8 sheep/hectare may be achievable (or 2-3 sheep/ha on newly-established pasture), similar to stocking rates on conventional grassland, i.e. between about March and November in the southwest and May to October in North-East England.

The most common practice is likely to be the use of solar farms as part of a grazing plan for fattening/finishing of young hill-bred 'store' lambs for sale to market. Store lambs are those newly-weaned animals that have not yet put on enough weight for slaughter, often sold by hill farmers in the Autumn for finishing in the lowlands. Some hardier breeds of sheep may be able to produce and rear lambs successfully under the shelter of solar farms, but there is little experience of this yet. Pasture management interventions such as 'topping' (mowing) may be required occasionally or in certain areas, in order to avoid grass getting into unsuitable condition for the sheep (e.g. too long, or starting to set seed).

Smaller solar parks can provide a light/shade environment for free-ranging poultry (this is now recognised by the RSPCA Freedom Foods certification scheme) – experience to date suggests there is little risk of roosting birds fouling the modules. Broiler (meat) chickens, laying hens and geese will all keep the grass down, and flocks may need to be rotated to allow recovery of vegetation. Stocking density of up to 2000 birds per hectare is allowed, so a 5 megawatt solar farm on 12 hectares would provide ranging for 24,000 birds.

Solar farm design and layout

In most solar farms, the PV modules are mounted on metal frames anchored by driven or screw piles, causing minimal ground disturbance and occupying less than 1% of the land area. The rest of the infrastructure typically disturbs less than 5% of the ground, and some 25-40% of the ground surface is over-sailed by the modules or panel. Therefore 95% of a field utilised for solar farm development is still accessible for vegetation growth, and can support agricultural activity as well as wildlife, for a lifespan of typically 25 years.

As described above, the layout of rows of modules and the width of field margins should anticipate future maintenance costs, taking into account the size, reach and turning circle of machinery and equipment that might be used for 'topping' (mowing), collecting forage grass, spot-weeding (e.g. of 'injurious' weeds like ragwort and dock) and re-seeding. Again, in anticipation of reverting the field to its original use after 25 years, many agri-environmental measures may be better located around field margins and/or where specifically recommended by local ecologists. All European farmers are obliged to maintain land in "good agricultural and environmental condition" under the Common Agricultural Policy rules of 'cross compliance', so it is important to demonstrate sound stewardship of the land for the lifetime of a solar farm project, from initial design to eventual remediation.

The depth of buried cables, armouring of rising cables, and securing of loose wires on the backs of modules all need to be taken into consideration where agricultural machinery and livestock will be present. Cables need to be buried according to national regulations and local DNO requirements, deep enough to avoid the risk of being disturbed by farming practice – for example, disc harrowing and re-seeding may till the soil to a depth of typically 100-150 mm, or a maximum of 200 mm. British Standard BS 7671 ("Wiring Regulations") describes the principles of appropriate depth for buried cables, cable conduits and cable trench marking. Note also that stony land may present a risk of stone-throw where inappropriate grass management machinery is used (e.g. unguarded cylinder mowers).

Eligibility for CAP support and greening measures

From 2015, under the Common Agricultural Policy, farmers will be applying for the new Basic Payment Scheme (BPS) of area-based farm support funding. It has been proposed that the presence of sheep grazing could be accepted as proof that the land is available for agriculture, and therefore eligible to receive BPS, but final details are still awaited from Defra at the time of writing. Farmers must have the land "at their disposal" in order to claim BPS, and solar farm agreements should be carefully drafted in order to demonstrate this (BPS cannot be claimed if the land is actually rented out). Ineligible land taken up by mountings and hard standing should be deducted from BPS claims, and in the year of construction larger areas may be temporarily ineligible if they are not available for agriculture.

Defra has not yet provided full details on BPS 'greening' measures, but some types of Ecological Focus Areas may be possibly located within solar farms, probably around the margins, including grazed buffer strips and ungrazed fallow land, both sown with wildflowers. Note that where the agreed biodiversity management plan excludes all forms of grazing, the land will become ineligible for BPS, and this may have further implications for the landowner, such as for inheritance tax.

Long-term management, permanent grassland and SSSI designation

Since solar farms are likely to be in place typically for 25 years, the land could pass on to a succeeding generation of farmers or new owners, and the vegetation and habitat within the fenced area is expected to gradually change with time. According to Natural England, there is little additional risk that the flora and fauna would assume such quality and interest that the solar farm might be designated a SSSI (Site of Special Scientific Interest) compared with a similarly-managed open field. However, there could be a possible conflict with planning conditions to return the land to its original use at the end of the project, e.g. if this is specified as 'cropland' rather than more generically as 'for agricultural purposes'. If the pasture within a solar farm were considered to have become a permanent grassland, it may be subject to regulations requiring an Environmental Impact Assessment to restore the original land use, although restoration clauses in the original planning consent may take precedence here. It is proposed that temporary (arable) grassland should be established on the majority of the land area that lies between the rows of modules. This would be managed in 'improved' condition by periodic harrowing and re-seeding (e.g. every 5 years), typically using a combination disc harrow and seed drill.

Other measures to maintain the productivity of grassland, without the need for mechanised cultivations or total reseeding, could include: maintaining optimum soil fertility and pH to encourage productive grass species; seasonally variable stocking rates to prevent over/under-grazing with the aim of preventing grass from seeding and becoming unpalatable. Non-tillage techniques to optimise grass sward content might include the use of a sward/grass harrow and air-seeder to revive tired pastures. When applying soil conditioners (e.g. lime), fertilisers or other products, consideration should be taken to prevent damage to or soiling of the solar modules.

Good practice in construction and neighbourliness

Consideration should also be given to best practice during construction and installation, and ensuring that the future agricultural management of the land (such as a change from arable cropping to lamb production) fits into the local rural economy. Site access should follow strictly the proposed traffic management plan, and careful attention to flood and mud management in accordance with the Flood Risk Assessment (e.g. controlling run-off by disrupting drainage along wheelings), will also ensure that the landowner remains on good terms with his/her neighbours.

Time of year should be taken into account for agricultural and biodiversity operations such as prior seeding of pasture grasses and wildflowers. Contractors should consider avoiding soil compaction and damage to land drains, e.g. by using low ground pressure tyres or tracked vehicles. Likewise, 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.

Evidence base and suggested research needs

A number of preliminary studies on the quantity and quality of forage available in solar farms have suggested that overall production is very little different from open grassland under similar conditions. A more comprehensive and independent evidence base could be established through a programme of directed research, e.g. by consultants (such as ADAS) or interested university groups (e.g. Exeter University departments of geography and biosciences), perhaps in association with seed suppliers and other stakeholders. Productivity of grasses could be compared between partial shade beneath the solar modules and unshaded areas between the rows. Alternatively daily live weight gain could be compared between two groups of fattening lambs (both under the same husbandry regime) on similar blocks of land, with and without solar modules present.

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

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)

Agricultural case studies

Benbole Farm, Wadebridge, Cornwall

One of the first solar farms developed in Britain in 2011, this 1.74 megawatt installation on a four-hectare site is well screened by high hedges and grazed by a flock of more than 20 geese. A community scheme implemented by the solar farm developers enabled local residents to benefit from free domestic solar panels and other green energy projects.

Higher Hill, Butleigh, Somerset

Angus Macdonald, a third-generation farmer, installed a five megawatt solar farm on his own land. Located near Glastonbury, the site has been grazed by sheep since its inception in 2011.

Eastacombe Farm, Holsworthy, Devon

This farm has been in the Petherick family for four generations, but they were struggling to survive with a small dairy herd. In 2011/12, a solar developer helped them convert eight hectares of the lower-grade part of their land into a 3.6 megawatt solar farm with sheep grazing, which has diversified the business, guaranteeing its future for the next generation of farmers.

Newlands Farm, Axminster, Devon

Devon sheep farmer Gilbert Churchill chose to supplement his agricultural enterprise by leasing 13 hectares of grazing land for a 4.2 megawatt solar PV development, which was completed in early 2013. According to Mr Churchill, the additional income stream is "a lifeline" that "will safeguard the farm's survival for the future".

Trevemper Farm, Newquay, Cornwall

In 2011, the Trewithen Estate worked with a solar developer to build a 1.7 megawatt solar farm on 6 hectares of this south-facing block of land, which had good proximity to a grid connection. During the 25-year lease, the resident tenant farmer is still able to graze the land with sheep at his normal stocking density, and is also paid an annual fee to manage the pasture.

Yeowood Solar Farm, North Somerset

Completed in 2012, this 1.3 megawatt installation on 4 hectares of land surrounds a poultry farm of 24,000 laying hens, which are free to roam the land between and underneath the rows of solar modules, as well as other fields. The Ford family, farm owners, also grow the energy crop miscanthus to heat their eco-friendly public swimming pool and office units.

Wyld Meadow Farm, Bridport, Dorset

Farmers Clive and Jo Sage continue to graze their own-brand Poll Dorset sheep on this 4.8 megawatt solar farm, established on 11 hectares in 2012. The solar farm was designed to have very low visual impact locally, with an agreement to ensure livestock grazing throughout the project's lifetime.

Wymeswold Solar Farm, Leicestershire

The author pictured in July 2014 at Britain's largest connected solar farm. At 33 megawatts, this development provides enough energy to power 8,500 homes. Built on a disused airfield in 2013, this extensive installation over 61 hectares (150 acres) received no objections during planning and is grazed by the landowner's sheep – just visible in the background.

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Appendix KCC4

Extracts Construction Code of Practice

www.defra.gov.uk

Construction Code of Practice for the Sustainable Use of Soils on Construction Sites

BIS | Department for Business Innovation & Skills

wrap Material change for a better environment

defra Department for Environment Food and Rural Affairs

5.4 Soil stockpiling

Why?

1. Soil often has to be stripped or excavated during the construction process. In order to enable its reuse on site at a later stage, soil needs to be stored in temporary stockpiles to minimise the surface area occupied, and to prevent damage from the weather and other construction activities.

How?

2. The main aim when temporarily storing soil in stockpiles is to maintain soil quality and minimise damage to the soil's physical (structural) condition so that it can be easily reinstated once respread. In addition, stockpiling soil should not cause soil erosion, pollution to watercourses or increase flooding risk to the surrounding area.

3. When soil is stored for longer than a few weeks, the soil in the core of the stockpile becomes anaerobic and certain temporary chemical and biological changes take place. These changes are usually reversed when the soil is respread to normal depths. However, the time it takes for these changes to occur very much depends on the physical condition of the soil.

4. Handling soil to create stockpiles invariably damages the physical condition of the soil to a greater or lesser extent. If stockpiling is done incorrectly the physical condition of the soil can be damaged irreversibly, resulting in a loss of a valuable resource and potentially significant costs to the project. The Soil Resource Survey and Soil Resource Plan should set out any limitations that the soil may possess, with respect to handling, stripping and stockpiling.

5. The size and height of the stockpile will depend on several factors, including the amount of space available, the nature and composition of the soil, the prevailing weather conditions at the time of stripping and any planning conditions associated with the development. Stockpile heights of 3-4m are commonly used for topsoil that can be stripped and stockpiled in a dry state but heights may need to be greater where storage space is limited.

6. Soil moisture and soil consistency (plastic or non-plastic) are major factors when deciding on the size and height of the stockpile, and the method of formation. As a general rule, if the soil is dry (e.g. drier than the plastic limit) when it goes into the stockpile, the vast majority of it should remain dry during storage, and thereby enable dry soil to be excavated and respread at the end of the storage period. Soil in a dry and non-plastic state is less prone to compaction, tends to retain a proportion of its structure, will respread easily and break down into a suitable tilth for landscaping. Any anaerobic soil also usually becomes re-aerated in a matter of days.

7. Soil stockpiled wet or when plastic in consistency is easily compacted by the weight of soil above it and from the machinery handling it. In a compacted state, soil in the core of the stockpile remains wet and anaerobic for the duration of the storage period, is difficult to handle and respread and does not usually break down into a suitable tilth. A period of further drying and cultivation is then required before the soil becomes re-aerated and acceptable for landscaping.

Stockpiling methods

8. There are two principal methods for forming soil stockpiles, based on their soil moisture and consistency.

9. Method 1 should be applied to soil that is in a dry and non-plastic state. The aim is to create a large core of dry soil, and to restrict the amount of water that can get into the stockpile during the storage period. Dry soil that is stored in this manner can remain so for a period of years and it is reuseable within days of respreading.

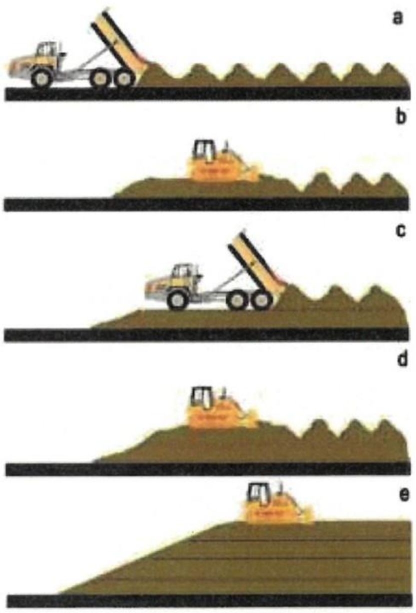
10. Method 2 should be applied if the construction programme or prevailing weather conditions result in soil having to be stockpiled when wet and/or plastic in consistency. This method minimises the amount of compaction, while at the same time maximising the surface area of the stockpile to enable the soil to dry out further. It also allows the soil to be heaped up into a 'Method 1' type stockpile, once it has dried out.

Soil stockpiling

Soil should be stored in an area of the site where it can be left undisturbed and will not interfere with site operations. Ground to be used for storing the topsoil should be cleared of vegetation and any waste arising from the development (e.g. building rubble and fill materials). Topsoil should first be stripped from any land to be used for storing subsoil.

Method 1 – Dry non-plastic soils

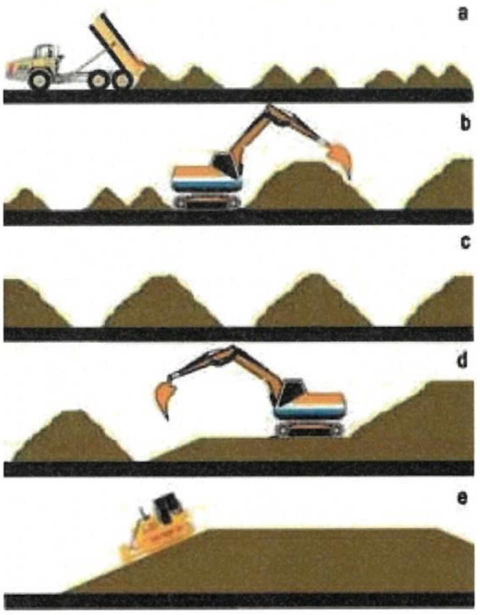
The soil is loose-tipped in heaps from a dump truck (a), starting at the furthest point in the storage area and working back toward the access point. When the entire storage area has been filled with heaps, a tracked machine (excavator or dozer) levels them (b) and firms the surface in order for a second layer of heaps to be tipped. This sequence is repeated (c & d) until the stockpile reaches its planned height. To help shed rainwater and prevent ponding and infiltration a tracked machine compacts and re-grades the sides and top of the stockpile (e) to form a smooth gradient.



Method 2 – Wet plastic soils

The soil is tipped in a line of heaps to form a 'windrow', starting at the furthest point in the storage area and working back toward the access point (a). Any additional windrows are spaced sufficiently apart to allow tracked plant to gain access between them so that the soil can be heaped up to a maximum height of 2m (b).
To avoid compaction, no machinery, even tracked plant, traverses the windrow.

Once the soil has dried out and is non-plastic in consistency (this usually requires several weeks of dry and windy or warm weather), the windrows are combined to form larger stockpiles, using a tracked excavator (d). The surface of the stockpile is then regraded and compacted (e) by a tracked machine (dozer or excavator) to reduce rainwater infiltration.



Stockpile location and stability

11. Stockpiles should not be positioned within the root or crown spread of trees, or adjacent to ditches, watercourses or existing or future excavations. Soil will have a natural angle of repose of up to 40° depending on texture and moisture content but, if stable stockpiles are to be formed, slope angles will normally need to be less than that. For stockpiles that are to be grass seeded and maintained, a maximum side slope of 1 in 2 (25°) is appropriate.

Stockpile protection and maintenance

12. Once the stockpile has been completed the area should be cordoned off with secure fencing to prevent any disturbance or contamination by other construction activities. If the soil is to be stockpiled for more than six months, the surface of the stockpiles should be seeded with a grass/clover mix to minimise soil erosion and to help reduce infestation by nuisance weeds that might spread seed onto adjacent land.

13. Management of weeds that do appear should be undertaken during the summer months, either by spraying to kill them or by mowing or strimming to prevent their seeds being shed.

Clearly defined stockpiling of different soil materials

Long term stockpile of stripped topsoil left with only weed vegetation

Appendix KCC5

Application Plan of Site Layout

KEY

Site Boundary

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Revisions:
First Issue- 03/05/2022 JS
01 - (12/07/2022 JS) Revised boundary
02 - (21/02/2023 JS) Revised boundary
03 - (20/04/2023 JS) Revised boundary
04 - (28/04/2023 JS) Revised boundary
05 - (12/06/2023 JS) Revised boundary
06 - (20/07/2023 JS) Revised boundary
07 - (03/08/2023 AD) removal of sheets 2 & 3

enso energy

Project Title:

Helios Renewable Energy Project

Drawing Title:

Site Location Plan

DRWG No:	Rev:	Sht no:
DX-01-P01	07	1/1

Drawn by:	Checked by:
AD	KL

Scale:	Date:
1:10,000 @ A1	03/08/2023

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