



Tophams Solar Farm

Soil Management Plan

22/00741/FP

DOCUMENT V1

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Soil Management Plan (SMP)

Tophams, Land West of Ashwell Road, Bygrave

1. Introduction:

This Soil Management Plan (SMP) has been prepared to discharge the planning condition requiring a Soil Management Plan to be submitted and approved prior to the commencement of each phase of development (Construction, Operational and Decommissioning) for Tophams Solar Farm, Land West of Ashwell Road, Bygrave.

“Prior to the commencement of each phase of development (Construction, Operational and Decommissioning), a Soil Management Plan shall be submitted to, and approved in writing by, the local planning authority. The plan shall include, but not be limited to details pertaining to careful soil management during each phase, including consideration of the appropriate time of year for soil handling, planting beneath the panels and return to the former land quality as indicated in the Agricultural Land Classification survey on 8th April 2021 by Bateman Rural Associates Limited. The Management Plan shall adhere to the guidance set out in the following documents (or any subsequent replacement versions):

- a) Defra's Construction Code of Practice for the Sustainable Use of Soils on Construction Sites (September 2009); and.*
- b) The British Society of Soil Science Working with Soil Guidance Note on Benefiting from Soil Management in Development and Construction.*

The Soil Management Plan as so approved shall be implemented, and adhered to, for each phase of the development.

Reason: To protect soil quality and so enable the reinstatement of its agricultural land quality following the cessation of the solar farm use of the land in accordance with the NPPF, Defra guidance and policy NE12 in the Local Plan”

This SMP has been reviewed against, and is fully compliant with, Defra's *Construction Code of Practice for the Sustainable Use of Soils on Construction Sites* (September

2009). The SMP translates the Code's high-level principles into site-specific, practical measures covering soil assessment, stripping, handling, storage, trafficking, reinstatement and aftercare. It also accords with the British Society of Soil Science (BSSS) *Working with Soil* guidance.

The SMP adopts the Defra Code's core objectives to:

- Treat soil as a valuable, finite and non-renewable resource;
- Protect soil physical, chemical and biological functions;
- Minimise the area, depth and duration of soil disturbance;
- Prevent soil damage through inappropriate timing or trafficking;
- Reuse soils sustainably and reinstate them to maintain agricultural land quality.

1.1 Objectives

The objective of the SMP is to ensure that the soil resource is protected during all phases - construction, operation, and decommissioning:

- Protect soil structure, texture and function during construction, operation and decommissioning;
- Prevent unnecessary compaction, smearing and contamination of soils;
- Ensure soils are handled only when conditions are suitable;
- Maintain the productive capacity of Best and Most Versatile (BMV) land (Grades 2);
- Enable reinstatement of the land to its former agricultural quality, consistent with the baseline ALC survey.

1.2 Site Description

Tophams Solar Farm comprises the construction, operation and decommissioning of ground-mounted solar photovoltaic (PV) arrays and associated infrastructure, including battery energy storage systems (BESS), access tracks, inverter stations, underground cabling, landscaping and biodiversity enhancements.

The site lies to the west of Ashwell Road, Bygrave, and is currently in agricultural use. The proximity of the site to the electricity substation and overhead lines removes the need for an extensive off-site cable corridor, thereby reducing the scale of excavation and potential soil disturbance.

Over the 40-year operational lifespan of the scheme, reduced cultivation and nutrient extraction are expected to result in improvements to soil structure, organic matter and biological activity compared with continued arable use.

2. Baseline soil and site conditions:

An Agricultural Land Classification (ALC) survey was undertaken by Bateman Rural Associates Limited on 8 April 2021, in accordance with the Ministry of Agriculture, Fisheries and Food (MAFF) *Revised Guidelines and Criteria for Grading the Quality of Agricultural Land* (October 1988).

2.1 ALC Grades

The survey identified the site as predominantly Best and Most Versatile (BMV) agricultural land. The majority of the land was classified as Grade 2.

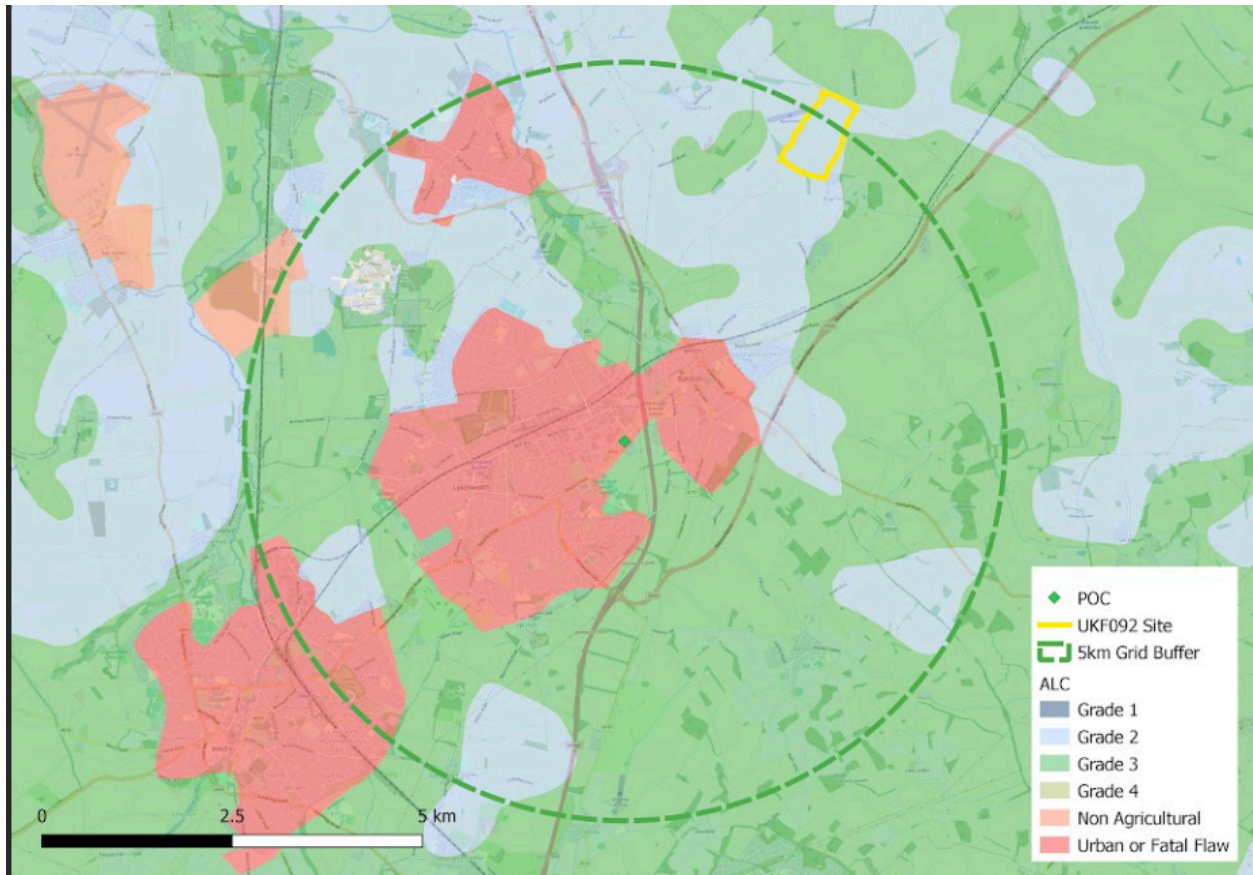


Figure 1: ALC Grades & Site Position

2.2 Texture and Structure

Agricultural Land Classification is determined by the most limiting factor present. The assessment identified wetness as the principal limiting factor influencing land quality and agricultural productivity across the site.

3. Soil Management:

The major threats to the soil structure during construction and decommissioning are the poor trafficking of vehicles/plant and poor handling. These can cause compaction and smearing, compromising soil structure and limiting its absorptive capacity. Compression reduces the volume of the area and integrity of the soil meaning it is able to store less water, air and nutrients for plant roots. As such the SMP is primarily concerned with the management of this risk.

3.1 Pre-commencement checks

In accordance with Defra (2009), soils shall be assessed prior to disturbance to determine their suitability for handling. The following measures ensure compliance with the Code's requirement to avoid damage through inappropriate timing:

- Soil stripping, trafficking and handling shall only occur when soils are dry or friable.
- No soil handling shall take place when soils are wet, plastic or saturated.
- Visual inspection and plastic limit testing shall be undertaken immediately prior to works.
- Decisions to proceed shall be recorded in a site soil log.

These checks ensure soil structural integrity and biological function are protected, as required by the Defra Code.

Soil handling and trafficking shall only occur when soil moisture conditions are suitable. Given wetness is the primary soil limitation, field-based assessments shall be undertaken before soil stripping or trafficking. A visual assessment and plastic limit test shall be carried out:

Table 1: Pre-Commencement Checks

Soil condition	Observation	Test/indicator	Handling guidance
Wet soil	Films of water visible on soil particles or aggregates	Readily deforms into a 'cohesive' ball when squeezed by hand	No handling
Friable soil	Soil peds readily break up or crumble	Crumbles easily when squeezed in the hand	Handling ok
Moist soil	Slight dampness when squeezed; colour does not change with more water	Consistency must be tested (table 2)	Handling ok if undertaken by tracked excavator and consistency test is passed
Dry soil	Dry sample darkens when water is added; brittle structure	Consistency must be tested (table 2)	Handling ok if consistency test is passed

Table 2: Consistency Test - 'Plastic Limit'

Attempt to roll the ball by hand into a thread of 3mm diameter on a flat non-adhesive surface:

Soil rolls into a 3mm ball?	Handling guidance
Impossible - the soil crumbles or disintegrates	Handling ok
Possible	No handling

If works can be commenced a number of further measures are taken to ensure soil integrity.

3.2 Construction

Construction activities will comply with Defra (2009) guidance by:

- Minimising the area and duration of exposed soils;
- Preventing unnecessary trafficking over stripped or sensitive soils;
- Avoiding mixing of soil horizons;
- Protecting soils from erosion, compaction and contamination.

Soil disturbance will be limited to areas strictly necessary for access, foundations, cabling and infrastructure.

Construction activities will follow best practice to minimise soil disturbance, prevent mixing of soil horizons and avoid unnecessary compaction. Soil handling will be limited to the minimum area and duration required for the works.

The primary risks to soil are compaction and smearing from trafficking and poor handling. These risks shall be managed through timing, method selection and routing.

As a general principle, soil handling and extensive trafficking will be avoided during prolonged wet periods (typically December to early April) unless protective measures such as track mats are used and soil conditions permit.

3.2.1 Plant/Vehicles

To minimise risk to soil through Plant/Vehicle Use operation will:

- Prior to any major operation a grass sward should be established over the Solar PV area before trafficking over by construction plant and delivery vehicles to increase soil resistance.
- Plant/vehicles should avoid the handling of soil and use of plant/vehicles over soil when its moisture content is above the plastic limit and deemed too wet to handle without causing damage to soil structure.
- Soil handling should be carried out by an excavator and dump truck as outlined in the 'Institute of Quarrying: Good Practice Guide for Handling Soils in Mineral Workings'.
- When travelling across the site all machinery and vehicles should keep to access routes where possible to contain the risk of compaction.
- All plant/vehicles should be maintained in good working condition to maintain soil integrity eg. the depth of the strip is controlled through appropriately

maintained buckets for a suitably sized excavator and the regular maintenance of machinery to minimise the risk of contamination through spillages.

- Daily records of operations undertaken and the site and soil conditions will be kept during soil handling activities.
- Low ground pressure and tracked vehicles will be used where possible when working directly on bare or vegetated soils to minimise the extent and/or intensity of the soil loosening/decompaction required after reinstatement.
- Compliance with the Arboricultural Method Statement and Tree Protection Plan (Condition 7) to ensure the protection of root zones.
- If appropriate geotextile membranes will be installed with permeable sub-base and surface layers on access tracks to minimise compaction and reduce surface water.

3.2.2 Excavation and Storage:

The nature of the construction means there is limited requirement for soil stripping outside of compounds, posts (solar and fencing) and access tracks. Soil stripping and storage will be mostly confined to topsoil owed to its depth of 600mm with minimal excavation of subsoil. Where there is any requirement to store subsoil, this will be in bunds separate to the units of topsoil material. Where soil material is excavated for post holes, topsoil should be spread thinly to the side of the excavation, with subsoil removed to a storage bund or reused for building up levels.

General Principles are:

- To again avoid the handling of soils during periods of prolonged heavy rain.
- Ensured any stored soil and only soils are kept in designated storage areas.
- Where soil is to be stored it will be stored in bunds of:
 - Max height 1.5 m for topsoil (soil up to 600mm), 2.0 m for subsoil (soil typically below 600mm)
 - Shape: Shallow angles to prevent slumping
 - Location: Avoid slopes and areas at risk of runoff
 - Any bunds left on site will be seeded.
- Include a target specification for the restored soils which will be established according to location and soil types, end use and the existing baseline ALC grade identified in the ALC survey.
- Topsoil and subsoil shall be stripped and stored separately to prevent horizon mixing.
- Soil stripping depths shall reflect the natural soil profile.

Trenching:

Trenching is required to ensure cables are a safe distance below the ground, depths for trenches are typically as such:

- MV trench: 0.7m (w) x 1.0m (d)
- String trench: 0.3m (w) x 0.8m (d)
- DC trench: 1.37m (w) x 0.8m (d)
- Crossing: 0.6m (w) x 1.0m (d)
- CCTV trench: 0.3m (w) x 0.4m (d)
- Earthing Trench 0.15 (w) x 0.8m (d).

Where possible soil will be reinstated straight back into the trench, with top soil reinstated back to ground level from approx depth:

- Subsoil is reinstated first and lightly compacted.
- Topsoil is reinstated last to original depth and condition.
- Trenches are backfilled as soon as practicable to minimise soil exposure.

3.4 Operations

During operation, occasional vehicle movements within the site will be necessary for maintenance the the supervision of any grazing livestock, as would be expected of any agriculturally managed farm. Given the length of time without major agricultural interference (40 years) soil health can be expected to recover to a state better than its original condition.

There is little evidence available demonstrating any impact on soil health specific to solar panels over a 40-60 year timescale, in comparison to the effect of continued farming, any detectable effect, if there is one at all of solar panels, is anticipated to be positive through the reduced disruption of soil and reduced nutrient extraction.

- Trafficking should be confined to access tracks unless there is a specific need to take a vehicle onto the grassed surface. Any vehicles/plant operating should follow the same guidance given in **section 3.2.1**.
- Trafficking for mowing and/or supervision of livestock will be confined to periods of higher grass growth and naturally dryer soil conditions. Where the site does have wet conditions and plastic soils during the growing season, mowing operations and/or livestock grazing should be postponed until field tests demonstrate that topsoil is suitably dry.
- If grazing is utilised, grazing livestock will be encouraged to move across the site to manage grass growth. The programme of movement should take into

account areas of prolonged wetness following rainfall, prioritising grazing of these areas in summer rather than spring and autumn. Mobile feed and water troughs can be relocated to avoid loss of vegetation and build-up of compaction for the surrounding area.

It should be noted that the effects of vehicles and livestock across the site will be low compared to routine agricultural land management. The site will be managed as low input grassland and will carry less weight of stock than is standard for area fertilised fields. Vehicles used within the Principal Site for inspection and maintenance will be considerably smaller and lighter than those used for arable cultivation where heavy ballast is required for tractors to be able to draw a plough.

4. Decommissioning:

The decommissioning, as with construction, will require the trafficking of plant/vehicles over the grassed soil surface. This work should only be undertaken when the topsoil is drier than the plastic limit. The aim of the decommissioning state is to restore all agricultural land without any degradation of the current ALC Grade, as stated in the ALC survey. The length of the project (40 years) means that much of the soil will be left in better condition than it started in under arable conditions, as soil structures and nutrient banks will have been able to regenerate. However where intervention is necessary:

- All vehicle movements should be confined to access tracks unless there is a specific need to take a vehicle onto the grassed surface. Any vehicles/plant operating should follow the same guidance given in **section 3.2.1**.
- Solar farm infrastructure such as compounds, inverters, access etc and any ground coverings are removed; the subsoil condition should be examined by digging a trial pit.
- Across the site trial pits should be dug to assess the soil profile and any de-compaction should be undertaken to contribute to a programme of remediation.
- Should there be deep compaction (>500mm depth) in the soil profile the use of specialist equipment, protection (eg. track mats), additional soil (to reinstate) will be considered.
- Removal of hard standing and access tracks will loosen then lightly consolidate the soil with an excavator bucket to a depth of approximately 300mm before reinstatement/replacement of topsoil.
- Where there has been infrastructure requiring a foundation, a grass cover must be established and left for three years under grazing (or mowing) conditions before it returns to arable production.

- Where there have been compounds or fuelling points the subsoil should be sampled and a UKAS and MCERTS (or equivalent) laboratory analysis undertaken for metals, oils and Polycyclic Aromatic Hydrocarbons (PAHs).
- The decommissioning phase and reinstatement of soil should be monitored by a suitably qualified competent person. Records of operations should be kept with photographic evidence
- Grass on any soil bunds will be sprayed/mowed off 10 days before soil reinstatement · examine the conditions of the soil under the bunds and take remedial action such as loosening if required before reinstatement.
- The decommissioning phase and reinstatement of soil should be monitored by a suitably qualified competent person. Records of operations should be kept within a log with soil wetness conditions and activities undertaken.
- The condition of field drainage should be assessed and reviewed for any remedial action.
- Any void left after pile pull out should be examined and may require in-filling with similar soil
- Where problematic compaction is found the area should be subsoiled prior to any reestablishment of arable production.

5. Supervision

- Throughout the construction, operation and decommissioning phases, regular inspections should be made by a suitable person. Inspections will check for compliance with the agreed SMP, such as the depth of material stripped for areas of track, confirmation of soil handling and trafficking over land being stopped when soil has wetted to a plastic consistency, and condition of soil material in storage bunds.
- Specific site inspections should take place prior to and post decommission work to identify any areas of specific remediation work required, and that any such remediation work has been completed successfully. An example would be looking for any areas of subsoil compaction that have developed where service vehicles have been used off the access track routes, specifying appropriate subsoil cultivation and assessing the effectiveness of that cultivation.
- Periodic site inspection of the Principal Site can also be used in conjunction with the landowners, to identify any emerging issues such as loss of gravel hardcore from access tracks to adjacent land or unnecessary vehicle movements off the access tracks.

A note on Flood Risk & Surface Water Mitigation

Flood risk will be mitigated by protecting soil structure and maintaining infiltration capacity throughout construction, operation and decommissioning. Soil handling will be restricted to dry or friable conditions to prevent compaction and smearing. This allows the structure of the soil to remain porous giving it a natural absorptive capacity. Post construction permanent grass cover beneath and between panels, low-intensity grazing or mowing, and controlled vehicle movements will preserve soil permeability and slow surface water runoff. This means water retention should be improved from its baseline state as arable farm land. Following decommissioning, soils will be reinstated in the correct order, depth and condition, with any compaction alleviated, ensuring rainfall continues to infiltrate naturally and that surface water runoff rates are no greater than baseline conditions.

Appendix

- Agricultural Land Classification Survey – Bateman Rural Associates Limited (8 April 2021)
- Defra (2009) Construction Code of Practice for the Sustainable Use of Soils on Construction Sites
- British Society of Soil Science – Working with Soil Guidance
- Institute of Quarrying (2021) Good Practice Guide for Handling Soils in Mineral Workings