Galileo 03 Ltd.

Mynydd Ty-talwyn Energy Park - Environmental Statement Volume III

Appendix 5.4: Outline Soil Management Plan

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1. Introduction

1.1. Instruction

This report has been prepared by Aqua Terra Consultants Ltd (Aqua Terra) on behalf of Galileo 03 Ltd (part of Galileo Empower UK Ltd) referred to as 'Galileo' or the 'Applicant'. Aqua Terra were instructed to provide an Outline Soil Management Plan (OSMP) for the proposed Mynydd Ty-talwyn Energy Park (the Proposed Development) on land to the north of New Road, approximately 4km north of Bridgend, within the jurisdiction of Bridgend Couty Borough Council (BCBC) and Neath Port Talbot County Borough Council (NPTCBC) (the Site).

1.2. Brief

RSK has compiled an Environmental Statement (ES) on behalf of the Applicant to accompany an application for planning permission for the Proposed Development at the Site which comprises the construction and operation of six wind turbines, ground mounted solar photovoltaic (PV) modules, one project substation , and ancillary infrastructure works.

A Scoping Direction has been provided by the Planning and Environment Decisions Wales. This document mentions the following:

"*It is noted that the applicant intends to produce a Soil Management Plan (Section 6.5.6) to support the ES and application. This is welcomed and should cover all soils (peat, organomineral and mineral).*

The plan should include a clear scheme and programme setting out how all soils and their function will be used, conserved, reinstated and restored. The Scheme should be presented in sufficient detail for the determining authority and statutory consultees to form a judgement as to its feasibility and to condition against. The scheme should include: -

- *Soil stripping programme - volumes and types of soils affected;*
- *Soil handling techniques and procedure;*
- *Size, location, construction, management and period of soil storage dumps; and,*
- *Proposed decommissioning, after use and restoration programme, including techniques and aftercare programme*[1]*."*

This OSMP has been written to address these requirements. It has been prepared as an Appendix to the ES Volume II, Chapter 5: Land, Soil and Groundwater.

1.3. Regulatory context

This OSMP is based upon the following guidance documents:

- Minerals Technical Advice Note (MTAN) 1 (Aggregates), Welsh Government[2];
- Construction Code of Practice for the Sustainable Use of Soils on Construction Sites, Department for Environment, Food and Rural Affair's (Defra)[3];

[1] PEDW. 2024. *EIA Scoping Direction DNS CAS-03018-G7G6H7 Mynydd Ty-Talwyn Energy Park*.
[2] Welsh Government **2004,** *Minerals Technical Advice Note 1 (Aggregates) [MTAN1].* Available at: http://gov.wales/topics/planning/policy/mineralstans/?lang=en.
[3] Defra, **2009**; *'Construction Code of Practice for the Sustainable Use of Soils on Construction Sites'. Available* at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/707134/pb13298-code-of-practice-090910.pd.

- Good Practice for handling soils, Ministry of Agriculture, Fisheries and Food [4];
- Environmental good practice on site guide (fourth edition). CIRIA Report No. 741, 2015; and,
- Planning Policy Wales Chapter 6[5].

The publication of the updated chapter 6 of Planning Policy Wales (PPW) in October 2023 (then subsequently incorporated into Edition 12 in February 2024) represents the most recent update to planning policy with regards to soils. It references the seven goals of the Well-being of Future Generations Act, listing protection of soils as one of the aspects underlying the Resilient Wales goal. It provides the goal of Distinctive and Natural outcomes, and lists soil compaction and sealing, and soil carbon management as underpinning such outcomes.

Chapter 6 of PPW has policy wording with reference to soils, the most salient of which have been drawn out and listed below:

- Paragraph 6.4.3 requires that development proposals must consider the need to safeguard soil, including peat.
- Paragraph 6.4.34 describes that where peat is identified within proposed developments considerable weighting shall be given to its protection, and "*unless other significant material considerations indicate otherwise it will be necessary to refuse permission.*"

1.4. Scope

The main body of this document considers all soils except peat. Peat has been subject to assessment in Phase 1 and 2 Peat surveys undertaken by Fluid Environmental[6].

The scope of this document has been drafted cognisant of the policy set out in chapter 6 of PPW.

Section 2 describes the soils present within the Site, as identified by a combination of desk-based study and fieldwork.

Section 3 provides the soil stripping programme, which describes and quantifies the volumes and types of soils affected.

Section 4 sets out the measures that shall be employed to protect soils during the construction and decommissioning stages of the development, minimising and mitigating the impact that the development has on soils. This includes the requirements that shall be adhered to in the stockpiling of soils.

Section 5 sets out the mitigation options for the Proposed Development.

1.5. Limitations

General report limitations are presented in Annex A.

This report relies in part on data collated from publicly available datasets and data sources, and from data collected on Site by other parties. Aqua Terra has deployed reasonable skill and care in the collation and assessment of these data, and provides comment on such data where considered necessary. However, Aqua Terra takes no responsibility for the veracity or accuracy of data gathered from external sources.

[4] MAFF **2000.** *Good Practise for Handling Soils.*
[5] Welsh Government 2024. *Planning Policy Wales Edition 12*. February 2024.
[6] Fluid Environmental Consulting 2025. Mynydd Ty-talwyn Energy Park Depth of Penetration Survey Report. November 2025.

2. Soil Resource Baseline

2.1. Context

Soil is considered to be defined as the upper layer of the earth's crust in which plants grow. It is essentially a non-renewable resource as it may take more than 500 years to form a 2cm thickness of topsoil (the most productive soil layer). The layers of soil are separated into horizons identified by their significant characteristics up to, usually a maximum of, 1.2m depth.

The most significant threats to soil in Wales[7] vary depending on the land use, but these include:

- Climate change;
- Soil compaction;
- Soil erosion;
- Loss of organic matter in soil; and,
- Contamination of soil.

Most Welsh soils are considered at a low risk for degradation under their current agricultural management (85% of land in Wales is agricultural). The main threat is heavy machinery causing soil compaction. Therefore, the use of heavy machinery during construction of the Proposed Development must be carefully managed.

2.2. Published soils data

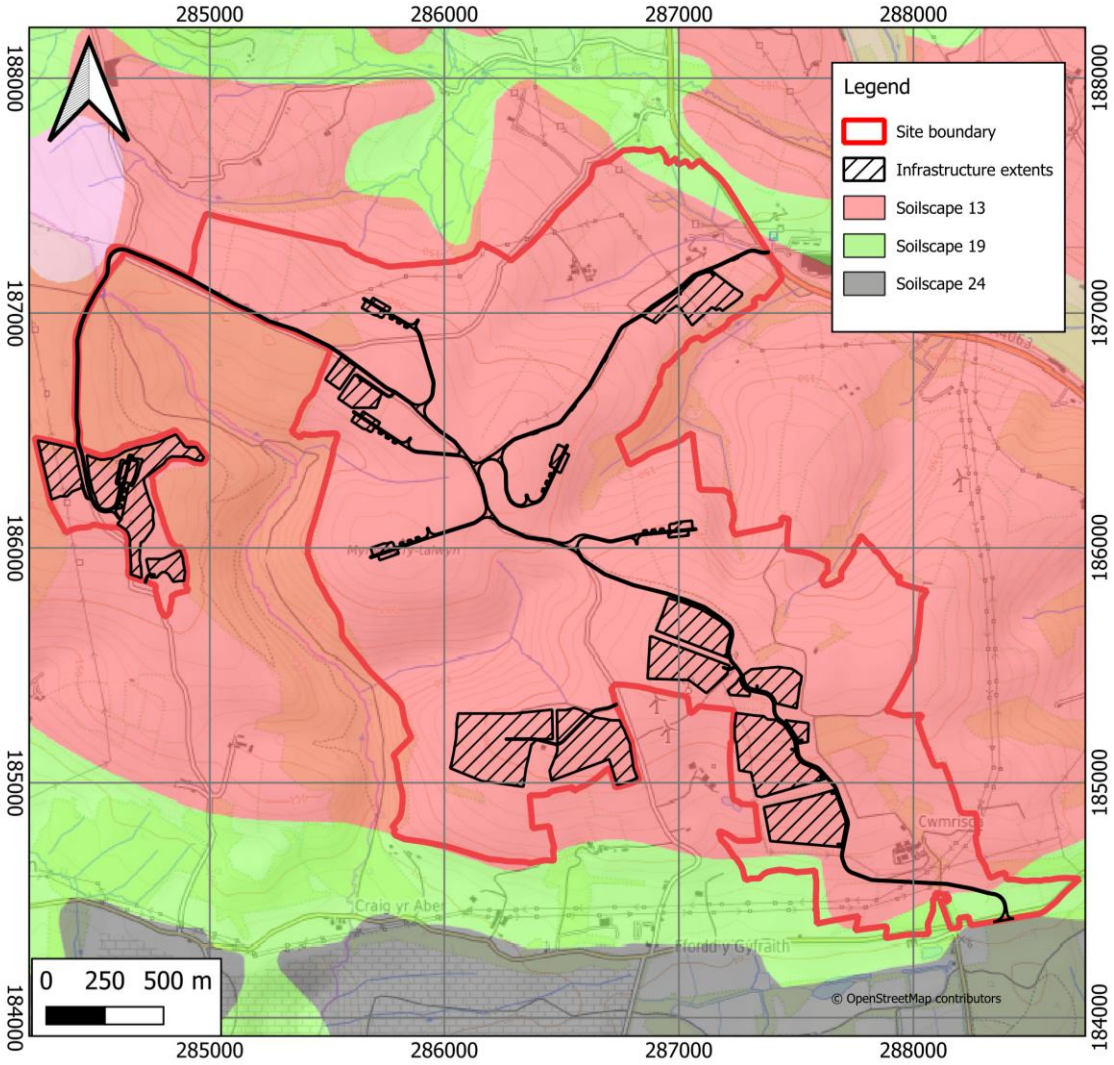
Soil types present on Site have been broadly defined using the data from Cranfield University's National Soils Map[8] as shown in Figure 2-1 below.

This mapping indicates the majority of the Site is classified as Soilscape 13, which is described as "*freely draining, acid, loamy soils over rock*". These soils are described as having a medium carbon content and drain to local groundwater and the river network.

Small sections at the northern and southern edges of Site, the largest area at the south west of Site, are mapped as being underlain by Soilscape 19, which is described as "*slowly permeable, wet, very acid, upland soils with a peaty surface*". Drainage is typically impeded and soils drain to the local stream network. These soils are described as having a peaty or humose loamy texture and a high carbon content. However, as noted in Section 2.3.2, minimal peat soils are anticipated to be located within the Site.

[7] Welsh Government **2019**, *Assessment of Welsh Soil Issues in Context,* Available at: https://www.gov.wales/sites/default/files/publications/2021-04/assessment-soil-issues-in-context_0.pdf
[8] Cranfield Soil and Agrifood Institute, *Soilscapes,* Available at: https://www.landis.org.uk/soilscapes/

Figure 2-1 Cranfield University's National Soils Map with numbered turbine locations



2.3. Peat and soil surveys

2.3.1. Survey details

Phase one and Phase two peat surveys have been completed across the Site by Fluid Environmental Consulting between May and June 2024 and in February 2025. A total of 2,213No. positions were probed, each of recording the depth of penetration (Figure 2-2), an estimate of underlying geology, vegetation and ground firmness. Depth of penetration is used as a proxy for peat depth, although it is acknowledged in Fluid Environmental Consulting's report that this can be an overestimation where the underlying formation is soft. An additional 66No. hand augured cores were also completed which verified the findings of probing, as well as allowing peat thickness and detailed soil descriptions to be recorded.

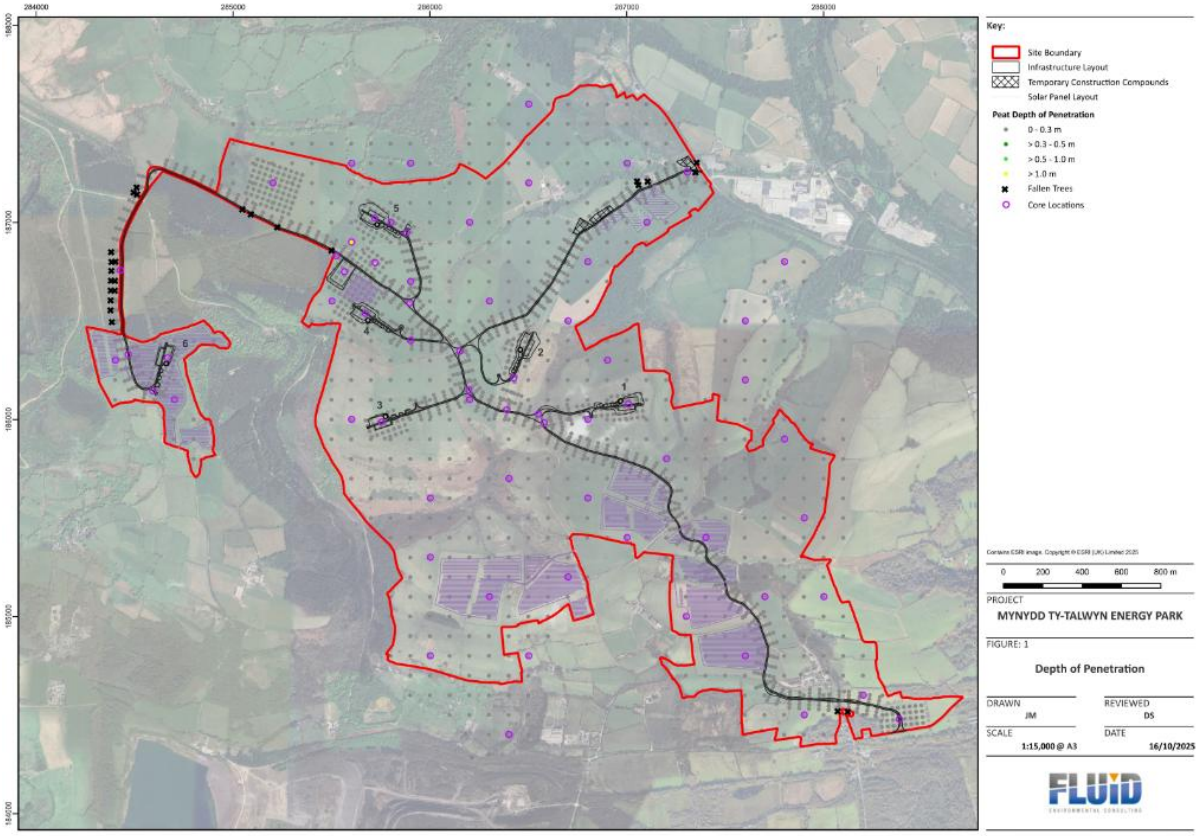
An initial 100 m grid of probe locations was undertaken across the Site. This was then augmented by a secondary probing exercise in February 2025, along the proposed infrastructure layout, with probe density varying from 10m to 50m dependent upon the likelihood of encountering peat, as discerned from the results of the initial 100m gridding exercise.

2.3.2. Soil and peat thickness

The depth of penetration data together the soil core data was processed by Fluid Environmental Consulting. Figure 2-3 below provides a plan of the interpolated peat thickness across the Site showing that no peat was found where areas of infrastructure are planned.

Peat was identified within one of the core locations, the remaining 65 cores provide an estimate of soil depth. Aqua Terra have produced a soil depth plot from this data, which is provided in Figure 2-4. This plot excludes peat thicknesses, where present.

Figure 2-2 Peat probe depth of penetration (provided by Fluid Environmental Consulting)



2.3.3. Soil type

The basic soil descriptions collected by Fluid Environmental Consulting during the probing fieldwork have been used to determine the distribution of basic soil types across the Site. Five different soil types were identified from the soil cores: silty loam, sandy loam, silty clay, silty clay loam and peat. As soil was not visually examined at the probe locations, soil was described by feel rather than

geological texture. Soil cores show silty loam is present across the majority of Site (55 of 66 cores), this is supported by the probe data where 63.5% of positions were logged as gritty silt (the grittiness likely attributed to the sand component of loam).

Figure 2-6 and Figure 2-7 show the distribution of soils across Site as recorded by probes and cores respectively. Soils are similar across much of the Site as indicated in the published National Soils Map, however there is no clear change in soil type at the southern and northern edges of Site where Soilscape 19 is mapped.

Peat greater than 0.3m depth was recorded within one probe location and was confirmed by a soil core. Probe penetration between 0.05 and 0.25m was recorded in multiple positions, however adjacent soil cores suggest this is a thin layer of silty clay/ loam rather than peat. Peat deposits on Site are therefore expected to be limited.

Figure 2-3 Peat thickness extrapolated from probe data (provided by Fluid Environmental Consulting)

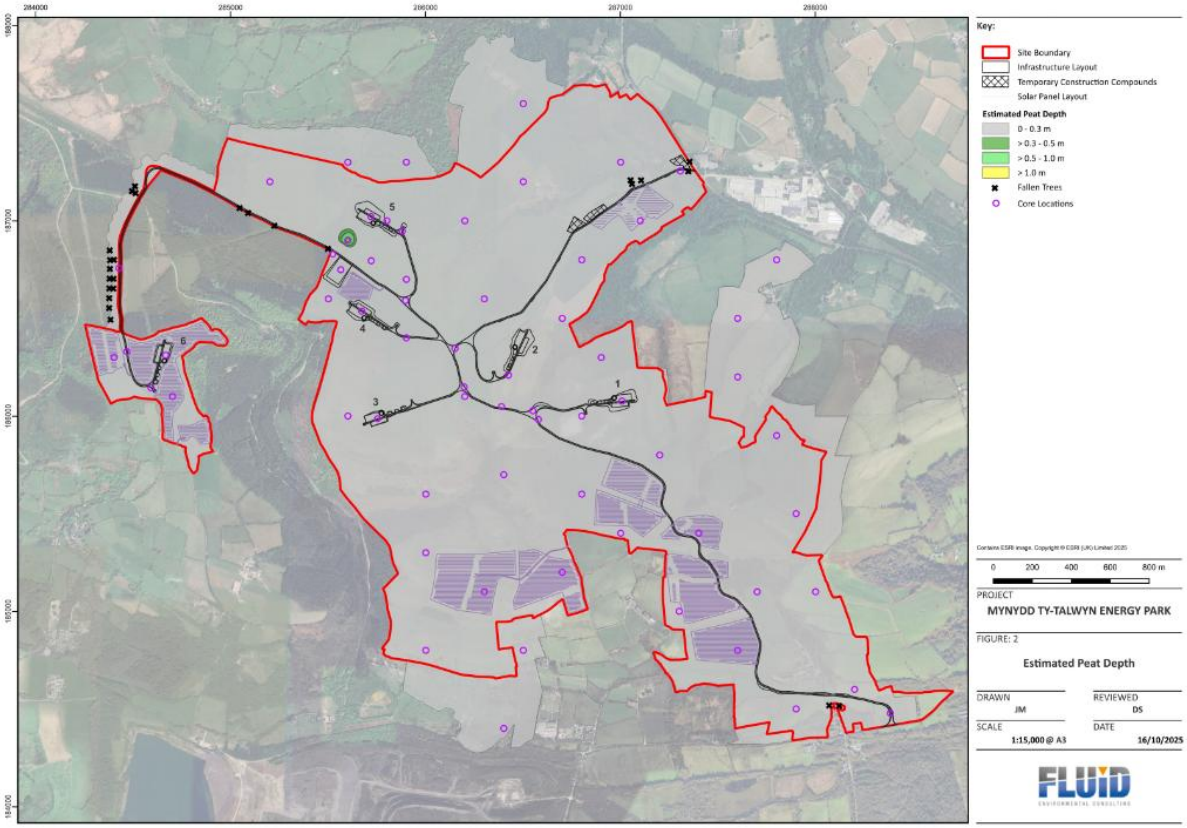


Figure 2-4 *Soil depth for the north of Site extrapolated from probing and core data (provided by Fluid Environmental Consulting)*

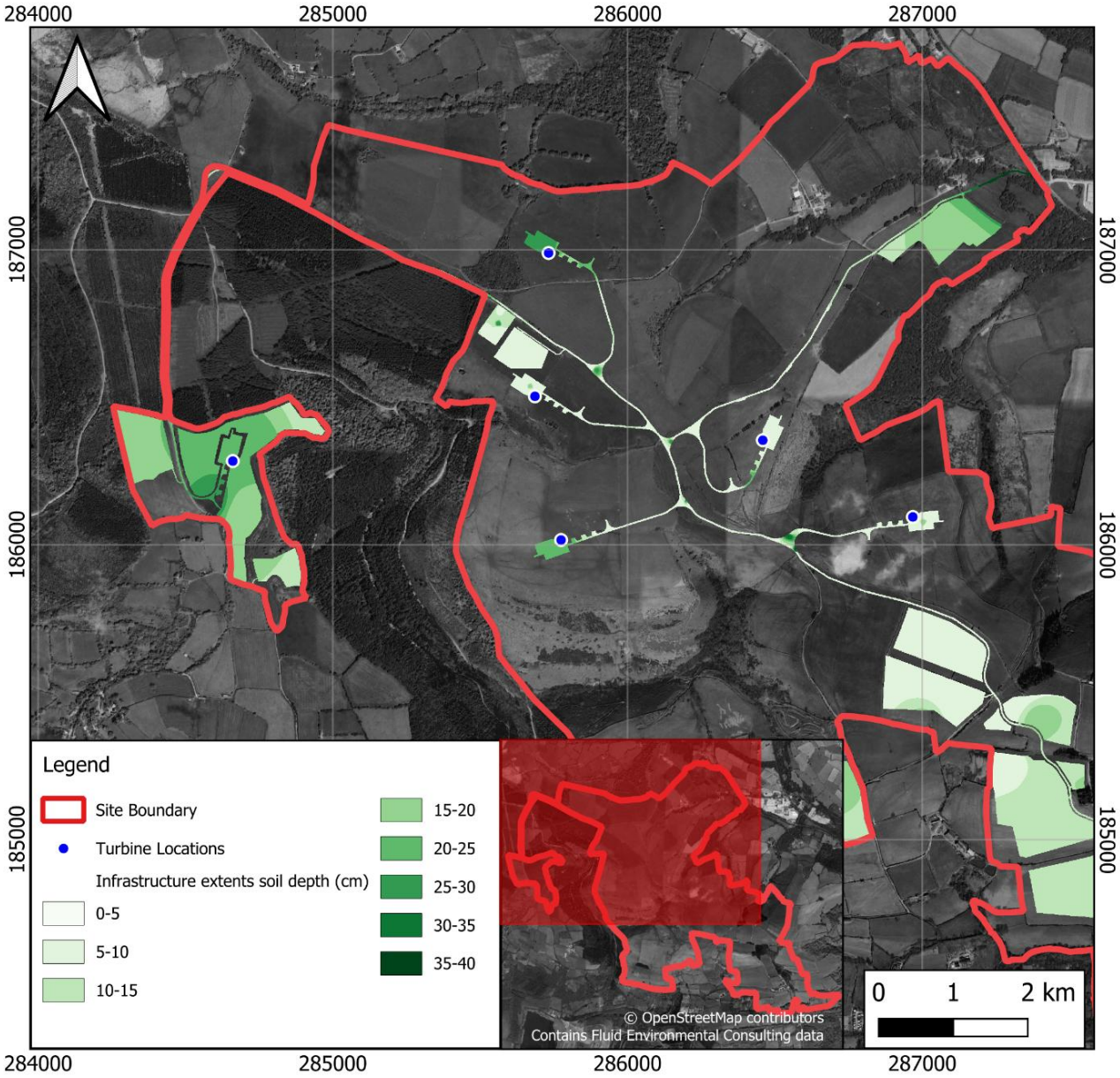


Figure 2-5 *Soil depth for the south of Site extrapolated from probing and core data (provided by Fluid Environmental Consulting)*

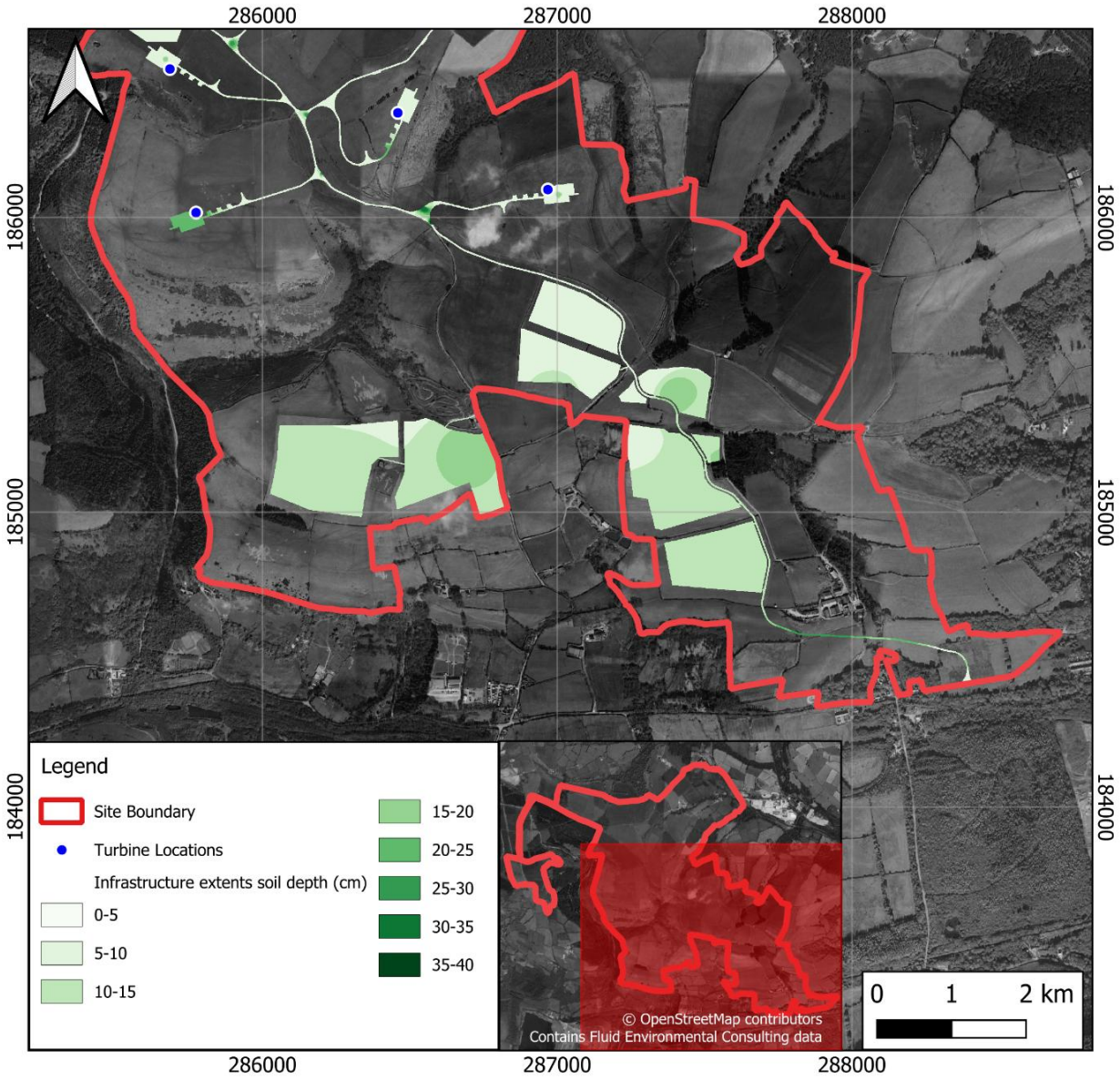


Figure 2-6 Soil types on site as recorded from probes during peat survey fieldwork

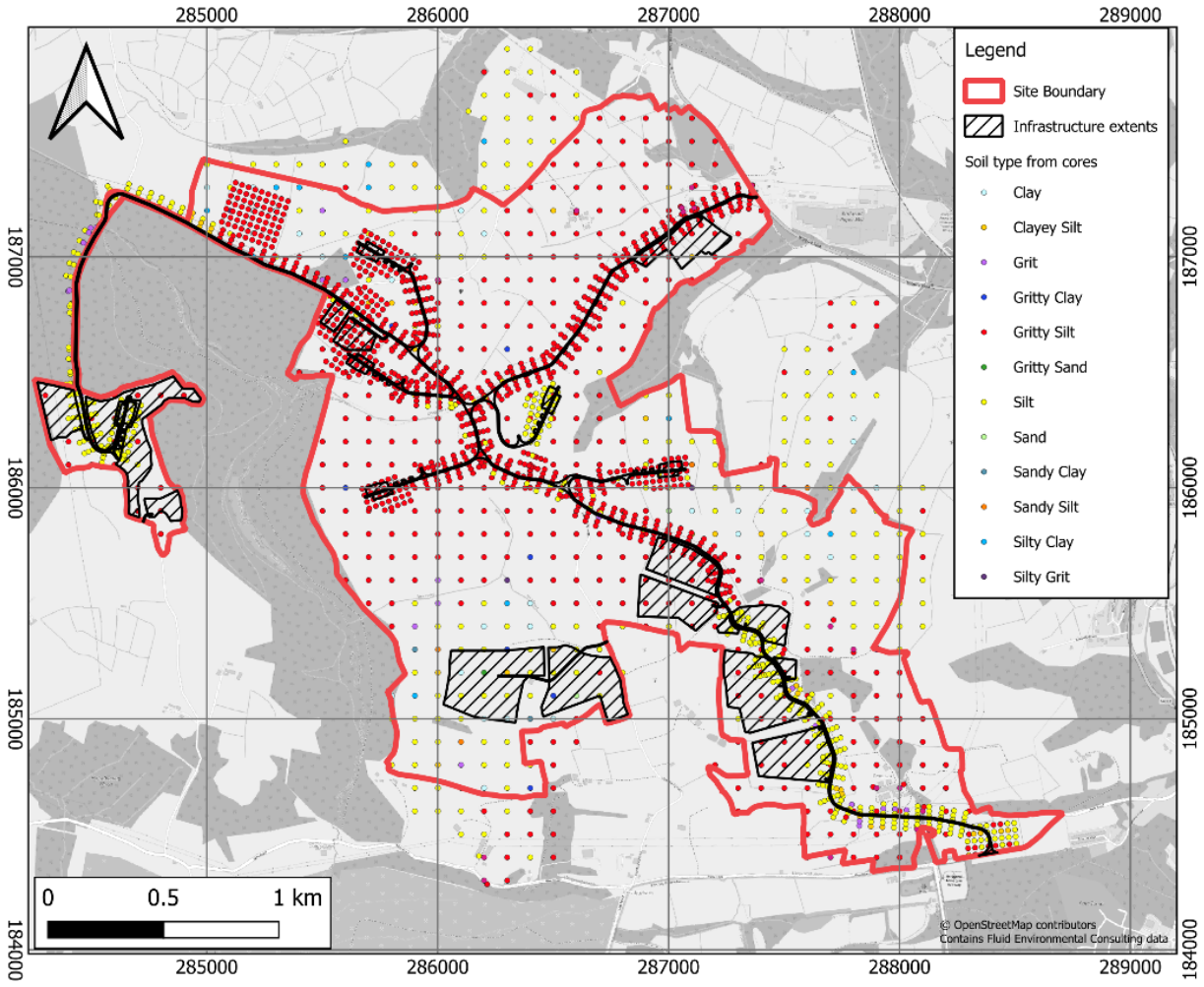
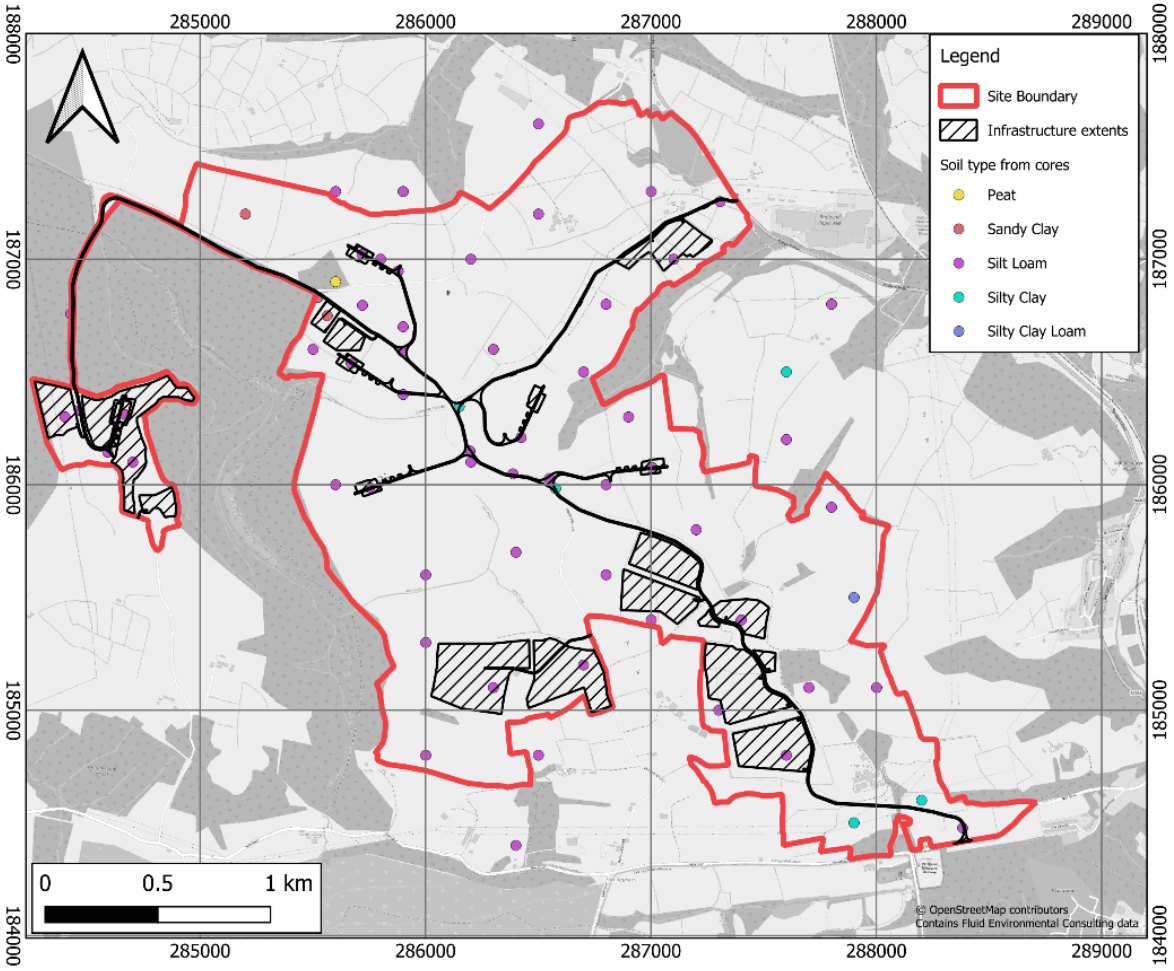


Figure 2-7 Soil types on Site as recorded from cores during peat survey fieldwork



3. Soil stripping programme

3.1. Methodology

To ascertain the volume and type of soils that will need to be stripped during the construction phase, the development footprint was separated into the following types:

- **Earthworks**. This includes the earthwork batters either side of the infrastructure layout. It excludes the temporary and permanent infrastructure footprints themselves. Soils stripped from these areas will require storage for a short duration, with soil being restored upon completion of the earthworks. The volume stripped has been assumed to be the same as the volume restored, hence a neutral soil balance is to be achieved.
- **Temporary infrastructure**. This comprises the crane and lay down hardstands and construction compound. Soils stripped from these areas shall be restored upon completion of the construction programme and hence a neutral soil balance will be achieved. Soils from these areas shall require longer term storage than those associated with earthwork batters.
- **Permanent infrastructure**. This comprises permanent tracks and permanent hardstanding areas associated with turbines and substation. Soils stripped from these areas shall not be restored in situ, and hence will require placement and restoration at an alternative location on Site. Solar parcels will also form part of the permanent infrastructure but no soil stripping will be required in these areas.

A modelling exercise has been undertaken to determine the volumes of soil that will need to be stripped. The proposed infrastructure layout was split into the three component types set out above, and further split into development aspect (e.g. hardstanding). Soil depth data was used to segment the infrastructure elements into segments. The volume of soil in each segment was then calculated using the surface area multiplied by mean soil depth.

The infrastructure and earthworks segments are annotated Figure 3-1 in Figure 3-2 and respectively.

Figure 3-1 Infrastructure segments

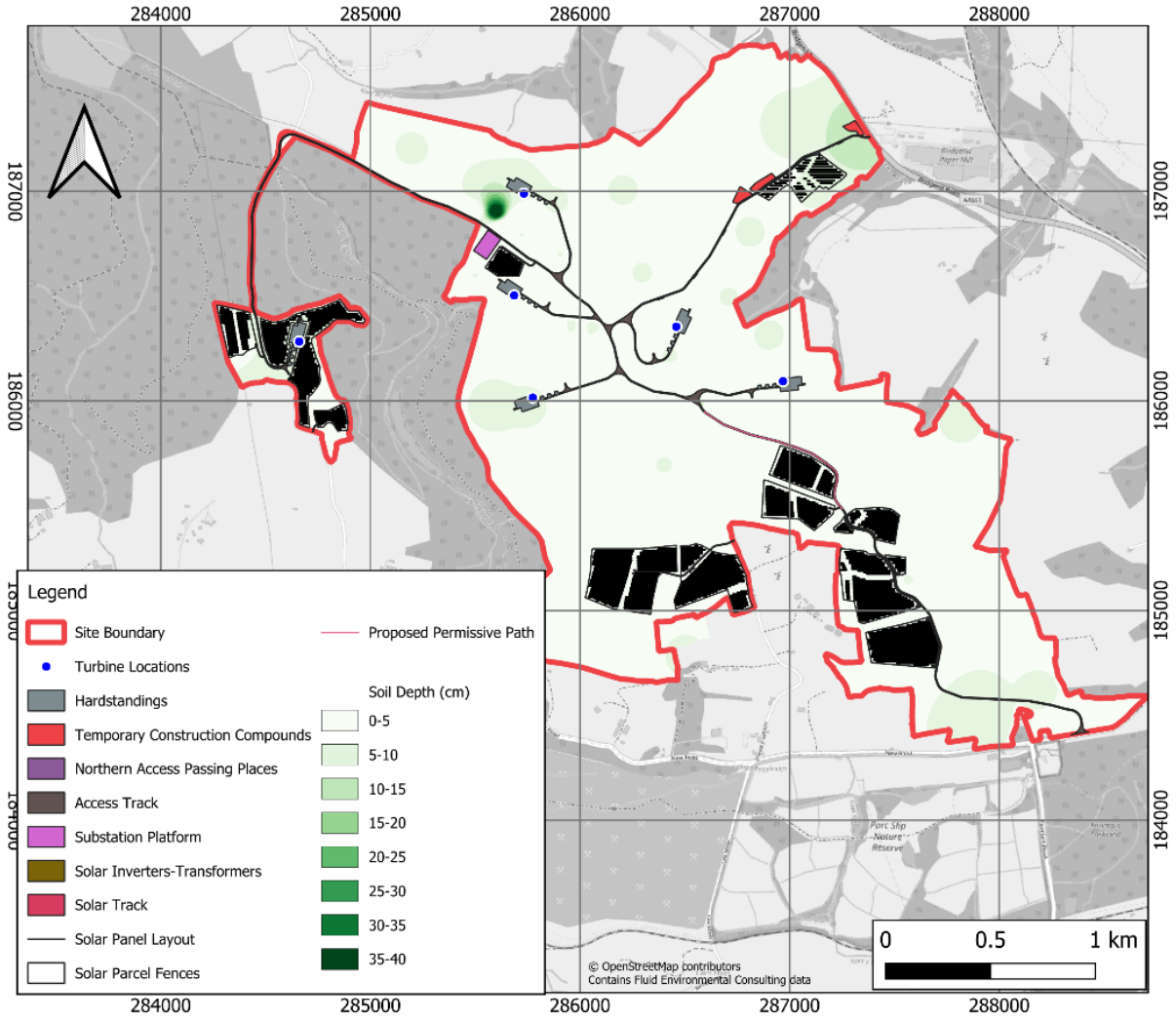
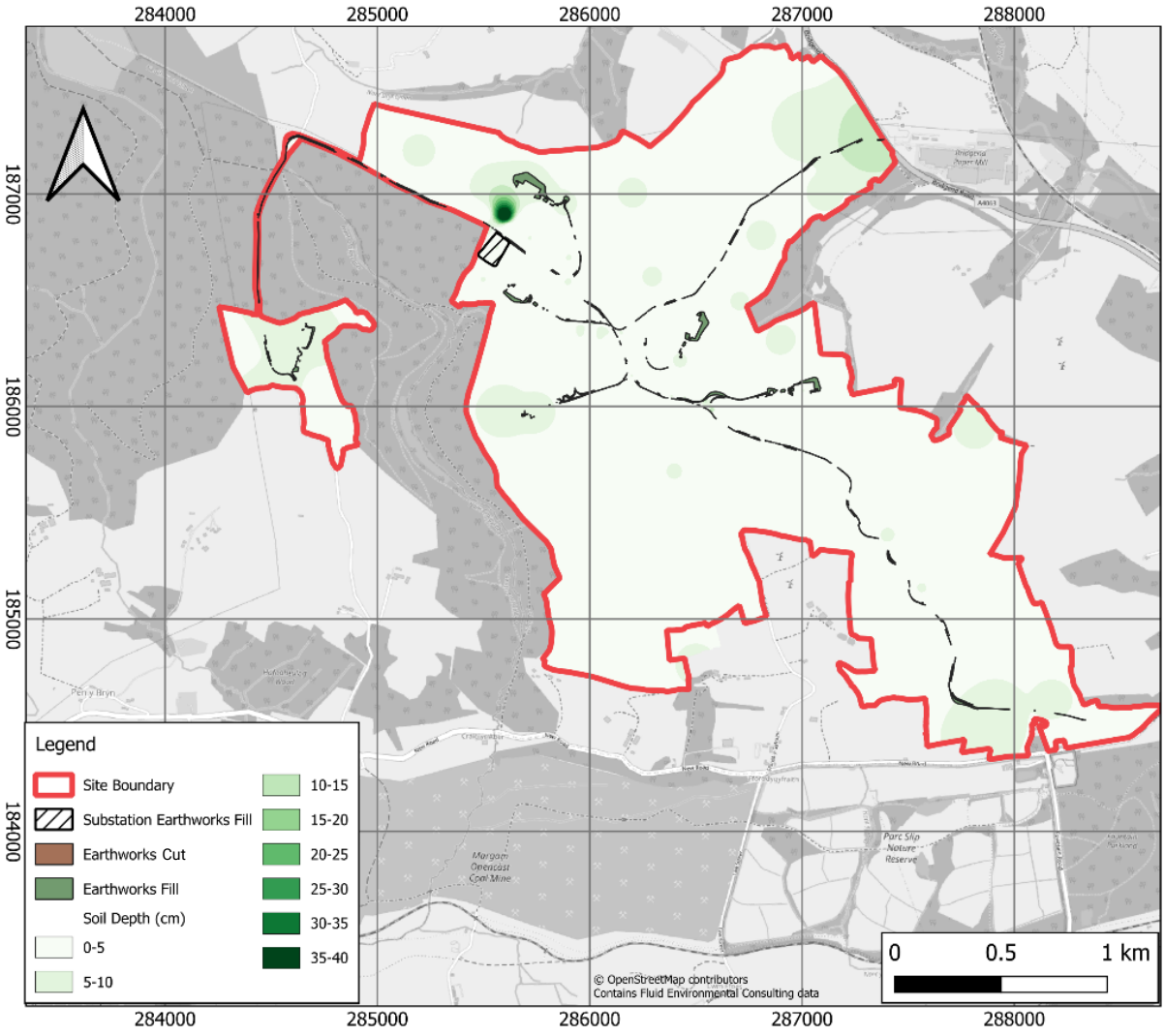


Figure 3-2 Earthworks segments



3.2. Soil volumes and types

The soil volumes calculated for each development segment were taken from areas of each infrastructure segment. These segments were then compared with the soil types and average depths recorded at each of the soil core/ peat probe locations and a soil type assigned to each segment. Where possible, observed soils at soil core locations have been used over estimated soil type recorded at probe locations.

The resultant soil type classification by infrastructure and earthworks segment is illustrated in Figure 3-3.

3.2.1. Soil excavation and re-use volume estimates

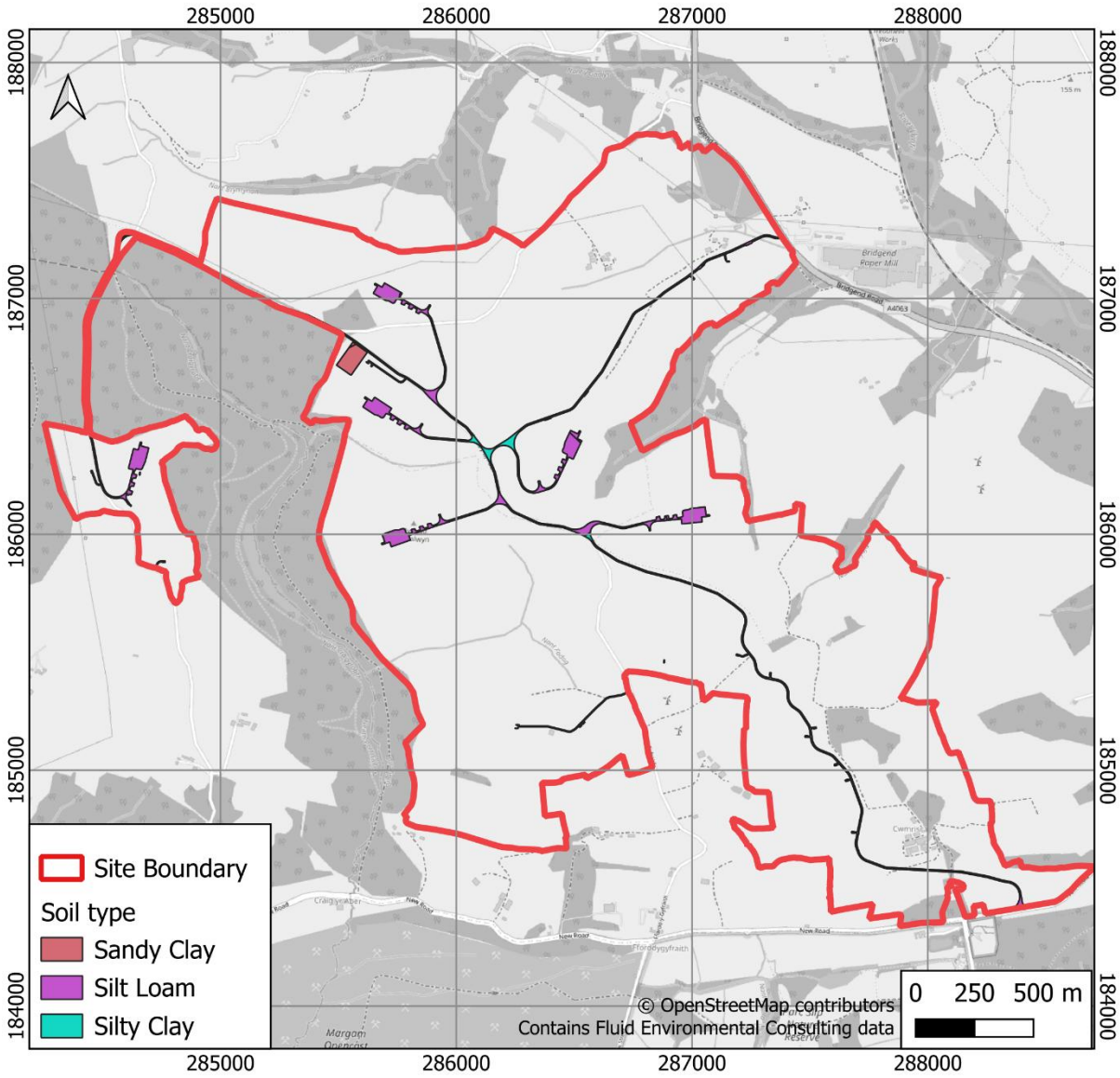
Soil excavation volumes were estimated from the proposed infrastructure designs as well as earthworks cut and fill plans, and the peat and soil depth contour maps. The resulting volumes are presented in Table 3-1 below.

*Table 3-1 Soil strip volumes (m^3) by soil type and infrastructure element**

Soil type	**Earthworks**	**Permanent infrastructure**					
		Substation	Permanent hardstanding	Track	Northern access passing places	Solar track	Inverters - Transformers
Sandy Clay	151	-	-	714	-	84	
Silt Loam	1,223	893	5,487	6,311	69	546	53
Silty Clay	705	-	-	1,202	-		
Sub-total	*2,079*	*893*	*5,487*	*8,227*	*69*	*630*	*53*
Total		*893*	*13,783*			*683*	
Grand total		15,359					

*Solar parcels have not been included in the excavation and re-use estimates as soil stripping is not required in these areas.

Figure 3-3 Soil type by infrastructure



4. Minimising impact on soil during construction

4.1. Assessing soil erodibility

The standard and techniques required to minimise and mitigate impact on soils is dependant to a degree on its erodibility as noted below.

4.1.1. Soils with low erosion risk

These soils are generally more resistant to damage; standard control and management mitigation measures will provide appropriate protection.

4.1.2. Soils with moderate erosion risk

If work is completed when conditions are ideal, standard control and management mitigation measures will provide appropriate protection. However, damage is likely to occur if soils are disturbed in unideal conditions such as when wet. Therefore, more careful consideration of the controls and mitigation implemented would be required.

4.1.3. Soils with high erosion risk

Development of these soils shall be avoided where possible. However, if work is completely necessary, special consideration shall be taken when planning the construction methods and extra mitigations shall be implemented in order to preserve the structure and function of the soils. Several of the turbines are located on steep slopes, special consideration will be given to soils in these areas.

Defra (2015)[9] use the metrics listed in Table 4-1 to define erosion risk:

Table 4-1 Erosion risk (after Defra 2015)

Factor	High risk	Medium risk	Low risk
Slope	Steep slopes >7° (12.3%)	Moderate slopes 3° to 7° (5.25 – 12.3%)	Low risk <3° (5.25%)
Proximity to waterbody	Directly adjacent to waterbody	At least one field between works are and waterbody	Distant from waterbody
Run-off history	Run-off or ponding seen in most years	Runoff seen in some years during wet periods/ most years during very wet periods	Runoff seen in some years during very wet periods

It shall be the responsibility of the Main Contractor to assess the erosion risk of each area of works using the above factors as a guide, as well as professional experience. The steepness of slopes is of particular importance in the protection of soils. The measures implemented by the Main Contractor shall then be designed based upon this assessment of erodibility.

[9] Defra, **2015**, Countryside Stewardship Runoff and soil erosion risk assessment. Countryside Stewardship Runoff and soil erosion risk assessment

4.2. Seasonal working constraints

A seasonal working constraint shall be considered during the preparation of the construction programme, particularly for works involving working with and/ or moving large amount of soils. This restraint may not be project wide as it may not be achievable in reality, but instead must be considered on a case-by-case basis.

The works shall be planned to maximise works when soils are not too wet or saturated wherever possible. The period lending to the driest soil conditions is typically the summer therefore the ideal time to complete operations involving soil handling is between May and September, however this may vary.

If placing the soils in temporary stockpiles, once this is complete, the soil moisture is of lesser importance. However, this is providing rainfall doesn't cause erosion of the soil, reducing the percentage of fines and altering the soil composition. This erosion can also have significant impacts on watercourses due to the influx of sediment.

4.3. Soil conditions

Determining soil conditions accurately allows appropriate practice for soil handling to be determined. Methods for handling of mineral soils (e.g. clayey loam, stony soil) can be broadly split into two based on whether the soil is dry (method 1) or wet (method 2). Ideally all soil handling shall be conducted when the soil is dry to avoid unnecessary compaction and damage to soil structure however, when this is not achievable, method 2 for handling wet soils shall be implemented. For organic rich soils, following of Method 2 is most appropriate if soils must be handled.

Handling soils when wet comes with a higher risk of compaction, damaging the soil structure. When soil is wet it can be more easily compacted by machinery, and if placed in a stockpile, the weight of the soil above can compact the soils at the bottom of the stockpile. Furthermore, if placed in a stockpile when wet, the soil in the centre of the pile will remain wet and thus be very difficult to handle and re-spread. Therefore, soils shall always be handled dry where possible and if soil is wet when stockpiled, a period of drying and reparation will be required to ensure the soil is suitable for reinstatement.

4.3.1. Field testing of soil conditions

The following methodology for assessing the condition of soils is considered adequate to inform which method for handling shall be used. The number of samples tested correlates with the extent of work to be undertaken, for example, a minimum of one sample per 50m of linear features, or a minimum of two samples per Ha for compound and hardstand areas. Each 'sample' shall consist of at least five subsamples, and samples of topsoil and subsoil shall be tested separately. The final chosen method of handling will be based upon at least 80% of samples passing the tests for said method.

Table 4-2 Testing for soil moisture

Test	Method of handling to be used
Soil sample is wet, films of water are visible on the surfaces of grains and aggregates; or Soil sample readily forms a cohesive 'ball' when squeezed.	Method 2 (wet soil)
Soil peds break up/crumble readily when squeezed. Sample does not form a cohesive ball.	Method 1 (dry soil)
Sample is moist and there is a slight dampness when squeezed but it does not significantly darken on further wetting.	If the consistency test for Method 1 (see below) is passed, Method 1 can be used with excavators – not dozers.
Sample is dry and brittle. Sample looks dry and darkens on wetting.	Apply consistency test below.

Table 4-3 Testing for soil consistency

Test	Method of handling soil
Step 1 – Attempt to roll sample into a ball by hand	
It is impossible because the soil is too hard (dry)	Method 1
It is impossible because the soil is too loose (dry)	Method 1
It is impossible because the soil is too loose (wet)	Method 2
It is possible to roll the sample into a ball by hand	See step 2 below
Step 2 – Attempt to roll the ball into a thread of 3mm diameter on a flat non-adhesive surface using light pressure from hand	
It is impossible as the soil crumbles or disintegrates	Method 1
It is possible to roll a 3mm diameter thread	Method 2

4.4. Conditions for ceasing of soil handling activity

Certain weather conditions may lead to the cessation of soil handling to prevent damage. If the following criteria apply, soil handling must cease:

- Heavy rainfall is occurring.
- Sustained rainfall of more than 10mm in 24hours. In this case, soil handling must not be restarted until one full day of drying has been allowed or an agreed soil moisture content has

been met. This soil moisture content will have been advised by or agreed upon by an appropriately qualified soil scientist.
- Immediately following heavy rainfall such that the soil is waterlogged or there are standing pools of water on the soil surface.
- Ground is frozen or covered by snow.

Exceptions:

- If soil stripping is already underway prior to a weather event that requires cessation of activity, the work shall be completed to base level of topsoil/ subsoil in the location before works are suspended.
- If the soil is organic rich, different stop conditions may be put in place.

Before recommencing work, the soil moisture content must be tested by the methods described in Table 4-2 and Table 4-3 above to determine the appropriate soil handling method.

4.5. Minimising the works footprint

Areas where soil is to be removed, stockpile locations and haul routes shall be clearly defined prior to work commencing, and no trafficking of vehicles/ plant shall occur outside of these routes so as to minimise the extent of damage to soils.

Topsoil shall be stripped, stockpiled, handled and placed in the driest conditions possible (still giving consideration to risk of erosion by wind) as follows:

- Tracked vehicles and plants shall be used where possible to reduce compaction extent and intensity;
- No trafficking of plants or vehicles shall occur on reinstated soil;
- In the event that soils are wet or damp when being handled, excavators shall be used instead of dozers; and,
- Daily records of operations undertaken and soil conditions shall be maintained during the period of soil handling.

5. Mitigation

5.1. Soil handling principals

The main issues inhibiting successful restoration of soil resources revolve around incorrect handling and the trafficking of vehicles. The guidelines summarised below, as described in the Construction Code of Practice for the Sustainable Use of Soils on Construction Sites, Defra (2009)[10], shall be adhered to in order to minimise the risk of damage to soil resources during construction.

The delivery mechanism for these mitigation measures will be via the Construction Environment Management Plan (CEMP). In consent conditions, measures included within the CEMP will not also be included in the final Soil Management Plan to avoid duplication and/ or confusion.

5.2. Pre-construction Site preparation

Key tasks for sufficient preparation of a Site prior to construction are as follows:

- Clearance of vegetation. Ensure that removal of vegetation is minimised to working areas and only for works that are essential. In order to minimise the risk of erosion and run-off, vegetation stripping shall be undertaken in segments, with only those areas to be worked on imminently stripped of vegetation. In this manner, vegetation stripping shall be undertaken in a staged sequence as the construction footprint progresses.
- Clear marking of areas where soil is to be removed, stockpiled and placed.
- Key signposting of areas that are to remain undisturbed during construction activities.
- Identification of areas requiring storage of multiple soil horizons and adequate signposting to prevent distinct horizons from mixing.
- Areas designated for stockpiling shall be bare or mown/ strimmed such that surface vegetation is short. This is to reduce the likelihood of anaerobic conditions developing within stockpile.

5.3. Soil stripping technique

Applies to both Method 1 and Method 2 for dry or wet soils.

Soil stripping conducted during construction shall follow the guidance given in Defra's Construction Code of Practice for Sustainable Use of Soils in Construction Sites[11]. The key points to adhere to are as follows:

- Topsoil will be stripped separately prior to stripping the subsoil and progressively down to the base/ formation layer.

[10] Defra, **2009**; 'Construction Code of Practice for the Sustainable Use of Soils on Construction Sites'. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/707134/pb13298-code-of-practice-090910.pd

[11] Defra, **2009**; '*Construction Code of Practice for the Sustainable Use of Soils on Construction Sites*'. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/707134/pb13298-code-of-practice-090910.pd

- A tracked excavator with a toothed-bucket shall be used for stripping in combination with dump trucks to transport stripped soil to stockpiles or area of reinstation.
- Soil is stripped in the driest condition possible.
- Tracked equipment is used wherever possible.
- Topsoil must be stripped from any planned subsoil storage areas prior to the stripping of the subsoil.
- An appropriately sized earthmoving equipment shall be used for different sized work areas to be stripped.

Following this guidance will reduce compaction of soil during stripping and prevent loss of soil structure, maximising its readiness for re-use.

5.4. Stockpiles

Soil stockpiling shall be required during construction to enable storage and re-use of soils whilst limiting the damage caused by weather and construction activities, particularly following the stripping of the borrow pits.

Soils shall be segregated as excavated, such that each soil type present on Site is stockpiled separately (e.g. organic rich soils shall be stockpiled separately to clayey loam). The following provides a list of general principles that shall be adhered to:

- Storage of soils shall be avoided wherever possible, direct movement from donor to receptor location shall be used in the first instance;
- Soil storage periods shall be kept as short as possible through overall good management of the Site;
- Vegetation and other waste materials shall be removed from planned storage areas prior to creating stockpiles;
- In order to protect stockpiles from erosion, they shall be seeded or covered until soil is removed and placed;
- Stockpiles shall be clearly separated based on soil type (i.e. topsoil and subsoil)and origin location, and signposted based on their contents to prevent mixing of soils;
- Stockpiles must not be vulnerable to compaction or erosion;
- Stockpiles must not cause pollution to surrounding watercourses;
- Stockpiles must not increase local flood risk;
- Stockpiles must be clearly marked out and signed;
- Stockpiles shall generally not exceed (in height) 4m for topsoil or 5m for subsoil;
- Ecologically important soils must be stored separately from neighbouring soils.

There are two different methods for stockpiling based on the soil moisture and consistency, these are referred to in previous sections as method 1 and method 2.

Method 1 shall be used when soil is dry and in a non-plastic state. This allows a core of dry soil to be created, and along with appropriate protection of the soil from water during the storage period, this soil can be stored in this way on the scale of years.

Method 2 shall be used when the soil has to be stockpiled when wet and/or plastic in consistency. The aim is to minimise compaction and maximise surface area of the stockpile to allow the soil to dry out. Once the soil has dried, it can be heaped into stockpiles like in Method 1.

5.4.1. Stockpiling Method 1 – Dry or non-plastic soil (e.g. stony soil, dry clayey loam)

Following the stripping of soil and its collection in a dumper truck, the soil is loose tipped in heaps, beginning from the furthest point into a storage area and working backwards towards the access point.

When the storage area has been filled with heaps, a tracked excavator will level the heaps and firm the surface in order for a second layer of heaps to be tipped on top.

This process is repeated until the stockpile reaches its planned height, with uniform gradients and a level surface to encourage water to run-off so that the soil remains dry.

The maximum gradient of a stockpiles sides depends on the texture and moisture content of the soil. The greatest achievable slope is 40 degrees (the natural angle of repose of soil) but to form stable stockpiles, a shallower slope angle is more appropriate. Defra recommends not steepening the slopes of a stockpile beyond 30 degrees in order to reduce the risk of erosion. Any stockpile kept for 3 months or more shall be seeded to reduce runoff, in this case, a maximum side slope of 25 degrees would be considered appropriate to allow maintenance.

5.4.2. Stockpiling Method 2 - Wet or plastic soils (e.g. wet clayey loam, organic rich soils)

Following the stripping of soil and its collection in a dumper truck, the soil shall be tipped in a line of heaps to form a 'windrow' beginning from the furthest point into a storage area and working backwards towards the access point. Additional windrows must be spaced apart such that a tracked plant can pass between them.

These heaps can be built up to a maximum height of 2m. No machinery, tracked or un-tracked, can traverse the windrow in order to prevent compaction. Vehicles must only move between windrows in the allocated spaces.

Once the soil has dried out sufficiently (a process that may require several weeks of dry and windy or warm weather) and has a non-plastic consistency, the windrows can be combined to form larger stockpiles. These larger stockpiles can be formed following the same steps as described for Method 1. To finish, the surface of the stockpile shall then be regraded and compacted to reduce infiltration of rainwater.

5.4.3. Protection and maintenance of stockpiles

Following the completion of the stockpile, the area shall be cordoned off and clearly signposted to prevent disturbance or contamination from other construction activities. The locations of each stockpile, approximate volumes and type of soil stored will be recorded on a Site plan.

It is anticipated that stockpiles shall fall into three broad categories, with each category being split into different stockpiles by soil type:

5.4.3.1. Short term earthworks batter stockpiles:

Where possible, the need to stockpile soils arising from earthworks batter areas shall be minimised by the synchronising of stripping (from newly excavated areas to start excavation of batters) and placement (in areas where the earthworks batter has been formed). Where physical or programme constraints prevent this, short-term stockpiles shall be required local to the excavation and re-use areas. Soils stockpiled in these areas are anticipated to remain in piles for less than 3 months.

5.4.3.2. Medium term temporary infrastructure areas

The nature of the construction method is such that there will be areas of the development footprint that require stripping of soils for the duration of the construction period in that particular area. Examples include the works compound and the temporary crane hardstands and lay-down areas at each turbine. In these areas, soils will need to be stockpile for longer periods, likely to be in excess of 6 months.

5.4.3.3. Long term stockpiling as resource for decommissioning

The soil stripped from the permanent track, turbine hardstand and substation footprints shall need to be stockpiled for the duration of the operational phase of the development, in order that it is available as a resource to enable re-soiling during decommissioning if required. These soils will be placed on the earthworks batters surrounding each infrastructure aspect, by locally thickening the soil profile in these areas. This will maintain the seedbank and soil type local to its origin. It will also minimise earth movements during both construction and decommissioning phases.

5.4.3.4. Stockpiling protection

If stockpiles are to be stored for more than 6 months, the surface of the stockpile shall be seeded with a seed mix that matches the surrounding habitat. This is to minimise soil erosion, protect nutrient loss, maintain biological activity and reduce infestation of weeds or locally invasive species that could spread onto adjacent land. If seeding is to take place during a period of dry weather, the stockpiles shall be sprayed down with water in order to prevent wind erosion and aid the establishment of the seeds.

With the exception of that necessary to control invasive non-native species (INNS) under an appropriate INNS working method statement, use of herbicides shall be avoided to reduce potential impacts on local biodiversity.

5.5. Reinstatement of soil

The general aim is for most soil disturbed in the construction process to be reinstated to its original quality and land-use. This can primarily be achieved by ensuring the soil is structured, uncompacted, well aerated and reinstated in the correct sequence of horizons. The potential end quality of the soil depends upon how well its structure is restored during placement; the following 'loose tipping' method described below is the most appropriate to use.

- Subsoil shall be decompacted prior to the placement of topsoil;
- The physical condition of the soil shall be assessed when placed to ensure the entire soil profile will promote sufficient aeration, drainage and growth;
- Anaerobic topsoil shall be fully aerated before commencing with any planting or seeding;
- Following construction and disturbance of soils, the soil health shall be closely monitored in a period of aftercare, with deficiencies being corrected as soon as they are detected.

5.5.1. Loose tipping method

When soil is not to be stored and moved directly to receiving area, an excavator with toothed bucket shall be used to load the soil materials onto a dump truck to the be transported. If soils are being stored in stockpiles, the dump track will enter the storage area by travelling on the base layer/subsoil. The toothed excavator may stand on top of the stockpile to load the dump truck, the stockpile will be dug to the base before moving back along its length.

The receiving subsoil or base layer shall first be decompacted and loosened, the recommendation is that this is achieved with winged subsoiler tines. This decompacting will only be effective if it is conducted when the moisture content of the soil is below the lower plastic limit so the soil will shatter and create fissures. This will reduce flood risk and promote deep root growth within the soil.

The dump truck carrying the soils will then be used to discharge the soils onto the decompacted receiving ground. An excavator, standing next to the dropped soil, will spread it out to the required thickness. If there are multiple horizons to be restored, the entire strip will be reinstated with subsoil before moving reinstating with topsoil by repetition of the process. The topsoil must be placed on the subsoil without the excavator tracking along the reinstated subsoil layer.

The quality of soil being reinstated will need to be verified by an appropriately qualified soil scientist. The quality required will depend on the land-use of the reinstated soil. This will be determined by carrying out a soil survey to record the physical characteristics of the reinstated soils and compare them against the pre -construction condition. If conditions vary greatly from the pre-construction conditions, remediation may need to be carried out in order to reach the reinstatement standard and commence to the aftercare period.

5.5.2. Reinstatement of Topsoil

The thickness of topsoil placement will depend on the pre-construction conditions and volume of topsoil retrieved for reinstatement in a certain location. Topsoil does not perform well below a depth of 400mm below ground level (m bgl), soil thicknesses nearing this depth will only likely be required if the desired result involves bushes and trees with great rooting depths.

If topsoil has been stored in a stockpile it is likely compacted and anaerobic, thus appropriate tillage equipment will need to be used in order to decompact and re-aerate the soil when reinstating.

5.6. Aftercare

5.6.1. General aftercare

Structurally weak soils may settle and self-compact following placement, resulting in waterlogging and anaerobic conditions in the soil. This will impact plant growth and contribute to erosion and flooding, therefore maintaining soil permeability is a vital part of aftercare.

Maintenance shall include monitoring of soil to identify any unsatisfactory conditions, which shall be achieved by taking augers of representative locations across the Site 2-3 times a year. This shall begin more frequently, particularly the first few weeks following reinstatement, and then decline to a few times per year.

The requirement for additional aftercare interventions shall be assessed by the Main Contractor. Such interventions may include cultivation (subsoiling etc.), underdrainage installation or blocking of preferential drainage pathways or seeding. These remediation treatments will depend on the habitat that is to be achieved following reinstatement.

Defra guidance suggests aftercare between 1 and 5 years after construction. The aftercare period for the Proposed Development will be for the lifetime and duration of the scheme, hence significantly exceeding these guidelines.

Annex A Report conditions

Report Conditions

This report has been prepared by Aqua Terra Consultants Ltd. (Aqua Terra) in its professional capacity as soil specialists, with reasonable skill, care and diligence within the agreed scope and terms of contract and taking account of the manpower and resources devoted to it by agreement with its client and is provided by Aqua Terra solely for the internal use of its client.

The advice and opinions in this report should be read and relied on only in the context of the report, taking account of the terms of reference agreed with the client. The findings are based on the information made available to Aqua Terra at the date of the report (and will have been assumed to be correct) and on current UK standards, codes, technology, and practices as at that time. They do not purport to include any manner of legal advice or opinion. New information or changes in conditions and regulatory requirements may occur in future, which will change the conclusions presented here.

Where necessary and appropriate, the report represents and relies on published information from third party, publicly and commercially available sources which is used in good faith of its accuracy and efficacy. Aqua Terra cannot accept responsibility for the work of others.

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