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CONVATEC LIMITED

PEP WIND AND SOLAR DEVELOPMENT

OUTLINE SOIL MANAGEMENT PLAN

JANUARY 2024

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CONVATEC LIMITED

PEP WIND AND SOLAR DEVELOPMENT

OUTLINE SOIL MANAGEMENT PLAN

JANUARY 2024

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1 INTRODUCTION

1.1 Background

1.1.1 Wardell Armstrong LLP (WA) has been commissioned by Convatec Limited to produce this Outline Soil Management Plan (OSMP) for the proposed development on land located to the west of the Heads of the Valleys Industrial Estate (grid reference: SO101 082), Rhymney, Tredegar (hereafter referred to as 'the Site').

1.1.2 This OSMP is informed by the Peat and Soil Technical Note produced by Wardell Armstrong in January 2024 for the peat and soil survey (Appendix 1). It provides a description of the peat and soil resources within the Site which has been used to determine the best practice measures and processes required to safeguard the soil and land resources from loss, damage, or disruption as a result of the proposed development.

1.1.3 With the use of a finalised site design and construction programme, along with the soil and peat survey, an audit of soil resources can be completed. This OSMP, in addition to the audit of soil resources, will be required before a Soil Resource Plan (SRP) for the Site can be produced. Therefore, this report does not include an SRP for the Site.

1.1.4 An SRP will identify areas of soil to be protected from earthworks and construction activities, the areas and types of topsoil and subsoil to be stripped, the location of haul routes and stockpiles, and the methods for stripping, stockpiling respreading and ameliorating landscape soils.

1.1.5 The Site comprises a c. 26 hectare (ha) parcel of agricultural land. The extent of the Site is shown in Plate 1 below.

Plate 1: Site boundary (basemap © Google Satellite)

1.2 Summary of Works to be Undertaken

1.2.1 This OSMP is informed by the proposed works set out in the Project Description chapter of the EIA prepared by Wardell Armstrong in January 2024. The proposed development will comprise of the following elements:

- Three wind turbines of approximately 150 m tip height, each with external transformers, foundations, 40 m x 30 m crane hardstanding areas, and storage areas
- Ground mounted solar photovoltaic panels
- Electrical substation and control building
- Creation of approximately 1,200 m of permanent access tracks on-site for construction and maintenance.
- Underground power cables linking the turbines and solar array to the onsite substation and Convatec's manufacturing facility in the Heads of the Valleys Industrial Estate
- Steel tower anemometer mast for monitoring wind speeds and turbine performance
- Temporary construction and storage compound. The area will make use of an existing area of hardstanding and therefore its construction will not require soil stripping or storing.

1.2.2 A detailed construction programme and methods will be developed by the contractor appointed to design and construct the works, and an indicative programme is provided in the Project Description.

1.2.3 The main workings involving soil disturbance during the construction period are listed below:

- Access tracks – Construction of access tracks will involve soil stripping down to a firm base along the access track before surfacing with locally sourced crushed aggregate. Stored topsoil will be used to create a soil profile to allow the establishment of vegetation on the landscaped verges.
- Wind turbines – Each wind turbine will be supported by circular reinforced concrete foundations up to 20 m in diameter and an overall depth of approximately 3-4 m. Construction will involve excavating topsoil and subsoil which will be separately stockpiled for backfilling above the concrete base.
- Turbine hardstanding areas – These areas will be dug into the slope adjacent to the turbine foundations for crane operation. Topsoil and subsoil excavated during construction will be stored separately and used to create a soil profile to allow the establishment of grassland following construction, leaving the hardstanding area in situ under the reinstated ground level.
- Solar PV panels – The panels will be mounted on a frame piled into the ground to a depth of no greater than 1.8 m. The movement of plant during installation poses a compaction risk to the soil resource.
- Electric cabling – Cabling connecting the turbines and solar array to the control building and substation will be laid in trenches running alongside the access tracks. Trenches will be excavated and backfilled by a tracked excavator.
- Substation – The electrical components will be installed on small concrete pads with the rest of the site covered with stone chippings. This will require stripping of topsoil and stockpiling for reuse on other parts of the site.
- Transformers – These are designed to be deployed without the need for additional foundations other than a gravel base. Topsoil will need to be stripped from the transformer footprint and stored for reuse on other parts of the site.

1.3 Baseline Conditions

1.3.1 Soil Survey of England and Wales[1] soil association mapping indicates that the Site is composed of disturbed soils due to historic opencast coal mining (soil association 92c), with soils of the Wilcocks 1 (721c) association also found within the wider area.

1.3.2 The Predictive ALC Map of Wales[2] indicates the Site occurs in an area of Grade 5 agricultural land. Based on current Welsh Government guidance, a detailed ALC survey

[1] Soil Survey of England and Wales (1984) Soils and their Use in Wales, with accompanying 1: 250,000 map (Sheet 2). Not available online.

[2] Welsh Government (2019) Predictive Agricultural Land Classification (ALC) Map 2. Available online: https://datamap.gov.wales/layers/inspire-wg:wg_predictive_alc2 [Accessed 22 January 2024]

is not required and the predictive Grade 5 (very poor-quality agricultural land) can be taken as the best available information.

1.3.3 Whilst an ALC survey was not required, a peat and soil survey was conducted in January 2024 with two objectives. Firstly, to identify and map the presence of any areas of peat within the site. Secondly, to provide information on properties which influence the soil resource's susceptibility to structural damage or loss during construction.

1.3.4 The survey provides a baseline for the peat and soil resources within the Site. Survey data presented in a Peat and Soil Technical Note (Appendix 13.1) are summarised below.

Soil Physical Characteristics

1.3.5 No peat was found within the Site.

1.3.6 The site was characterised by a dark grey (10YR 4/1), dark greyish brown (10YR 4/2) or very dark greyish brown (10YR 3/1) topsoil.

1.3.7 Topsoil depth was shallow (~ 15 cm) throughout the site, particularly on the steeper slopes and the higher ground in the western part of the Site.

1.3.8 The topsoils textures are heavy textured clay loams to silty clays. The organic matter content ranged from 8.3 in Area 1 to 17.2 in Area 6 (Table 1 in Appendix 13.1). Soil texture, that is the relative proportions of sand, silt, clay, and organic matter content are important determinants of a soil's susceptibility to compaction and erosion during construction. The heavy textured topsoils on the Site are less prone to water erosion, but care is required when handling to avoid compaction.

1.3.9 Below the topsoil was a layer of a dark, coarse substrate likely to be coal mining spoil. This was found consistently throughout the site apart from one point (Area 6, point 6) where a clay subsoil was recorded.

Soil Chemical Characteristics

1.3.10 Topsoil samples were analysed for three key plant available nutrients in the topsoil. Plant available potassium (K) levels in all samples were Low (ADAS index 1) to Moderate (ADAS index 2). The levels of plant available phosphorus (P) are Very Low (ADAS index 0) to Low (ADAS index 1), with the exception of Area 2 which had Moderate levels (ADAS index 2). The topsoils throughout the site are Very High in Magnesium (Mg) (ADAS index 5 to 6).

1.3.11 The organic matter content of the topsoil ranged from 8.3% to 17.2% with an average of 12.5%. All topsoil samples were within the range defined as organic-mineral soils in Hodgson (2022)[3].

1.3.12 Topsoil pH on site was low, averaging 5.6 and ranging from 5.4 to 5.8.

Table 1: Chemical Characteristics of Topsoil within the Site

Characteristic	Units	Average	Min	Max
Topsoil				
P	mg/l	12.2	7.8	23.6
K	mg/l	177.7	103.0	224.0
Mg	mg/l	355.2	273.0	417.0
pH	-	5.6	5.4	5.8
OM (Loss on Ignition)	% (w/w)	12.5	8.3	17.2

2 GUIDANCE ON SOIL MANAGEMENT

2.1 Introduction

2.1.1 To ensure the sustainable use of the soil resource on the Site, soil management and handling activities should be informed by the following documents:

- British Society of Soil Science (2022) Working with Soil Guidance Note 3 on 'Benefitting from Soil Management in Development and Construction'[4]
- DEFRA (2009) Code of Practice for the Sustainable Use of Soils on Construction Sites[5]
- DEFRA (2011) Safeguarding Our Soils – A strategy for England[6]
- MAFF (2000) Good Practice Guide for Handling Soils[7]
- Institute of Quarrying (2021) Good Practice Guide for Handling Soils in Mineral

[3] Hodgson (2022) *Soil Survey Field Handbook (4th Edition)*. Soil Survey Technical Monograph No. 5, Cranfield.
[4] British Society of Soil Science (2022). Working with Soil Guidance Note 3 '*Benefitting from Soil Management in Development and Construction*'. Available at: https://soils.org.uk/wp-content/uploads/2022/02/WWS3-Benefitting-from-Soil-Management-in-Development-and-Construction-Jan-2022.pdf. Accessed October 2023
[5] DEFRA (2009) Code of Practice for the Sustainable Use of Soils on Construction Sites. Available at: https://www.gov.uk/government/publications/code-of-practice-for-the-sustainable-use-of-soils-on-construction-sites. Accessed October 2023.
[6] DEFRA (2011) Safeguarding Our Soils – A strategy for England. Available at: https://www.gov.uk/government/publications/safeguarding-our-soils-a-strategy-for-england. Accessed October 2023.
[7] MAFF (2000) Good Practice Guide for Handling Soils (version 04/00). FRCA, Cambridge.

Workings[8]

- Institute of Environmental Management and Assessment (2022). A New Perspective on Land and Soil in Environmental Impact Assessment[9]

2.2 DEFRA (2009) Code of Practice for the Sustainable Use of Soils on Construction Sites

2.2.1 DEFRA's 2009 guidance relates to construction sites and contains good practice guidance on the handling and storage of soil resources to ensure they are managed sustainably. The 2009 DEFRA guidance outlines the potential impacts on soils that may result from construction activities.

2.3 MAFF (2000) Good Practice Guide for Handling Soils

2.3.1 The MAFF (2000) guidance provides advice on good practice soil handling methods. The guide is in the form of 19 Sheets which detail a range of methods for stripping, stockpiling, handling, excavating, replacing, and decompacting soils.

2.4 Institute of Quarrying (2021) Good Practice Guide for Handling Soils in Mineral Workings

2.4.1 The aim of the Institute of Quarrying's (IQ) 2021 guidance 'Good Practice Guide for Handling Soil in Mineral Workings' is to provide good practice advice and ensures that impacts on the soil resources and soil functions are minimised and enhanced wherever possible.

2.4.2 The IQ guidance provided is intended for the minerals sector and thus is not directly transferrable to this particular project. However, the document includes a test for the field assessment of soil moisture content and plasticity (summarised in Tables 3 and 4) which is an important issue relevant to all projects involving soil handling. Incorporating this test into planned works helps ensure that work is not carried out on soils that are not in an appropriate condition for handling.

2.5 Institute of Environmental Management and Assessment (2022). A New Perspective on Land and Soil in Environmental Impact Assessment

2.5.1 The Institute of Environmental Management and Assessment (IEMA) issued their guidance document 'A New Perspective on Land and Soil in Environmental Impact

[8] Institute of Quarrying (2021) Good Practice Guide for Handling Soils in Mineral Workings. Available at: https://www.quarrying.org/soils-guidance Accessed October 2023.

[9] Institute of Environmental Management & Assessment (IEMA) (2022). A New Perspective on Land and Soil in Environmental Impact Assessment. Available to access through: https://www.iema.net/resources/blog/2022/02/17/launch-of-new-eia-guidance-on-land-and-soils.

Assessment' on 17 February 2022. Chapter 11 of this guidance document sets out priorities and processes needed to ensure that construction operations are well managed so that land and soil are protected and managed sustainably and includes guidance on the onsite and offsite reuse of soil.

3 SOIL BALANCE AND REUSE ON SITE

3.1 Background

3.1.1 For the proposed development, the majority of the soils will be retained onsite. Where not directly reinstated to their final destination, any stripped soils should be stored appropriately onsite.

3.1.2 Areas where stripping of topsoil and subsoil will be required are limited to the wind turbine foundation and hardstanding areas, access tracks, and the substation and transformer areas.

3.2 Soil Volume Balance

3.2.1 A soil balance identifies if there is any surplus or deficit of soil within the current site plan and includes the total quantities of topsoil and subsoil. Where possible, all soil resources (topsoil and subsoil) should be retained on site for reuse. This will often save money and time in having to source soil elsewhere or pay for disposal off site (which requires an environmental permit).

3.2.2 A soil volume balance can be provided from an audit of soil resources and detailed within the SRP.

3.2.3 The priority will be to ensure that surplus topsoil and subsoil will be retained on site for use in any planned restoration. It is expected that, where possible, any soil not required for restoration will be reused for purposes such as reprofiling areas and landscaping.

3.2.4 The destination of surplus soils needs to be confirmed and specified prior to work commencement.

3.2.5 The 2022 IEMA guidance outlines that if natural and uncontaminated surplus soil resource is identified, "sustainable off-site uses for the soil" should be identified. Any soils to be transported off Site will need specification for its reuse and thus testing prior to export to avoid mixing of soil.

3.3 Soil Storage Locations

3.3.1 Appropriate soil storage locations should be identified prior to stripping which ensure that soil handling and movement is kept to a minimum. Ideally soils should be moved directly from the donor site to the receptor site.

3.3.2 The location of soil storage should consider the length of time the soils are expected to be stockpiled, ensuring they will not have to be moved or disturbed to support later stages of the development.

3.3.3 Soils stored in stockpiles for more than six months should be seeded with an appropriate low maintenance grass/clover mixture. This will reduce soil erosion and prevent colonisation of stockpiles by weeds and promote soil health.

3.3.4 Topsoils may be stored on top of topsoil or subsoil. Subsoils may only be stored on top of subsoils.

3.3.5 The 2022 IEMA guidance states that a detailed operational site plan should be created that "should show soil stripping, storage, and reinstatement areas, together with haulage routes".

3.4 Soil Handling and Storage Monitoring Protocol

3.4.1 Table 2 summarises the need for record keeping and monitoring by site contractors and a Soil Scientist during the construction phase. Records should be kept for reference and auditing purposes.

Table 2: Record keeping and monitoring during the construction phase

Item	What to look for	Responsibility	Frequency
Soil Stockpiles	Erosion rills, water ponding, loss of protective cover.	Contractor	Once a month and after rainfall exceeding 10 mm in 24 h.
Soil handling	Conformance with the Soil Resource Plan (SRP), record operations undertaken, weather and soil conditions, any problems and corrective actions undertaken.	Contractor	Daily when operations including or impacting soils are undertaken.
	Conformance with the SRP, check daily record.	Contractor	
Ongoing monitoring of SMP implementation	Verification of soil works on site and soil stockpiles to measures outlined in SRP.	Soil Scientist	At key stages of site works, approximately monthly.
Verification of the restoration standard	Has the soil profile been restored as much as practicable to do so?	Soil Scientist	Once, after reinstatement, re-inspected after remediation (if applicable).

Aftercare reports	Significant differences in plant performance, compaction and waterlogging between the restored and undisturbed land.	Soil Scientist	Annually until unrestricted.

3.5 Site-specific Measures

3.5.1 Where soils are excavated, they should be separated into topsoil and subsoil and these must be stored separately to avoid the loss of soil resources through mixing. The underlying coal mining spoil should also be stored separately if excavated.

3.5.2 Dependant on the depth of the excavations, there will be a volume of topsoil available for reuse. It is recommended that topsoil is replaced to a depth no greater than 300 mm, unless a specific plan is proposed that ensures that the proposed end usage is suitable.

3.5.3 It is recommended that construction takes place in the drier summer months, particularly with the heavy textured soils present on site. If construction is to be undertaken when the ground is moist to wet and close to field capacity, ground preparations for machinery will be vitally important. It is recommended that all plant used be equipped with low ground pressure tires or tracks and traffic be limited to dedicated haul roads.

3.5.4 Due to the steep gradients on part of the site, the land management strategy for the site during the operational phase should ensure that an active vegetation cover is maintained to reduce the risk of soil erosion, as well as to protect and promote soil quality. The ground should be seeded post-construction. If any adverse damage is done to the soils during construction, this should be ameliorated prior to seeding.

4 GENERAL PRINCIPLES OF SOIL HANDLING

4.1.1 The main threats to soil resources on construction sites are trafficking of vehicles/plant and incorrect handling, which will cause damage to soil structure through compaction and smearing (both effects are sometimes referred to as deformation). These effects compromise the ability of the soil to perform its functions, such as providing adequate amounts of water, air, and nutrients to plant roots, and thus its suitability for reuse within the site without costly and time-consuming remediation.

4.1.2 The risk of compaction and smearing increases with soil wetness. To minimise the risk of damage to soil structure, the following rules must be observed during all soil handling tasks:

- No trafficking/driving of vehicles/plant or materials storage to occur outside designated areas.
- No trafficking/driving of vehicles/plant on reinstated soil (topsoil or subsoil).
- Only direct movement of soil from donor to receptor areas (no triple handling and/or ad hoc storage).
- No soil handling to be carried out when the soil moisture content is above the lower plastic limit (where the soil is plastic, see Tables 3 and 4 below).
- Soil handling must take account of prevailing weather conditions (see rainfall "stop" criteria in Section 5.1).
- No mixing of topsoil with subsoil, soil resources from different units (soil types), or mixing of soil with other materials, e.g. the underlying coal mining spoil found on Site.
- Soil should only be stored in designated soil storage areas.
- Plant and machinery only work when ground or soil surface conditions enable their maximum operating efficiency.
- All plant and machinery must always be maintained in a safe and efficient working condition.
- Daily records of operations should be kept, and site and soil conditions should be maintained (see Section **Error! Reference source not found.**.4 for the summary of monitoring and record keeping schedule).

4.1.3 Low ground pressure (LGP) models or tracked vehicles should be used. This will greatly minimise the extent of compaction and/or intensity of the soil loosening required during site restoration. Consequently, it will reduce the costs and potential delays due to the need for additional soil cultivation.

4.1.4 The separately identifiable topsoils and subsoils encountered (and stripped for storage) are to be stored separately in stockpiles. Soils must be kept free of contamination.

5 STOP CONDITIONS

5.1 Adverse Weather

5.1.1 In certain weather conditions, the handling of topsoil must be effectively managed to prevent damage. The following criteria must be applied during operation to determine if conditions are suitable for topsoil and subsoil handling:

- In drizzle and/or intermittent light rain, handling can continue for up to four hours or until the soils enter a plastic state at which point operation must cease (see Tables 3 and 4, testing for soil moisture state and plasticity)
- If there is heavy rain (e.g. heavy showers, slow moving depressions), handling must stop immediately;
- If there is sustained heavy rainfall of more than 10 mm in 24 hours, soil handling must be suspended and not restarted until the ground has had at least a full day to dry, or an agreed soil moisture limit can be met;
- Soil shall not be handled or trafficked over/driven on immediately after heavy rainfall (or snow/hail) in a waterlogged condition, or when there are standing pools of water on the soil surface; and

5.1.2 If the works are interrupted by a rainfall event, soil stripping should be suspended, and where the soil profile has already been disturbed, the works should be completed to the base level in that location.

5.1.3 Before recommencing work, soil moisture content must be tested, as described in Table 3 and Table 4. Work can only recommence if the soil moisture is below the lower plastic limit. The weather forecast must also be checked and works only recommenced if there is no rain forecast for at least a day, regardless of soil moisture condition.

5.1.4 Additionally, soil should not be handled or trafficked over/driven on when the ground is frozen or covered by snow.

5.1.5 The above criteria should be clearly understood by all personnel.

5.2 Soil Conditions

5.2.1 Irrespective of the weather, soils should not be handled when in a plastic state (when moisture content exceeds their lower plastic limit), and as a rule, they should be dry when handled. The methodology for determining whether soils have a suitable moisture content for handling is described below in Tables 3 and 4.

5.2.2 A project-wide seasonal constraint to the construction programme is not recommended as this may not be achievable in practice. However, the shallow heavy clay loam and silty clay topsoils identified in the Peat and Soil Technical Note and described in Section 1.3 mean that soil handling should ideally be restricted to the drier periods of the year.

5.2.3 If the soil is excavated and placed in stockpiles when wet (above the plastic limit), they can be over-compacted by the machinery handling them, or by the weight of the soil above them in the stockpile. As well as this structural damage, compacting soils within a stockpile leads to the core of the stockpile remaining anaerobic throughout the storage period. This results in the soil being difficult to handle and re-spread at the time of reinstatement (i.e. it will not be in a friable state and will not break down into a suitable tilth). If compaction during storage does occur, a period of drying and appropriate cultivation is required (to repair soil structure and re-aerate the soil) to ensure the soil is acceptable for planting. The costs of these unplanned operations, and consequent delays to the programme of works could be substantially greater than the costs of ensuring that the soil stripping and stockpiling operations are carried out in optimum conditions and making allowances for delays due to bad weather.

5.2.4 Stockpiles should be monitored to ensure there are no environmental impacts, such as erosion and discharges of sediment laden water from the stockpiles to drainage ditches and other watercourses.

5.3 Field Testing of Soil Conditions

5.3.1 The following sections detail a two-stage methodology for the field assessment of soil plasticity and suitability for handling. The method is comprised of a moisture state test and a consistency test and has been recognised by Natural England as an acceptable and valid approach as it is considered to be less open to interpretation and easier to conduct than use of consistency testing (Table 4) alone.

5.3.2 At least five points per area to be worked on a given day should be sampled (a minimum of 1 point per 50 m of the length of the working area, or 2 samples per ha). The sample should be a composite of at least five subsamples from around each sample point. Samples of both topsoil and subsoil should be taken and sampled separately.

Soil moisture state

5.3.3 The samples should first be tested for soil moisture state, see methodology in Table

3.

Table 3: Testing for moisture state	
Test	**Handling Allowed?**
If soil sample is wet, films of water are visible on the surfaces of grains and aggregates; or If soil sample readily deforms into a cohesive 'ball' when squeezed.	Soils should not be handled.
Soil peds break up/crumble readily when squeezed in the hand. Sample does not form a cohesive ball.	Soils can be handled
If the sample is moist, i.e. there is a slight dampness when squeezed between the fingers, but it does not significantly change colour (darken) on further wetting.	No handling by dozers but may be handled by excavators if the consistency test is passed.
Sample is dry and brittle. Sample looks dry and changes colour (darkens) on wetting.	Soils can be handled if the consistency test is passed.

Consistency

5.3.4 Where required as per Table 3, samples should be further tested for consistency (see methodology in Table 4.

Table 4: Consistency testing		
STEP A		
Attempt to roll sample into a ball by hand	It is impossible because the soil is too hard (dry)	Soils can be handled
	It is impossible because the soil is too loose (dry)	Soils can be handled
	It is impossible because the soil is too loose (wet)	Soils should not be handled
	It is possible to roll the sample into a ball by hand	See STEP B
STEP B		
Attempt to roll the ball into a thread of 3 mm diameter on a flat non-adhesive surface using light pressure from the flat of a hand	It is impossible as the soil crumbles or disintegrates	Soils can be handled
	It is possible to roll a 3 mm diameter thread	Soils should not be handled

5.3.5 The final decision on whether soil handling can commence will be made based upon at least 80% of samples passing the specific criteria set out in Tables 3 and 4. The above criteria should be clearly understood by all personnel.

6 SITE-SPECIFIC SOIL MANAGEMENT METHODOLOGY

6.1 Site Preparation

6.1.1 Marking and signposting of the undisturbed areas (where no construction activities or vehicle trafficking over/driving on occurs) is required and should be detailed in the Contractor method statements (to be prepared by the Contractor). Any trees, hedgerows or valuable habitats which are to be retained should be marked out with barrier tape; and subsequently protected and managed.

6.1.2 Any underground services crossing the area of soil stripping are to be surveyed and their depth and position are to be clearly marked to ensure they are not impacted by the stripping works. After stripping, to ensure the integrity of service infrastructure is maintained, the service location may require fencing off, or if the area over services are to be trafficked, additional protection or mitigation may be required.

6.1.3 To reduce the likelihood of anaerobic conditions developing within the topsoil stockpile, prior to commencement of soil stripping, the topsoil surface should either be bare, under stubble, or have only short surface vegetation. To achieve short surface vegetation, the area should be mown or trimmed, where required. Cuttings should be disposed of off-site to a suitably licenced facility with reuse and recycling favoured over disposal (e.g., recycling via a local composting facility). Cuttings must not be added to or mixed with the stripped soil, as the presence of excessive amounts of plant material in the stockpile will be detrimental to its quality due to its decomposition (rotting) in anaerobic conditions. Alternatively, the vegetation may be killed off by application of an approved and suitable non-residual herbicide no less than two weeks prior to commencement of soil stripping operations at the location.

6.2 Soil Stripping

6.2.1 Topsoil can be stored on either topsoil (of the same type) or on subsoil. Subsoil can ONLY be stored on subsoil, therefore, the topsoil must be stripped from subsoil storage areas in advance of subsoil stripping.

6.2.2 The stripping method should follow one of the appropriate methods described in the MAFF ‘Good Practice Guide for Handling Soils’. Reference should also be made to DEFRA’s ‘Code of Practice for the Sustainable Use of Soils on Construction Sites’ and Annex F ‘Soil Handling for Restoration to Agriculture, Ecology and Land Design’ of the 2022 IEMA guidance.

6.2.3 The Defra guidance state that the preferred method is to use excavators to strip

topsoil and subsequently subsoil in parallel strips, often called the "bed" or "strip" method. Similarly, IEMA state that it is good practice to use excavators for stripping of topsoils and subsoil and that the method of using bulldozers to strip soil, while being a 'quicker and cheaper method', causes more damage to soil resource even under appropriate weather conditions.

6.2.4 The excavator bed/strip method is described in Sheet 1 of the MAFF (2000) guidance and is illustrated in Figures 1 and 2, below. It uses an excavator fitted with a toothed bucket to remove the topsoil from a strip of land the width of the excavator's reach minus the stand-off to operate, typically 3 to 4 m. The stripped soil is loaded onto a dumper truck for transport to the storage, with the dumper truck travelling only on the basal layer and on predefined designated haul routes. A second excavator is required in the storage area to form the stockpile. If soils are to be stored adjacent to the excavation area, the use of dumper trucks will not be required as a single excavator should be able to strip soils and form the stockpiles. Once the topsoil has been removed, the process is repeated for underlying layers of soil. The next strip is not started until the current strip is completely stripped to the basal layer. The method, if correctly carried out, should avoid severe compaction as soil trafficking is minimised.

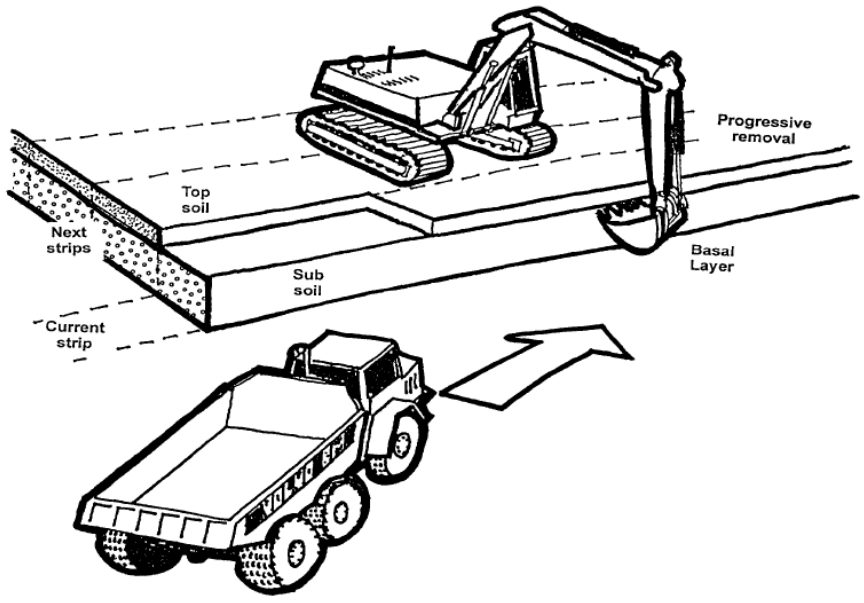

Figure 1: Topsoil stripping using the excavator and dump truck method described in Sheet 1 of the MAFF guidance (reproduced from MAFF, 2000).

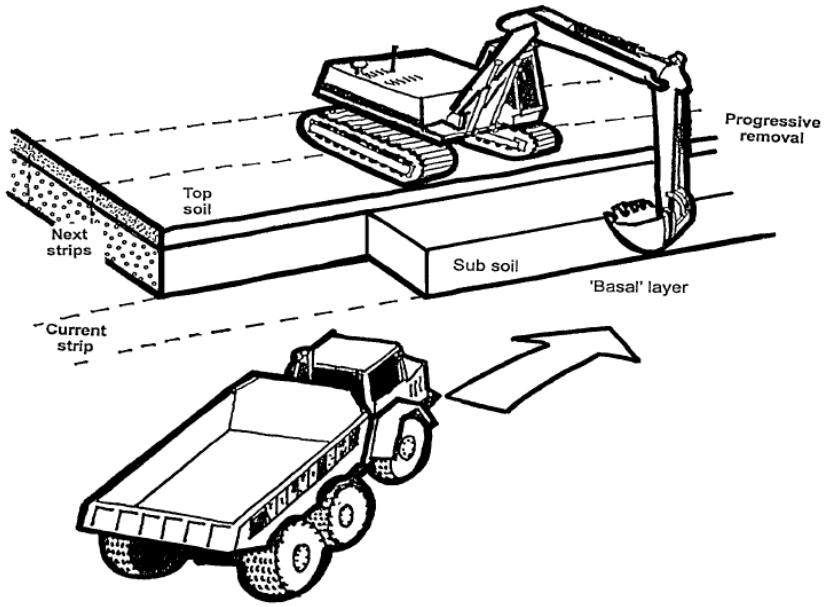

Figure 2: Subsoil stripping using the excavator and dump truck method described in Sheet 1 of the MAFF guidance (reproduced from MAFF, 2000).

6.2.5 Prior to commencement of soil stripping, the width of each strip must be determined. The strip width should make full use of the reach of the excavator. This will maximise the time the excavator can remain at a fixed location, before moving further along the strip, minimising the number of locations subject to the weight of standing plant. During stripping, the excavator should stand on the surface of the topsoil, digging the topsoil to the required depth and forming the stockpile or loading it into the transport vehicle (dump truck).

6.2.6 The depth of topsoil stripping is to be determined on a 'location by location' basis using soil survey data. The boundary between the topsoil and subsoil is usually very clearly visible through a change in colour (the topsoil being much darker due to greater organic matter content). However, this may not always be the case, as often the topsoil gradually transitions into subsoil, and their colours are similar. Therefore, the depth of the topsoil to be stripped must be determined by measuring the depth from the surface (excluding any vegetation) using data obtained from an audit of soil resources and presented within the SRP.

6.2.7 The size of the earthmoving plant to be used should be tailored to the size of the area to be stripped and the space available within the working area. The use of a long reach excavator is recommended to further reduce soil compaction, as it will minimise the need for movement across the soil surface.

6.2.8 To minimise soil compaction and maximise its readiness for reuse, the recommendations set out in Section 4 (General Principles of Soil Handling) and Section 5 (Stop Conditions) should be followed.

6.3 Creation of Stockpiles

6.3.1 Correct storage/stockpiling will maintain soil quality and minimise damage to soil structure and soil biota. This ensures that the soil will readily recover once re-spread, promoting timely and effective restoration. Stockpiled soil must not be vulnerable to compaction or erosion, must not cause pollution to surrounding watercourses, and must not increase flood risk to the surrounding area.

6.3.2 A good practice guide for the formation of stockpiles using excavators and dump trucks is provided in Sheet 2 of the MAFF guidance (Figure 3). Dump trucks are used to transport material to the storage area, 'loose-tipping' the soil in a designated area. An excavator is then used to shape the mound, forming a level surface on the top and uniform gradients down the sides. During 'forming', the top and sides should be smoothed so that they can shed water, ensuring that the entry of the water to the stockpile is limited and that the stored soil remains dry, and helping prevent erosion and ponding. This is achieved by dragging the bottom of the excavator bucket along the stockpile surface.

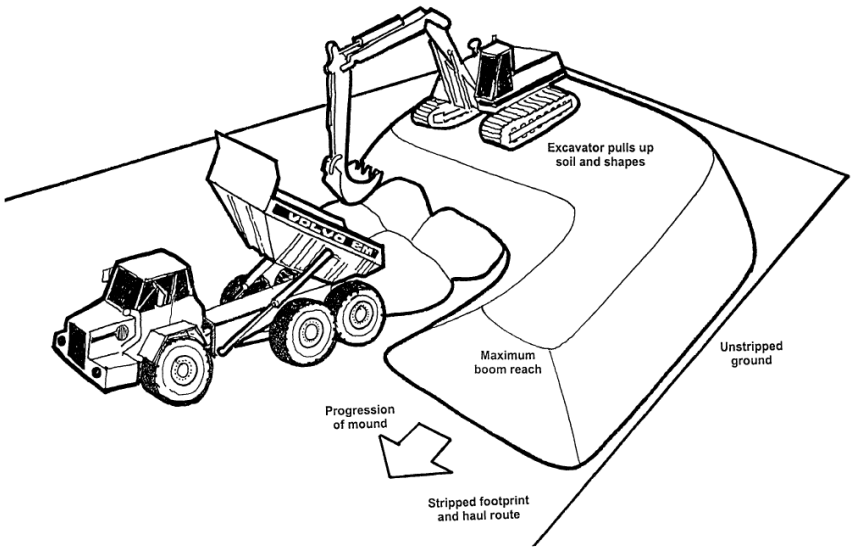

Figure 3: Building of soil stockpile using the excavator and dump truck method described in Sheet 2 of the MAFF (2000) guidance (reproduced from MAFF, 2000).

6.3.3 Potential soil compaction, erosion, and water pollution can be minimised through several good practice measures, as set out in Section 4 (General Principles of Soil

Handling) and Section 5 (Stop Conditions).

6.4 Stockpile Maintenance

6.4.1 If it is expected that the soil will be stored for a period of more than six months, the stockpiles should be seeded with appropriate low maintenance grass/clover mixture (to protect the soil against erosion, minimise soil nutrient loss, and maintain soil biological activity). Appropriate seeding will also help prevent colonisation of the stockpile by nuisance weeds that could spread seed onto adjacent land.

6.4.2 In the period where vegetative cover on the stockpiles is establishing, where required during dry weather, the stockpiles will be sprayed with water to prevent wind erosion (generation of dust) and to ensure that the seeds establish.

6.4.3 The stockpile vegetation cover is to be managed (by spraying, mowing, or stripping as appropriate and as defined in location-specific construction method statements, or similar) to prevent the spread of seeds from the stockpile onto adjacent land.

6.4.4 The condition of the stockpiles is to be regularly monitored. If rainwater gathers on the stockpile surface or in areas directly adjacent to them, drainage pathways to soakaway(s) away from the stockpile should be provided.

6.5 Stockpile Records

6.5.1 The locations and footprints of each stockpile should be accurately recorded on a plan of appropriate scale. Marker posts should be provided in locations which have been surveyed and recorded.

6.5.2 The approximate volume of each stockpile should be recorded, along with details of the type of soil stored.

6.6 Drainage

6.6.1 Prior to soil stripping, where required, pre-construction drainage will be installed per specification provided by a specialist drainage contractor. This drainage is designed to prevent water entering the working area.

6.6.2 Gaps shall be left between soil stockpiles where necessary to allow for surface water drainage and avoid the catchment (ponding) of water behind stockpiles. Where required, ‘grips’ may be dug across the working area at predetermined locations to prevent erosion and prevent ponding against stockpiles. Appropriate measures such as stone silt traps and silt fencing should be employed as required.

6.7 Restoration

6.7.1 Soil reinstatement shall be subject to the same constraints of weather and soil moisture conditions as soil stripping (see Table 3 and Table 4 above). All methods must adhere to the general principles set out below.

Soil decompaction

6.7.2 Where subsoil or overburden is used as the working surface during construction, subsoil decompaction will be required prior to the placement of the topsoil. The method described in Sheet 19 of the MAFF (2000) guidance using a low ground pressure bulldozer either fitted or towed with winged subsoiler tines is recommended. Three passes of the dozer should be completed, there should be no heave above the allowed surface evenness. Light grading following decompaction may be needed to achieve this.

6.7.3 The final surface should be even, but not smooth. Different depths of decompaction and number of passes may need to be used if additional compacted layers are identified (Figure 4). For the decompaction to be effective, the moisture content of the soil must be below the lower plastic limit, so that the soil is dry enough to shatter and for fissures to be created. Decompaction is vital, especially for the clayey soils present within the site, as otherwise there is a risk of an impermeable layer being created beneath the reinstated soils which will lead to poor drainage, surface water ponding and potentially planting failure.

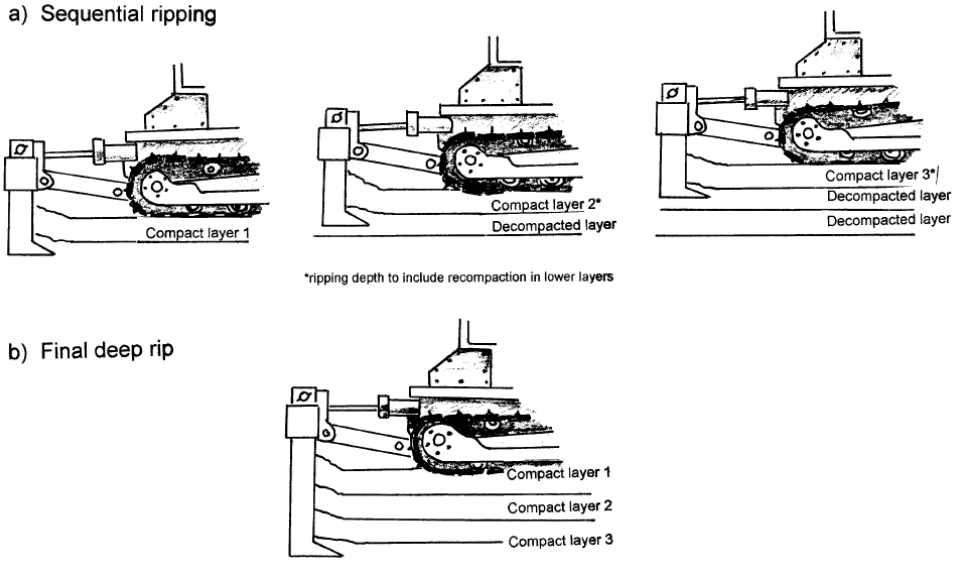

Figure 4: The sequential method of decompaction using bulldozer drawn tines detailed in Sheet 19 of the MAFF (2000) guidance (reproduced from MAFF, 2000).

Excavation of soil stockpiles

6.7.4 In some locations, direct excavation of the soil from the stockpiles using a long-reach back-acting/360° excavator may be possible. However, it is anticipated that the majority of soils will be transported to the reinstatement area via dump truck, and stockpile excavation is to follow the methodology described in the MAFF Good Practice Guide, *Sheet 3: Excavation of Soil Storage Mounds with Excavators & Dump Trucks*. In this method, the dump trucks enter the storage area travelling on the base layer (where topsoil and subsoil are stripped) and on the subsoil (where only topsoil has been stripped). If a back acting/360° excavator is used, it must stand on top of the stockpile to load the dump truck (Figure 5). The stockpile is dug to the base (the original subsoil) before moving progressively back along its axis. Front loading machines may also be used, in which case they will not need to enter the top of the stockpile. Any exposed edges/surfaces should be shaped at the onset of rain and at the end of each day.

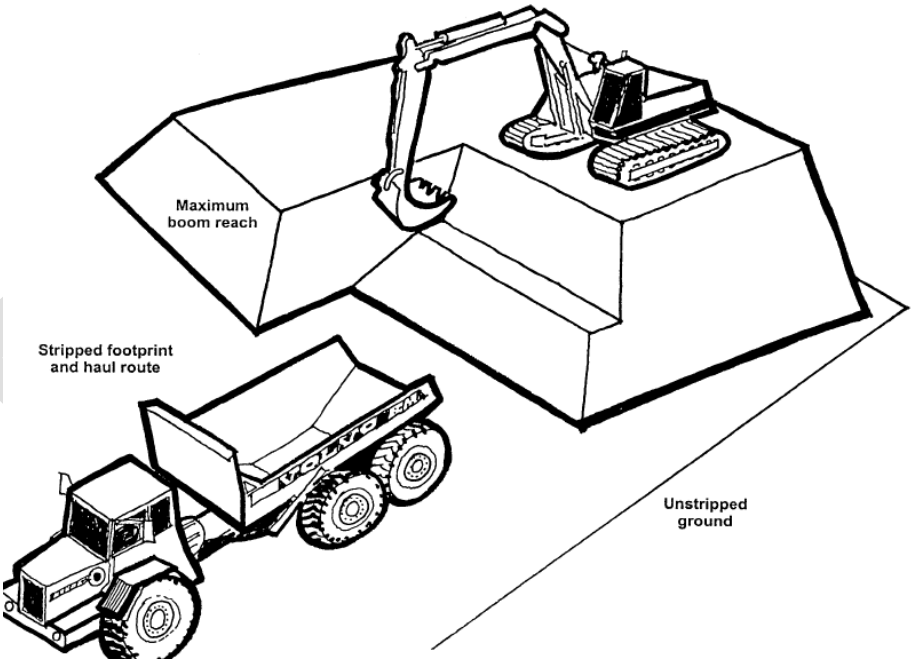

Figure 5: Stockpile excavation using the excavator and dump truck method described in Sheet 3 of the MAFF (2000) guidance (reproduced from MAFF, 2000).

6.7.5 The above methodology will also apply for the loading of dump trucks from stockpiles where excess soil resource is to be exported from site.

Soil Reinstatement

6.7.6 Soil reinstatement is carried out in strips in a similar manner to the stripping

operations to recreate the original soil profile, or a profile specified by the Landscape Architect, to achieve the agreed planting plan.

6.7.7 First, the initial strip width and axis is to be demarcated. The width of the strip is determined by excavator boom length minus the stand-off to operate. In some locations, direct excavation and restoration of the soil from the stockpiles using a long-reach back-acting/360^{o} excavator may be possible. However, it is anticipated that most soils on this Site will be transported to the reinstatement area from the storage area with a dump truck.

6.7.8 Soil replacement should follow the methodology set out in the MAFF Good Practice Guide, *Sheet 4: Soil Replacement with Excavators and Dump Trucks*. In this method, the subsoil is to be replaced first by loose-tipping onto the edge of the strip (Figure 6). The dump truck must not drive away until all the soil is deposited within the strip without spillage over the basal layer. To achieve this, assistance from the excavator to 'dig away' some of the tipped soil may be required. The tipped soil should be spread by an excavator fitted with a wide-bladed bucket to the full thickness required, utilising the digging, pushing and pulling action of the bucket. Should the spread soil comprise large blocks (>0.3 m), they should be broken down by 'slicing' them with the excavator bucket. Each load must be spread before another is tipped. This process is then repeated along the strip until it is completely covered with the required depth of the soil layer. Once the subsoil has been deposited across the whole strip, the process can be repeated to reinstate the topsoil layer above the newly laid subsoil strip (Figure 7).

6.7.9 The correct use of this method should prevent the need for soil decompaction following the soil placement as the excavator and dump trucks will be restricted to the basal layer. The operations need to follow a detailed plan showing the areas to be reinstated, haul routes, and how correct topsoil depths are to be achieved. Care must be taken to ensure that soil horizons are replaced to the correct thickness. Up to a 20% allowance should be made for settlement (bulking factor) of loosely placed soil (before any cultivation).

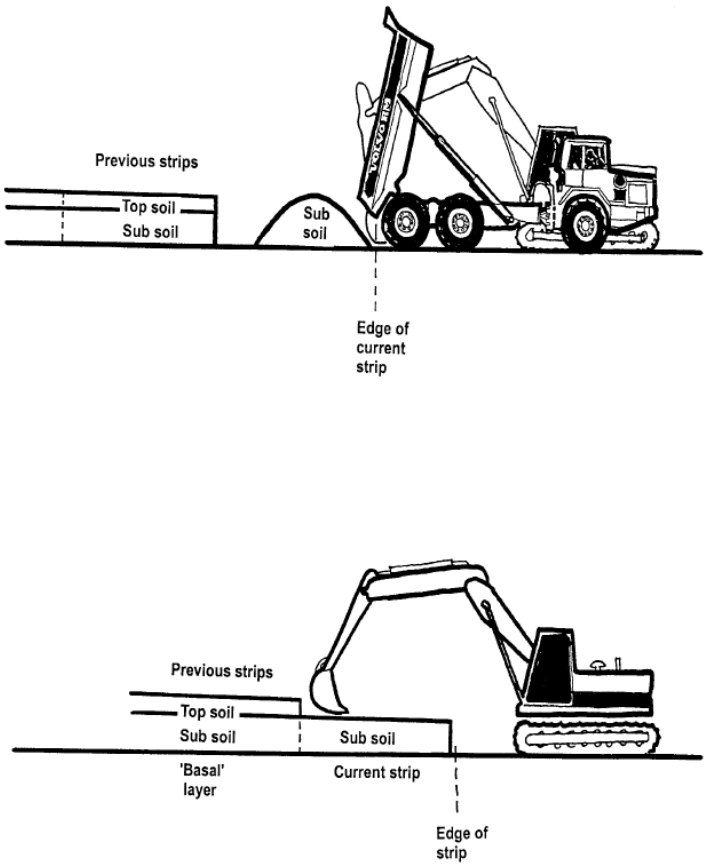

Figure 6: Subsoil reinstatement using the dump truck and excavator method detailed in the MAFF (2000) guidance (reproduced from MAFF, 2000).

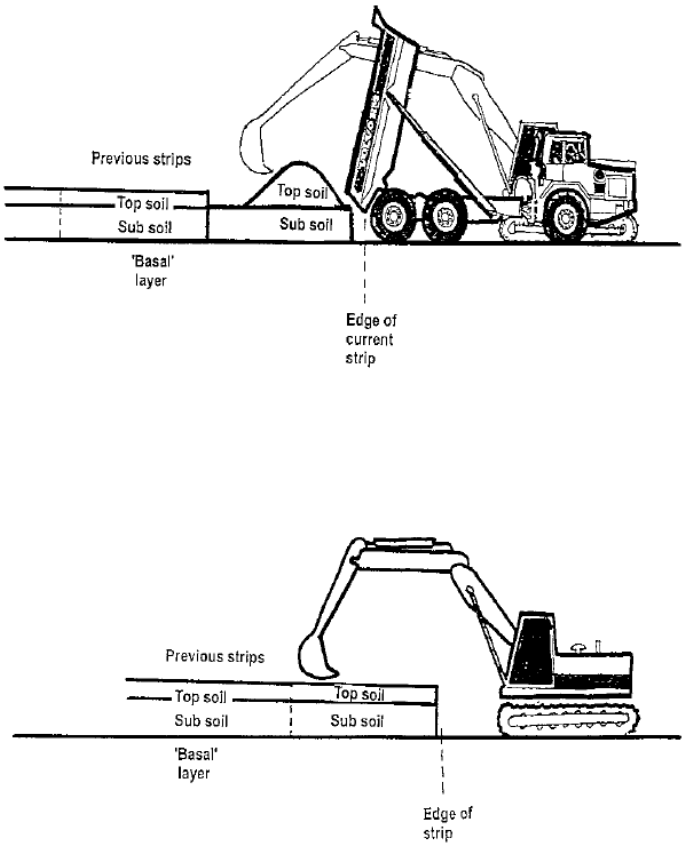

Figure 7: Topsoil reinstatement using the dump truck and excavator method detailed in the MAFF (2000) guidance (reproduced from MAFF, 2000).

APPENDICES

APPENDIX 13.1 – Peat and Soil Technical Note

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