The Great Grid Upgrade

Sea Link

Sea Link

Volume 7: Other Documents

Document Number 7.5.10.1 Outline Soil Management Plan - Suffolk

Planning Inspectorate Reference: EN020026

Version: B
April 2026

Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009 Regulation 5(2)(q)

nationalgrid

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Date	**Version**	**Status**	**Description / Changes**
March 2025	A	Final	For DCO submission
April 2026	B	Final	Updated following completion of Agricultural Land Classification surveys and to add more detail in relation to aftercare

Executive Summary

Ex1.1.1 This Outline Soil Management Plan (oSMP) has been developed to ensure the effective management, protection, and reinstatement of soil resources during the proposed development of the Suffolk Onshore Scheme as part of the Proposed Project. The plan outlines the necessary measures to minimise soil degradation and promote sustainable land use in accordance with best practice and regulatory requirements.

Ex1.1.2 This oSMP provides context on the Proposed Project as well as establishing the importance of soil management in construction and development. The defined roles as part of this document ensure accountability and includes the identification of key responsibilities for soil management throughout the Proposed Project lifetime.

Ex1.1.3 This document serves as a framework to mitigate environment impacts to ensure that soil resources are managed efficiently and sustainably throughout the Proposed Project lifecycle. As such this management plan provides a clear protection strategy for the protection of soil resources, detailing measures to prevent soil degradation; this includes guidance on soil stripping, stockpiling, and reinstatement to preserve soil functionality.

Ex1.1.4 The final SMP to be produced ahead of construction as part of Requirement 6 of the draft Development Consent Order (DCO) **(Application Document 3.1 draft Development Consent Order)** will include information from preconstruction Agricultural Land Classification (ALC) surveys to fill gaps in the current survey information as far as necessary and practicable and a Soil Resources Survey and to reflect the final design and construction approach/programme.

1. Introduction

1.1 Context

1.1.1 This outline Soil Management Plan (oSMP) has been developed to provide the necessary guidance in relation to soil handling and management, including:

- where land is being returned to agriculture at the end of the construction phase, that this land should be returned to the pre-construction Agricultural Land Classification (ALC) grade;
- providing clarity on how different soil types and/or soil horizons (topsoil and subsoil) should be handled, stockpiled, and restored in different ways depending on the soil profile and associated characteristics required to support the proposed end use; and
- roles and responsibilities of competent individuals and the experience and qualifications required from those who will be supervising, monitoring, and auditing the works covered by the Final SMP, known hereafter as the SMP.

1.1.2 A further commitment is made to undertake further detailed ALC and Soil Resources Surveys pre-construction to:

- Fill in gaps in the ALC survey data so that the ALC grade baseline is complete as far as necessary and practicable; and
- Provide baseline information on soil chemical properties to inform both land reinstatement monitoring and to identify appropriate soil resources for landscape and biodiversity requirements.

1.1.3 This oSMP requires that, prior to any soil stripping works commencing, a final SMP will be produced by the Contractor for the Suffolk Onshore Project (as part of the wider Sea Link Project) to provide the required details (as highlighted throughout this document).

1.2 The Proposed Project

1.2.1 The Sea Link Project (hereafter referred to as the 'Proposed Project') is a proposal by National Grid Electricity Transmission plc (hereafter referred to as National Grid) to reinforce the transmission network in the South East and East Anglia. The Proposed Project is required to accommodate additional power flows generated from renewable and low carbon generation, as well as accommodating additional new interconnection with mainland Europe.

1.2.2 National Grid owns, builds and maintains the electricity transmission network in England and Wales. Under the Electricity Act 1989, National Grid holds a transmission licence under which it is required to develop and maintain an efficient, coordinated, and economic electricity transmission system.

1.2.3 This would be achieved by reinforcing the network with a High Voltage Direct Current (HVDC) Link between the proposed Friston substation in the Sizewell area of Suffolk and the existing Richborough to Canterbury 400kV overhead line close to Richborough in Kent.

1.2.4 National Grid is also required, under Section 38 of the Electricity Act 1989, to comply with the provisions of Schedule 9 of the Act. Schedule 9 requires licence holders, in the formulation of proposals to transmit electricity, to:

- *Schedule 9(1)(a) '…have regard to the desirability of preserving natural beauty, of conserving flora, fauna and geological or physiographical features of special interest and of protecting sites, buildings and objects of architectural, historic or archaeological interest;' and*
- *Schedule 9(1)(b) '…do what [it] reasonably can to mitigate any effect which the proposals would have on the natural beauty of the countryside or on any such flora, fauna, features, sites, buildings or objects'.*

1.2.5 The Suffolk Onshore Scheme would comprise the following elements:

The Suffolk Onshore Scheme

- A connection from the existing transmission network via Friston Substation, including the substation itself. Friston Substation already has development consent as part of other third-party projects. If Friston Substation has already been constructed under another consent, only a connection into the substation would be constructed as part of the Proposed Project.
- A high voltage alternating current (HVAC) underground cable of approximately 1.9 km in length between the proposed Friston Substation and a proposed converter station (below).
- A 2 GW high voltage direct current (HVDC) converter station (including permanent access from the B1121 and a new bridge over the River Fromus) up to 26 m high plus external equipment (such as lightning protection, safety rails for maintenance works, ventilation equipment, aerials, similar small scale operational plant, or other roof treatment) near Saxmundham.
- A HVDC underground cable connection of approximately 10 km in length between the proposed converter station near Saxmundham, and a transition joint bay (TJB) approximately 900 m inshore from a landfall point (below) where the cable transitions from onshore to offshore technology.
- A landfall on the Suffolk coast (between Aldeburgh and Thorpeness).

1.3 Background

1.3.1 The purpose of the oSMP is to provide details of the methodology, control measures and monitoring programme for the site preparation and reinstatement work phases of the Suffolk Onshore Scheme as part of the Proposed Project. The document provides the over-arching principles that are applicable to all areas that form part of the Proposed Project with regards to soil management. This includes all land within the Order Limits where soils will be disturbed by the construction works.

1.3.2 The SMP will be used as a tool by National Grid and the appointed Agent(s), Contractor(s) or sub-contractor(s) acting on their behalf, as a method to control, record, and audit activities relating to soil conditions and soil quality for future re-use. It includes requirements and standards for any imported topsoil and subsoil required (the SMP will detail the anticipated soil balance and the specification for any imported materials to ensure it is suitable for the required end use).

1.3.3 The SMP draws on key guidance documents as follows:

- Defra Construction Code of Practice for the sustainable use of soils on construction sites (Department for Food and Rural Affairs, 2009);
- Good Practice Guide for Handling Soils in Mineral Workings - Institute of Quarrying (Institute of Quarrying, 2024);
- BS 3882:2015 – Specification for topsoil (British Standards Institution, 2015);
- BS 8601:2013 – Specification for subsoil and requirement for use (British Standards Institution, 2013); and
- Safeguarding our Soils: A Strategy for England (Department for Food and Rural Affairs, 2009).

1.3.4 This document is an oSMP. As set out in paragraph 1.1.3 above, prior to any soil stripping works commencing a final SMP will be produced by the Contractor to provide the required level of detail (as highlighted throughout this document).

1.3.5 The SMP will be produced by the Contractor(s) to include:

- maps showing the existing (pre-construction) ALC grades and the soil sampling points to show the expected ALC grade where land is to returned to agriculture;
- maps of the soil handling units for topsoil, upper subsoil, and lower subsoil;
- maps showing the areas to be stripped and those to be left in situ;
- soil test data;
- details of proposed vegetation clearance/management prior to soil stripping;
- maps with supporting text showing the proposed final landform, land uses, and target ALC grades where applicable;
- the volumes of the different types of soil resources that will be stripped, stored, and re-used;
- the proposed location, content, and volumes of stockpiles;
- any changes to methodology to be used (including machinery);
- a target specification for the restored soils (i.e., depth of soil profile, horizon thickness, textures, available soil nutrients where applicable, etc.,); and
- the person(s) responsible for supervising the soil management.

1.3.6 The SMP will be produced by the works contractor(s) prior to any soil stripping commencing for review, comment, and acceptance by National Grid.

2. Roles and Responsibilities

2.1 Context

2.1.1 The implementation and audit of the SMP will require certain key responsibilities to be assigned to defined roles. National Grid and the works contract(s) will have in place individuals with sufficient training and expertise in assessing soils, soil conditions, and soil handling operations to ensure the measures outlined herein can be implemented, supervised, and monitored effectively.

2.1.2 In advance of any soil stripping works commencing, full details of roles and required reporting mechanisms will be set out in the SMP. A table will be provided detailing the key activities and sub-activities, the frequency at which they will be undertaken, and who will be responsible for each activity, along with the necessary expertise and knowledge required.

2.1.3 The two key roles across both National Grid and the works contractor(s) in ensuring the appropriate implementation of the SMP will be the Site Environmental Lead and the Soil Scientist. Outline requirements for each role in relation to soils are detailed below.

2.2 Site Environmental Lead

2.2.1 The Site Environmental Lead is responsible for planning, over-seeing, and carrying out routine inspections of soil management activities to ensure adherence to SMP protocols including:

- adherence to access/haul route alignments and compliance with no off-route access throughout the works;
- treatment of site vegetation before topsoil stripping;
- determination of topsoil plasticity status ahead of soil stripping (plastic or non-plastic);
- soil segregation during stripping and storage according to ownership, soil horizon (topsoil/subsoil), soil type, and plasticity status;
- stockpile and windrow construction, where required;
- soil tracking from stripping, storage, reconditioning (where applicable) to re-use; and
- re-use of soils (transportation, placement, decompaction) and ensuring the creation of a soil profile and associated characteristics suitable for the proposed end use.

2.2.2 The Site Environmental Lead, in liaison with the Soil Scientist, will be responsible for providing plans and reports on all soil stripping, stockpiling, and restoration activities to National Grid including;

- Soil Stripping Plan;
- Soil Stockpile Plan;
- compilation of data relating to the volume and type of topsoil and subsoil excavated, transported, and stockpiled;

- Soil Reconditioning Plan;
- restoration plans; and
- report for the Earthworks phase, including supporting drawings, photographs, and observations.

2.2.3 These activities will be the responsibility of the Site Environmental Lead but, where required, may be delegated to individuals with sufficient training and expertise. The Site Environmental Lead and anyone with delegated responsibility will undertake training provided by the Soil Scientist, with the activities monitored at an agreed frequency by the Soil Scientist.

2.3 Soil Scientist

2.3.1 The Soil Scientist is responsible for the provision of expert and technical soil advice and supervision throughout the earthworks and the subsequent site restoration activities. The role includes liaison with the Site Environmental Lead and review and approval of method statements and risk assessments with regards to soil management.

2.3.2 The Soil Scientist will be a qualified soil scientist with the necessary training, qualifications, and experience, having achieved the soil professional competence standard 1 (Foundation skills in field soil investigation, description, and interpretation) and 6 (Soil science in soil handling and restoration) as set out by the British Society of Soil Science (see Appendix A).

2.3.3 The Soil Scientist is responsible for ensuring the final SMP covers the required aspects and includes and takes account of all available soil survey data, training key site staff in identification of topsoil and subsoil resources which are suitable for re-use so that accurate segregation of materials can be achieved. The Soil Scientist will also provide training on the assessment of soil plasticity status based on the field techniques provided in Appendix B.

2.3.4 The Soil Scientist will conduct targeted supervision, site inspections and monitoring of stripping works based on observations made by the Site Environmental Lead during key operations, including, but not limited to:

- treatment of existing vegetation;
- soil stripping and temporary storage;
- soil reconditioning (where necessary);
- overburden treatment;
- subsoil placement;
- topsoil placement;
- decompaction measures;
- surface cultivations; and
- soil amelioration.

2.3.5 Where necessary, and particularly during the replacement of soils and overburden for restoration, the Soil Scientist will excavate inspection pits at representative locations in order to check important in-situ pedological soil properties (e.g., compaction levels, soil structure, anaerobism, drainage characteristics, soil depths).

2.3.6 The Soil Scientist will provide to National Grid and relevant contractor Inspection Reports (including photographs and plans) for each site visit and will confirm that soil conditions are compliant with this SMP/landscape design or identify non-compliances that need to be addressed.

2.4 Roles and Responsibility Checklist

2.4.1 The table below summarises the split of the responsibilities across the above two roles.

Table 2.1 Roles and responsibilities matrix

Main Activity	Sub-activities	Frequency	Responsible	Qualifications
Training[1]	Presentation of key aspects of soil management.	At start of site preparation works.	Soil Scientist	An individual with the necessary "Foundation Skills", having achieved the soil professional competence standards set out by the British Society of Soil Science.
	Identification of topsoil and subsoil resources.	At start of site preparation works.	Soil Scientist	
	Soil plasticity assessment.	At start of site preparation works.	Soil Scientist	
	Toolbox talks.	To be agreed with Site Environment Lead.	Soil Scientist	
Inspections and monitoring	Adherence to access/haul route alignments and compliance with no off-route access.	Continuous until soil stripping complete.	Site Environmental Manager	In-house training provided by qualified soils scientist (with monitoring by the Soil Scientist to check works).
	Vegetation and foreign matter clearance.	Ahead of soil stripping.	Site Environmental Manager	
	Soil plasticity.	Ahead of soil stripping for each stripping unit. Additional checks required if rainfall results in works having to be stopped prior to soil stripping recommencing within that stripping unit.	Site Environmental Manager	

[1] Should key personnel change training may need to be delivered again to the replacement staff.

Main Activity	Sub-activities	Frequency	Responsible	Qualifications
	Appropriate separation of soil layers as required (topsoil, upper subsoil, lower subsoil) and accurate documentation of depths stripped, and volumes transported from each stripping unit.	Continuous until soil stripping complete.	Site Environmental Manager	
	Appropriate segregation of soil materials in stockpiles by stripping unit, layer and plasticity, and accurate documentation of material source and stockpile location.	Continuous until soil stockpiling complete.	Site Environmental Manager	
	Stockpile construction	Continuous until soil stockpiling complete, and stockpiles prepared for storage period.	Site Environmental Manager	
	Inspection of soil storage stockpiles.	Monthly.	Site Environmental Manager	
	Assessment of soil condition (including plasticity) within stockpiles prior to re-use.	Prior to re-use from each stockpile.	Soil Scientist	An individual with the necessary “Foundation Skills”, having achieved the soil professional competence standards set out by the British Society of Soil Science.
	Inspection of soil reconditioning windrows (where required).	Continuous until soil reconditioning complete.	Soil Scientist	

Main Activity	Sub-activities	Frequency	Responsible	Qualifications
	Inspections of restored soil profiles.	Continuous until soil placement complete. Checks should be undertaken as each layer is placed.	Soil Scientist	
Reporting	Condition reports detailing works undertaken and replaced soil conditions (in relation to target).	On completion of soil replacement activities for each asset.	Soil Scientist	
Monitoring	All the above activities will be monitored.	Weekly checks of soil handling operations (either combined with site visit or through review of reporting documentation).	Soil Scientist	
Auditing	All above activities will be audited.	Monthly audits will be undertaken of activities which have taken place in the preceding month. Annual audits of all activities will be undertaken.	Soil Scientist	

3. Baseline Soil Conditions

3.1.1 Detailed ALC survey information is available for the majority of the land within the Order Limits, as set out in **Application Document 9.30 Agricultural Land Classification (ALC) Survey Results – Suffolk [REP5-090]**.

3.1.2 Based on published mapping, the Soil Associations expected within the Order Limits for the Suffolk Onshore Scheme comprise the following:

- Wallasea 1: Deep stoneless non-calcareous and calcareous clayey soils. Some soils locally have humose or peaty surface horizons. Parent material: Marine alluvium.
- Newport 2: Deep well drained sandy and often ferruginous soils. Parent material: Glaciofluvial drift over Cretaceous sand or Crag sand.
- Newport 4: Deep well drained sandy soils, some very acid soils with bleached subsurface horizons especially under heath or in woodlands. Parent material: Glaciofluvial drift.
- Melford: Deep well drained fine loamy soils over clayey subsoils. Parent material: Chalky till.
- Ragdale: Slowly permeable seasonally waterlogged clayey and fine loamy soils over clayey subsoils. Parent material: Chalky till.
- Hanslope: Slowly permeable deep calcareous clayey soils. Parent material: Chalky till.
- Sandwich: Mainly deep well drained calcareous and non-calcareous sandy soils. Parent material: Dune sand and marine shingle.

3.1.3 The land within the Order Limits has been mapped to show the ALC grades which are based on the most limiting factor (covering climate, site and interactive limitations). The mapping is accurate to a scale of 1:10,000, any further enlargement could lead to inaccuracies.

3.1.4 The distribution of grades, based on the detailed ALC surveys, by area and percentage is set out in Table 3.1 below.

Table 3.1 Extent of each ALC grade present within the Order Limits

ALC Grade	Area (ha)	Percentage (%)
Grade 1	0.0	0.0
Grade 2	65.0	21.8
Grade 3a	128.7	43.3
BMV land	*193.7*	*65.1*
Grade 3b	54.0	18.2

ALC Grade	Area (ha)	Percentage (%)
Grade 4	21.5	7.2
Grade 5	0.0	0.0
Non-Agricultural	28.2	9.5
Total	**297.4**	**100**

3.1.5 Where there are gaps in the survey data, as shown in **Application Document 9.30 Agricultural Land Classification (ALC) Survey Results – Suffolk [REP5-090]**, further soil surveys will be undertaken pre-construction as far as necessary and practicable and will be used by the contractor(s) to produce a final SMP. These surveys will include detailed ALC surveys to fill gaps and a Soil Resources Survey where samples are collected on a field-by-field basis across the Order Limits and analysed for texture, pH, plant available nutrients (nitrogen, phosphorous, potassium and magnesium) and soil organic matter / soil organic carbon. Sample collection will comprise the collection and bulking of multiple samples along a 'W' transect. A report on these surveys and analyses, along with a final collation of all available information, will be made available for the development of the final SMP to ensure the approaches to soil handling are targeted to the actual soil conditions (for example actual topsoil thicknesses) and re-use plans can be developed aligned to the required end uses.

4. Calculation of Soil Volumes

4.1.1 The SMP will detail soil stripping, storage, and restoration plans based on soil volume calculations using the data collected from all the pre-construction surveys. This information will also be used to update the SMP prior to construction works commencing. Volumes of topsoil and subsoil to be stripped, stockpiled and reinstated will be calculated based on the soil horizon thickness information from the survey data – see **Application Document 9.30 Agricultural Land Classification (ALC) Survey Results – Suffolk [REP5-090]** for the current available survey dataset.

4.1.2 The clear tracking of actual moved and stockpiled volumes of both topsoil and subsoil will be undertaken to allow the restoration and re-use plans to be revised (as necessary) based on actual soil volumes (including required actions in relation to the overall topsoil/subsoil balance).

4.1.3 Where land is to be returned to agricultural use there is a commitment to return to land to pre-construction condition, including ALC grades. As such, clear segregation and storage of topsoil and subsoil resources will be critical to maximising re-use and minimising wastage via contamination or damage. All necessary topsoil, subsoil, and underlying overburden will be stripped and stockpiled separately.

4.1.4 Where land is to be restored in accordance with the (outline) Landscape and Ecological Management Plan ((o)LEMP), (**Application Document 7.5.7.1 Outline Landscape and Ecological management Plan – Suffolk**) which details the habitats which will be created, topsoil and subsoil resources may need to be mixed to create the suitable soil resources required for the restoration of the land. The SMP will align with the (o)LEMPs and will detail where soil horizons will need to be mixed to ensure both adequate volumes of material for the restoration, as well as minimising any surplus soil materials.

4.1.5 Where target habitats, such as species-rich grassland, are proposed, soil testing in line with BS3882:2015 (British Standards Institution, 2015) will be undertaken to ensure that soil resources are suitable for establishing and maintaining the intended plant communities.

4.1.6 Testing will be done at the point of reconditioning as soil nutrient profiles can change whilst material remains in stockpile. Advice should be sought from the Soil Scientist to design and undertake the required testing, as well as develop further reconditioning or amendment treatments where soils do not meet requirements.

4.1.7 This is essential as species-rich grassland, and other sensitive landscapes, require specific soil conditions, including appropriate nutrient levels, pH balance, and soil structure, to support biodiversity and long-term ecological function. Without proper assessment and, if necessary, soil amendments, the success of planned habitats may be compromised.

5. Soil Protection Strategy

5.1 Introduction

5.1.1 Since soil is a vulnerable and non-renewable resource, care must be taken throughout all handling, transporting, and stockpiling activities so that the soil resources are protected and conserved for future use. Many construction activities have the potential to damage soils. The following sections of the oSMP describe how the management of soils will be controlled and specifies how soils will be protected, and their quality conserved, throughout all stages of the work.

5.1.2 Failure to protect soils during disturbance can lead to their degradation with impacts such as:

- soil erosion;
- loss of soil organic matter and nutrients and as a result a decline in soil fertility;
- soil compaction leading to loss of soil structure and reduced permeability to water (leading to waterlogging) and restricted aeration and rooting potential; and
- loss of soil biological activity.

5.1.3 These impacts on soils can have wider environmental consequences, including:

- alteration to hydrology;
- increased sediment loading to adjacent watercourses;
- poor establishment and long-term growth of vegetation; and
- visual impact of slope failure or soil erosion leading to bare soil surfaces.

5.1.4 Measures set out in this oSMP are designed to manage how soils on site will be stripped, handled, and stored appropriately so that they can be re-used in the restoration of the Suffolk Onshore Scheme as part of the Proposed Project (where relevant) and, if removed from site, remain suitable for a range of potential end uses.

5.2 Outline Soil Protection Measures

5.2.1 This oSMP describes the procedures for soil stripping, handling, transporting, storing, and restoration of soils to maintain, as far as practicable, their soil quality and viability as required for the proposed end uses. There will be a number of control measures at each stage of the works.

5.2.2 A summary of these measures is outlined in bullet form below and described in more detail in the following sections.

5.2.3 Soil protection measures:

- measures for in-situ soil protection during early site clearance activities;
- soil recovery and storage (soil stripping and stockpiling), ensuring contaminated materials are handled, stored and managed separately;

- in-situ soil protection ahead of stripping;
- pre-treatment of existing vegetation;
- measures for handling and stockpiling;
- measures to ensure correct segregation of different topsoil and subsoil resources;
- measures for separate storage of different soil types; and
- method and locations of stockpiling.

5.2.4 Soil reconditioning (for use where required):

- measures to recondition wet and plastic topsoil and subsoil resources before reuse;
- measures to ensure correct segregation of different topsoil and subsoil resources;
- measures for handling and to optimise soil drying and re-aeration; and
- methods to monitor the process.

5.2.5 Soil restoration methods:

- soil prescriptions for each different land use;
- soil handling/replacement methods;
- in situ soil treatments for each different land use; and
- clear re-use strategy for all soil resources taken off-site.

5.2.6 Monitoring:

- monitoring programme; soil assessment procedures for (a) soil stripping and storage (b) soil reconditioning and (c) restoration activities;
- acceptability criteria for soil storage, reconditioning and soil replacement activities; and
- failures of acceptability criteria and corrective actions.

5.2.7 Quality control and auditing measures:

- quality control, auditing procedures and plans; criteria for cessation of works;
- non-compliances and corrective actions; and
- use of tool box talks for staff training.

6. Wet Weather Working and Cessation of Works

6.1.1 Soils shall be handled, where possible, when they are in a reasonably dry and friable state (as determined by the soil plasticity tests described in **Appendix B**) which is when soil structural units are the least susceptible to damage by compaction and smearing.

6.1.2 The soil plasticity tests shall apply to all soil materials that are to be tracked over, stripped, stockpiled and reinstated. All soil plasticity tests shall be carried out by a competent soil scientist or practitioner, or by an individual who has been trained by the appointed Soil Scientist.

6.1.3 If sustained heavy rainfall (>10 mm in 24 hours) occurs, any topsoil stripping operations must be suspended and not restarted until the ground has had at least a full dry day, or the moisture criteria set out in **Appendix C** has been met to allow for the restarting of soil handling operations.

6.1.4 There are extensive areas of deep well-drained sandy soils over glaciofluvial drift (Soil Association Newport 2 and Newport 4). Due to their sandy nature and low structural cohesiveness, these soils are often resilient to handling damage. However, there are significant areas of deep loamy and clay soils (Soil Associations Wallasea 1, Melford, Ragdale, and Hanslope). These finer grained, heavier textured soils are more prone to damage if handled when wet but may remain plastic for extended periods of time in their natural state. As such, the soil type present will therefore be taken into account when assessing the requirements to stop and restart works. The final SMP will include an overlay of works proposed and soil types such that all work package plans can account for and seek to minimise the likelihood and risks associated with plastic soils.

6.1.5 The Environmental Manager (in collaboration with the Soil Scientist where required) will ensure there is continuous awareness of ground conditions as weather patterns change and take pro-active decisions regarding whether soil handling operations should be suspended/restarted.

6.1.6 In some exceptional cases, it may be necessary to traffic over or handle soils when they are in a plastic state, for example due to programme, engineering or due to the specific nature of the soil. In these cases, location-specific methods will be agreed with the Soil Scientist prior to work commencing. Where soil handling operations continue when soils have become plastic, the soil materials will be clearly tracked as plastic and plans for effective reconditioning measures to be implemented at the appropriate time will be agreed with the Soil Scientist. The final SMP will identify within the Roles and Responsibilities section the project requirements for approval from a Project Manager or Senior Project Manager for any works planned or undertaken when soils are plastic.

7. Use of Toolbox Talks

7.1.1 Toolbox talks will be used so that all site personnel are aware of the SMP and applicable soil handling and soil protection procedures. The toolbox talks will be site- and task-specific, discussing soil conditions and approaches to soil handling on site.

7.1.2 Toolbox talks must include at least the following topics:

- key aspects of the SMP;
- identification of topsoil and subsoil resources (to ensure accurate soil stripping and prevention of topsoil/subsoil mixing);
- vegetation clearance;
- stockpile creation and management;
- assessment of soil plasticity using the techniques set out in Appendix B; and
- soil reinstatement approach (where required).

7.1.3 The suite of toolbox talks will be developed and delivered by the appointed Soil Scientist in collaboration with the Site Environmental Manager.

8. Soil Management Measures

8.1.1 Outlined below are further details of soil management measures.

8.2 General Soil Protection Measures

8.2.1 Plant and other site vehicles will be managed so that they do not traffic across in situ topsoil unless it can be confirmed this will not damage the soil (e.g. not create ruts or soil compaction). Where required, protection such as trackway will be used if vehicle access is required over unstripped soils, and the access could result in compaction/rutting. Where trackway has been used (irrespective of the soil's plasticity at the time of laying trackway), an assessment of the level of compaction under the trackway will be made by the Soil Scientist once the trackway is lifted. The assessment will identify the required remedial measures (such as depth of loosening required) and will be used to develop an archaeological mitigation strategy, where required. Archaeological mitigation will be put in place prior to any soil decompaction measures being implemented. If site access arrangements change as works progress, all personnel should be made aware of the new arrangements through a toolbox talk.

8.2.2 If site access arrangements change as works progress, all personnel should be made aware of the new arrangements through a toolbox talk.

8.2.3 There will be no lay-down of materials, except for those materials required for specific on-going construction activities on topsoil either within the route corridors or anywhere outside designated storage / laydown areas. For long-term storage / active storage compounds either the topsoil will be stripped or a suitable ground protection (such as trackway) will be used to protect the topsoil from damage. The specific requirements will be developed based on the nature of the materials to be stored, length of time of storage and extent and frequency of access required into the storage area.

8.2.4 Subject to ground conditions and confirmation from the Site Environmental Manager and/or Soil Scientist, materials can be temporarily stored on topsoil if it is considered this will not be detrimental to soil quality.

8.2.5 These measures will apply to all operations, including early ecological mitigation, archaeological investigations, site access and fencing, preconstruction drainage etc.).

8.3 Clearance of Existing Vegetation

8.3.1 Prior to soil stripping commencing, any vegetation will be cleared, and arisings removed. This is to ensure large quantities of green vegetative material do not get mixed with the stockpiled soils. Vegetation clearance and all subsequent activities covered by this oSMP will be undertaken in accordance with any relevant requirements to protect habitats and species present.

8.3.2 The method used will depend on the nature of the vegetation present; however, bulldozers will not be used to blade off vegetation. The clearance operation should ensure the vegetation is removed to ground level and all arisings (including chipped wood material) are removed.

8.3.3 All vegetation clearance works will be undertaken ensuring, where possible, that the soils are not damaged through the creation of ruts or mixing or compaction of topsoil and subsoil resources. This is particularly important where the soils are of a heavier texture and more prone to compaction and smearing (i.e., the compression and smoothing of clay-rich materials, removing structural units, drainage routes through the soil etc.).

8.3.4 The potential risks from vegetation clearance will be identified by the Soil Scientist (or suitably briefed delegate) in a toolbox talk prior to the works commencing.

8.4 Soil Stripping

8.4.1 Before any soil stripping activities take place, the proposed works and phasing will be detailed by the Contractor in the SMP (to include Method Statements, Drawings, Specifications etc.) and issued to National Grid for acceptance. The SMP will provide timescales and sequencing of soil stripping the proposed haul routes. The approaches will be based on the full suite of available soil survey data.

8.4.2 The earthworks will be phased to ensure that the topsoil is stripped in each part of the site ahead of subsoil materials, and that all soils are stripped from a designated area prior to bulk excavation and earthwork activities within that area.

8.4.3 To ensure that the correct soil depths are stripped (to avoid the mixing of topsoil and subsoil resources) all personnel involved in the works will attend a toolbox talk on the identification of topsoil and subsoil resources.

8.4.4 All stripped materials will be logged/tracked in line with the Materials Management Plan.

8.4.5 All stripped soils will be free from significant quantities of foreign matter or other materials which would make the soils unsuitable for their intended re-use.

8.4.6 Immediately prior to stripping, the soil shall be tested for plasticity using the methodology presented in **Appendix B**.

8.4.7 Soil will be stripped using a hydraulic excavator or tracked dozer following the methodology set out in **Appendix D** to minimise the risk of compaction of either topsoil or subsoil materials.

8.4.8 Prior to soil stripping commencing, a toolbox talk will be provided by a Soil Scientist (or suitably briefed delegate) in conjunction with the construction lead, to set out how topsoil and subsoil resources will be stripped and stockpiled separately. This will ensure that any differences between the topsoil/subsoil boundary is understood.

8.5 Soil Stockpiling

8.5.1 Key issues for soil handling, storage and eventual re-use are soil moisture content and soil consistency (plasticity). Soils that are stripped when plastic will need to be reconditioned before re-use for restoration. During the works, soil plasticity status will be determined in situ prior to stripping (see Appendix B) and the test results recorded.

8.5.2 The following principles will be followed for all stockpiled materials, following the methodology presented in **Appendix E**:

- topsoil can be stockpiled on topsoil but subsoil will only be stockpiled on areas where topsoil has been stripped;

- geotextiles will not be used underneath stockpiles due to the difficulty with clean recovery;
- as far as practicable, soils will be stockpiled close to their origin to support successful restoration;
- all stockpiles will be clearly labelled and protected from being trafficked by plant or vehicles;
- stockpiles will not be positioned adjacent to ditches and not within 15 m of a watercourse;
- soil resources will be loose tipped;
- topsoil and subsoil stockpiles will be seeded with a grassland seed mix to maintain slope stability and to prevent erosion or dust generation if they will be used for longer than six months (with other measures used as required, for example to limit dust generation, on stockpiles which will be in place for shorter periods); and
- soil stockpiles will be managed and monitored throughout their lifetime so that they can be maintained in relation to stability and integrity, and any weed growth can be managed in a timely manner.

8.5.3 Separate stockpiles will be created for topsoil, upper subsoil and lower subsoil (if subsoil stripping is required), and stockpiles within each layer will be separated based on soil texture. Documentation and physical control measures (such as signing of stockpiles) will be put in place to prevent accidental mixing and so that soils are segregated according to source location. Where there are spatial constraints, it may be required to stockpile soils up against each other, with physical separation being achieved by means of a geomembrane barrier or marker layer (such as straw) so that no mixing occurs, and the different materials can be effectively separated.

8.5.4 The sides of stockpiles will be smoothed using the back of an excavator bucket to ensure they shed water and to reduce the risk of waterlogging within the core of the stockpile.

8.5.5 Measures to manage and treat site runoff and prevent erosion and dust generation during soil stripping and stockpiling works will be set in place through a series of specific control measures as set out in the Code of Construction Practice for the Sustainable Use of Soils on Construction Sites and in the Onshore Construction Environment Management Plan (CEMP) (**Application Document 7.5.3 Outline Onshore Construction Environmental Management Plan**).

8.5.6 Soil materials will also be stored on like for like where restoration to agricultural use is required.

8.5.7 Construction methodologies will be such that appropriate biosecurity (disease and pest control) and weed control measures are in place to protect both on-site soils and adjacent land holdings.

8.5.8 Locations of stockpiles will be determined by the Site Environmental Manager and/or Project Soil Scientist when pre-construction information is available and will be decided in line with the Defra Construction Code of Practice for the Sustainable Use of Soils on Construction Sites, to avoid compaction and anaerobic conditions.

8.5.9 Stockpile heights of 3-4 m should be used for topsoil that can be stripped and stockpiled in a dry state, but heights may need to be greater where storage space is limited. The precise size and height of the stockpile should be determined by the Site Environmental

Manager and/or Soil Scientist accounting for the amount of space available, the nature and composition of the soil, the prevailing weather conditions at the time of stripping and planning conditions associated with the works, in line with the Construction Code of Practice for the Sustainable Use of Soils on Construction Sites.

8.6 Soil Reinstatement

8.6.1 Where the soils temporarily disturbed throughout the Proposed Project are to be reinstated, the approach set out in **Appendix F** will be followed.

8.6.2 The works required to effectively reinstate a soil profile suitable for the proposed end use and ensure the required soil structure is present and that there is no compaction, will depend on what soil layers have been stripped and the extent of the trafficking over the exposed surface that has occurred. Restoration plans must take account of archaeological restrictions (for example where compaction alleviation is required) and an effective solution found which protects the archaeology and enables appropriate soil conditions to be reinstated).

8.6.3 The sequence required to reinstate the soil profile will be detailed by the Site Environmental Manager and/or Soil Scientist and communicated as a toolbox talk.

8.6.4 Subsoil and topsoil re-use will aim to achieve the following:

- creation of the required combination of topsoil and/or subsoil above the top of the protection tile over the cables to re-create a soil profile with the characteristics required for the proposed use (for example soil profile required to recreate an ALC grade); and
- ensure, through careful handling and placement of soils, no compaction within the restored soil profiles that may limit vegetation establishment and growth, restrict water infiltration etc.

8.6.5 The approach for the checks required and the methodology to be used to reinstate the land at the end of the construction phase will depend on the thickness of soils stripped and the results of compaction testing etc. The approaches set out will be in line with published guidance and will ensure the following:

- deep ripping of the overburden where required prior to the placement of subsoil;
- deep ripping of subsoil which has not been stripped, for example under access roads and compounds;
- each soil layer placed will be mechanically cultivated when in a dry and friable state using appropriate tillage equipment to ensure all compaction is broken up and the soil structure is restored; and
- the soil profile created will be checked by suitably qualified personnel to ensure it is suitable for the proposed end use.

8.6.6 Where soils stripped during the construction phase will not be reinstated and cannot be re-used on site, they will be removed off-site. Prior to any removal off-site, the quantity and characteristics of available soil materials will be assessed, and the soil profiles being reinstated within the Proposed Project will be designed to maximise re-use (ensuring placing more soil does not have any detrimental effects). For example, it will be assessed whether a thicker topsoil layer can be placed. The final soil profile requirements will be detailed within the final landscape plans and a soil re-use summary

report produced by the Site Environmental Manager and/or Soil Scientist to demonstrate how off-site disposal has been minimised.

8.6.7 During re-use works, measures to manage and treat site runoff, and prevent erosion and dust generation will also be set in place through a series of specific control measures as outlined in the Code of Construction Practice (CoCP) (**Application Document 7.5.3.1 CEMP Appendix A Outline Code of Construction Practice**).

8.6.8 During the placement of soil resources in their final location the methods outlined above will be followed. This will include, but not be limited to, the implementation of an access and egress plan for vehicles and plant to prevent unnecessary trafficking of restored areas, use of appropriate scale plant, avoidance of double handling and avoidance of mixing topsoil and subsoil where these materials are required for the restoration of agricultural land. Soil replacement will be undertaken in accordance with the methodology set out in **Appendix F**.

8.7 Aftercare

8.7.1 An aftercare period will be required where soils are reinstated to ensure they recover structure and function and meet the condition required for their end use (e.g., agricultural production, landscaping or habitat creation). Soil aftercare focuses on identifying and rectifying issues such as compaction, poor drainage, inadequate soil depths, or nutrient imbalance during the establishment period.

8.7.2 The Main Works Contractor(s) will prepare an Aftercare Management Plan (or parcel/landowner-specific plans) which will define:

- Purpose and scope, including the aftercare parcels and their intended end uses, which may include (but are not limited to) agriculture, landscaping, habitat, biodiversity net gain (BNG).
- Links to other plans (such as the Landscape and Ecological Management Plan) as required.
- Aftercare stages and duration: duration should be up to 5 years, with scope for early completion if success criteria are met. The Aftercare Plan should set out in tabular format activities for each year/season.
- Success criteria (including anticipated timeframe) for each area/land use.
- Roles and responsibilities: who delivers aftercare measures (e.g. contractor / operator / landowner) and who oversees it (e.g. soils specialist).
- Management commitments: controls on trafficking, timing of operations, vegetation establishment / management, and access controls (e.g. fencing).
- Monitoring programme: soil parameters (e.g. structure, depths / mixing, compaction, drainage / wetness, debris / contamination, vegetation performance, fertility) and frequency / timing of monitoring (to include post-reinstatement and periodic checks).
- Methods: e.g. Visual evaluation of soil structure (VESS)/soil pits, augering and sampling, penetrometer testing, visual drainage / erosion checks.
- Triggers and remedial actions: define how issues will be identified and required corrective measures (e.g. cultivation / subsoiling, drainage repairs, amendments, targeted imports as last resort).

- Reporting and sign-off criteria, including requirements for aftercare monitoring reports, records of interventions, and completion criteria. Completion criteria will include post-reinstatement soil profile checks, and ALC verification. The timing of these is likely to be after 1-3 seasons as a minimum where land is returned to agriculture.

9. Monitoring

9.1.1 To ensure that during soil stripping, stockpiling, and re-use/restoration works the quality of soil materials is not detrimentally affected, monitoring by the Soil Scientist will be undertaken as detailed in Table 9.1.

9.1.2 Responsibility for some repeated tasks, as indicated in the table below, can be delegated to a suitably experienced and trained individual, following the initial monitoring visit. Training would be provided by the Soil Scientist.

9.1.3 Post reinstatement monitoring will be detailed in the Aftercare Management Plan.

Table 9.1 Monitoring requirements

	Monitoring requirement	Responsible
1	Effective clearance of vegetation and arisings from the soil surface – once prior to soil stripping commencing	Project Soil Scientist (can be delegated)
2	Soil plasticity state – prior to soil stripping commencing with additional tests following rainfall events	Project Soil Scientist (can be delegated)
3	Topsoil stripping – correct identification of base of topsoil and minimisation of subsoil incorporation throughout the soil stripping operations	Project Soil Scientist (can be delegated)
4	Subsoil stripping (if required) - correct identification of base of subsoil and minimisation of overburden incorporation throughout the soil stripping operations	Project Soil Scientist (can be delegated)
5	Stockpile construction to ensure no mixing of topsoil and subsoil – throughout the stockpile construction period	Project Soil Scientist (can be delegated)
6	Stockpile condition – checks to record signs of vehicle tracking, erosion, and weed growth and set out remedial measures should issues be identified	Project Soil Scientist (can be delegated)
7	Reinstated soil profiles – check to confirm profile and soil condition is suitable for the proposed end use	Project Soil Scientist

9.1.4 A record of monitoring visits will be created to include the following, shown in Table 9.2.

Table 9.2 Items for monitoring records

No	Information to be Recorded
1	Confirm successful treatment of vegetation
2	Confirmation of soil type (topsoil or subsoil)
3	Soil depth stripped
4	Soil plasticity (determined as ‘plastic’ or ‘non-plastic’)
5	Date(s) stripped, weather conditions during stripping, equipment/plant used for stripping.
6	Stockpile location. Designate each stockpile or stockpile portion as ‘plastic’ or ‘non-plastic’
7	Record any stockpile non-compliance from stockpile inspections. Detail, date, and stockpile location code (refer to Stockpile Inspection Checklist and Stockpile Plan)
8	Reinstated soil profiles characteristics and condition
9	Sign off for each stage

9.2 Reporting of Findings

9.2.1 The findings of all examinations and assessments will be recorded and held by the Contractor for record keeping and to enable actioning of any necessary corrective actions.

9.3 Failures of acceptability criteria and corrective actions

9.3.1 Where the soils are found to be non-compliant in any respect, appropriate means of remediation will be proposed by the appointed Contractor for acceptance by National Grid; once the affected area has been treated it will be reassessed before sign-off.

References

British Standards Institution. (2013). *BS 8601:2013 Specification for subsoil and requirements for use.* London.
British Standards Institution. (2015). *BS 3882:2015 Specification for topsoil.* London.
Department for Food and Rural Affairs. (2009). *Construction Code of Practice for the Sustainable Use of Soils on Construction Sites.*
Department for Food and Rural Affairs. (2009). *Safeguarding our Soils - A Strategy for England.*
Institute of Quarrying. (2024). *Good Practice Guide for Handling Soils in Mineral Workings.*

Appendix A

British Society of Soil Science Professional Standards

DOCUMENT 1

Foundation skills in field soil investigation, description and interpretation

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Background

The investigation of soils in the field, their consistent description according to a recognised scheme, and the interpretation of soil profiles, properties and conditions are generic foundation skills for professional scientists and engineers employed on tasks that relate to the use and/or management of land. This document identifies the minimum qualifications, skills and knowledge which the British Society of Soil Science (BSSS) considers to be required of scientists and engineers conducting field soil investigations.

Qualifications

Professional soil scientists with competence in these foundation skills are likely to have graduated in a relevant science subject. They will also have a number of years of relevant, regular field soil-based experience and will have, or be adequately qualified for, membership of a relevant professional body such as the BSSS.

Minimum competencies

Skills:

1. The ability to dig and/or auger a soil, or to instruct others to do this, so as to **expose a soil profile** to a relevant depth and to then accurately **identify the sequence of horizons** that comprise the soil profile (natural or manmade) using standard reference documents such as The Soil Survey Field Handbook[1]
2. The **design and development of a soil investigation strategy** that is appropriate to the site or landscape to be investigated, and will generate representative soil information at an appropriate scale. This should be based upon the objectives and context of the study, and an understanding of the likely patterns of soil variability
3. The ability to **read and interpret maps/spatial data** of topography, geology, soil and aerial photography in relation to the interpretation of soil conditions; where and when appropriate, conversance with the use of GIS, GPS and mobile technology

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4. The application of a relevant scheme of **field soil description** (such as Soil Survey Field Handbook) and the production and recording of accurate, consistent descriptions of soil profiles or materials. This should normally include the ability to describe soil colour (e.g. using a Munsell soil colour chart[2]) including mottling, soil texture, the properties of the soil surface, soil structure, consistence and porosity
5. The consistent **hand texturing** of particle size distribution in the fine earth, and the description of stones by their frequency, size, shape and rock type
6. The ability to **interpret soil horizons, features and materials** and whole profile descriptions to develop an understanding of the soil environment and its variability within a landscape
7. The ability and understanding required to **sample a soil or the soils of a site** for one or more relevant determinands representative of the soil or site and relevant to the objectives of the study. This may involve the collection of aggregated topsoil samples or horizon bag or tin samples
8. The ability and knowledge required to interpret the results of any soil chemical, physical or microbial analysis
9. The ability to **interpret the relationships between soil and landscape, land use and climate**
10. The ability to **produce accurate and understandable verbal and written reports** of the soil conditions (text and map information as appropriate) at or across the investigation site, with an interpretation of these in a way that is relevant to the context of the investigation (this is amplified by other BSSS PCSS documents in this series)

1 Hodgson, J M (1997) Soil Survey Field Handbook. Soil Survey Technical Monograph No 5, Silsoe

2 Munsell Soil Colour Book, Munsell Colour (2009)

Knowledge:

1. An understanding of **soil development processes** and of the influence of relief, geology, climate, vegetation and soil organisms on soil development
2. A basic knowledge of world and European soils and their taxonomy, and a more detailed knowledge of soil development and taxonomy within the United Kingdom
3. An understanding of the potential for **soil heterogeneity** in space and time, and of the factors that cause and influence variability
4. Knowledge of **soil horizon notation** and, where appropriate, of a relevant scheme for soil classification including the identification of diagnostic horizons, features and materials
5. Knowledge of **local soils and land use history affecting the soils** and of the range of soils developed across the UK and Europe, and of information sources for more detailed information
6. Knowledge of **natural soil properties and conditions** that is sufficient to set soil conditions at an investigation site within the context of natural variability
7. Knowledge and application of relevant **Health and Safety, Environmental and Biosecurity regulations,** including any animal or plant health restrictions in force and all relevant safe working practices
8. Knowledge of the **potential impacts of human activity and of land management** on soil properties and processes
9. Particular specialist knowledge of soil and crop nutrition, soil hydrology, and of the influence of soil on plant and animal ecology may be required in particular circumstances and these are detailed in related PCSS competency documents

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DOCUMENT 4

Soil science in soil handling and restoration

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Background

Large amounts of soil are disturbed during the development of land for urban, industrial/retail and transport uses, for installation of energy networks and for the quarrying of aggregates and minerals. In addition, previously excavated soils are re-instated after mineral working and in the restoration of previously despoiled land to green after-use and to create parks, gardens and landscaped areas within the built environment. Professional soil science has an important role to play in ensuring a successful outcome. Professional competence in managing the restoration of land after soil disturbance builds upon foundation skills in field soil investigation, description and interpretation (BSSS PCSS Document 1). The competencies outlined in BSSS PCSS Documents 6 (Soil science in the establishment, management and/or conservation of natural habitats and ecosystems) and 8 (Soil science in landscape design and construction) will also be relevant depending on the intended after-use of a site.

Qualifications

Professional soil scientists and engineers with competence in soil handling and land restoration will have graduated in a relevant science subject. They will also have a second degree and/or a number of years relevant field experience and will have or be adequately qualified for full membership of a relevant professional body such as the British Society of Soil Science (BSSS).

Minimum competencies

Skills and knowledge:

These are described under a number of sub-headings that relate to different tasks. A professionally-competent scientist or engineer should have the skills and knowledge identified under the **General heading** and **all other headings that are relevant** to the tasks required. Professional soil scientists and engineers working in this sector should be familiar with the Defra Construction Code of Practice for the Sustainable use of Soils on Construction Sites (Defra 2009).

General

1. The ability to investigate, sample, describe and interpret soils in the field in a consistent manner and to professional standards (BSSS PCSS Document 1)
2. The ability and knowledge required to interpret the results of any soil chemical, physical or microbiological analyses

DOCUMENT 4

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3. Knowledge of relevant European and national regulations and policies, including national and local land use planning policy and guidance, and soil protection policy
4. A working knowledge of the industry being advised, whether quarrying, development, infrastructure installation or landscaping
5. The ability to effectively communicate soil information in a simple and relevant form to developers, planners, landscape architects and earthmoving contractors with clear statements as to the reliability and certainty of the results
6. The ability to write accurate reports and/or method statements, written in clear terms, that communicate the relevant information to site planners, site managers, site personnel and eventual users of restored land
7. An awareness of the importance of systems of quality assurance and control in all aspects of professional work

The characterisation of soil resources

1. The know-how to select appropriate survey and sampling densities to characterise *in situ* and stockpiled soil resources to required levels of certainty
2. Understanding of Health and Safety requirements on site and the ability to compile a risk assessment when requested
3. Familiarity with the use and limitations of GPS for determining sampling locations on site
4. Proficiency in fieldwork practices and procedures such as soil texturing, soil description and the delineation of soil resource units (see BSSS PCSS Document 1)

The provision of advice on soil handling

1. A knowledge of the machines used for handling soils, their capabilities and limitations
2. An awareness of methods of soil handling that minimise physical damage to soils and guidance[1] that describes such methods, including management of stockpiled soil
3. An understanding of soil hydrology and physical and engineering properties such as plastic limit, and their relevance to soil handling
4. The ability to calculate volumes of *in situ* soil layers to be moved as well as soil stored in stockpiles
5. A knowledge and understanding of waste management and/or contaminated land regulations that might restrict the export of soil materials off-site or their management within site
6. Familiarity with British Standards relevant to characterising soil materials already on site or being imported to site[2]
7. The ability to prepare a Soil Management Strategy/Soil Resource Plan[3] and simple method statements for site personnel

The restoration of land

1. The ability to characterise existing substrates on site and make best use of them, including chemical or physical amelioration where necessary
2. Knowledge and experience of the uses of manufactured soils and the use of organic materials for soil creation where natural soils are in short supply
3. Understanding of the specific soil chemical and physical conditions (including the principles of soil engineering) necessary for various restored after uses and landforms, such as woodland, Best and Most Versatile agricultural land, wet meadow, species-rich grassland, commercial landscaping, etc.

The aftercare and assessment of restored land

1. The ability to prepare and/or interpret aftercare plans (for those restored land uses where one is required)[1]
2. The ability to assess soil physical quality and make any recommendations for amelioration to create a 'fit-for-purpose' soil profile[2]
3. The ability to take representative soil samples for chemical analysis and to interpret the results to make recommendations for the use of fertilisers[4], lime or other chemical ameliorants[3]

1 for example the MAFF (2000) Good Practice Guide for Handling Soils
2 e.g. BS3882:2007 Specification for Topsoil and Requirements for Use
3 Defra (2009) Construction Code of Practice for the Sustainable Use of Soils on Construction Sites
4 Might necessitate a FACTS qualification where the use is agricultural; see BSSS PCSS Document 10 Soil science in crop and livestock production

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Appendix B

Field Assessment of Soil Plasticity

B.1.1 This annex presents the method for assessing the plasticity (consistency) of soils in the field. This method is to be used to assess soil plasticity at all pertinent stages of the earthworks programme including:

- In-situ before/during soil stripping.
- Storage stockpiles (non-plastic soils only).
- Reconditioning windrows.
- During soil re-spreading and decompaction/cultivation operations.

B.1.2 The procedure is outlined as:

- Walkover/visual examination.
- Soil sampling.
- Sample assessment.

B.2 Walkover/visual examination

B.2.1 The assessor shall first walk over or along the area/field or stockpile/windrow to be assessed in order to identify any apparent significant variability (e.g., evidence of poaching incidents of surface water ponding saturated soils, or distribution of moisture loving plant species such as *Juncus*) and to identify suitable locations for sampling.

B.2.2 In addition to any areas identified from the walkover any locations likely to display varying plasticity to the majority (low lying spots, the base of stockpiles/windrows etc) shall be accounted for when sampling.

B.2.3 Site observations relating soil moisture content and soil plasticity, and the distribution of any significant variability shall be recorded.

B.3 Soil Sampling

B.3.1 For undisturbed areas, the topsoil and upper subsoil shall be sampled at several locations using an Edelman soil auger. Separate samples from each soil layer shall be taken from their full depth.

B.3.2 For stockpiles and windrows, the soil shall be sampled at representative locations using an Edelman soil auger at a range of depths depending on the stockpile size. Where deemed necessary by the Site Soil Scientist, samples from greater depths shall obtained using a suitable sized mechanical excavator.

B.3.3 For each layer approximately, a double handful of soil shall be collected and mixed up in a suitable container.

B.3.4 A minimum of 5 No. locations shall be sampled and assessed per field or stockpile/windrow.

Sample Assessment

B.3.5 The test sample (small handful) shall be taken from the collected sample and prepared for assessment by removing stones and vegetation including all roots greater than 1 mm. Any significant quantity of very fine roots (<1 mm) shall be removed.

B.3.6 The test sample shall be kneaded to break down any structure and ensure the mass is all at the same moisture content and assessed in accordance with the table below.

Table B.1 Handling criteria

Criteria	Action
If the soil sample is wet, films of water are visible on the surfaces of grains and aggregates and/or when a soil sample is squeezed in the hand, and it readily deforms into a cohesive “ball”.	HANDLING NOT RECOMMENDED – IF HANDLED STOCKPILED MATERIAL TO BE RECORDED AS PLASTIC
Peds (structures) break up/crumble readily when squeezed in the hand rather than forming into a ball.	HANDLING OK
If the sample is moist, 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 TRACKED EXCAVATORS IF CONSISTENCY TEST IS PASSED
If the sample is dry and brittle it will look dry and change colour (darken) if water is added	HANDLING OK IF CONSISTENCY TEST IS PASSED

Consistency Test

B.3.7 Attempt to mould a soil sample into a ball by hand:

Table B.2 Consistency test (part 1)

Criteria	Action
Impossible because the soil is too hard (dry)	HANDLING OK
Impossible because the soil is too loose (dry)	HANDLING OK
Impossible because the soil is too loose (wet)	HANDLING NOT RECOMMENDED- If handled, the stockpiled material is to be recorded as plastic

Possible	**PROCEED TO NEXT TABLE**

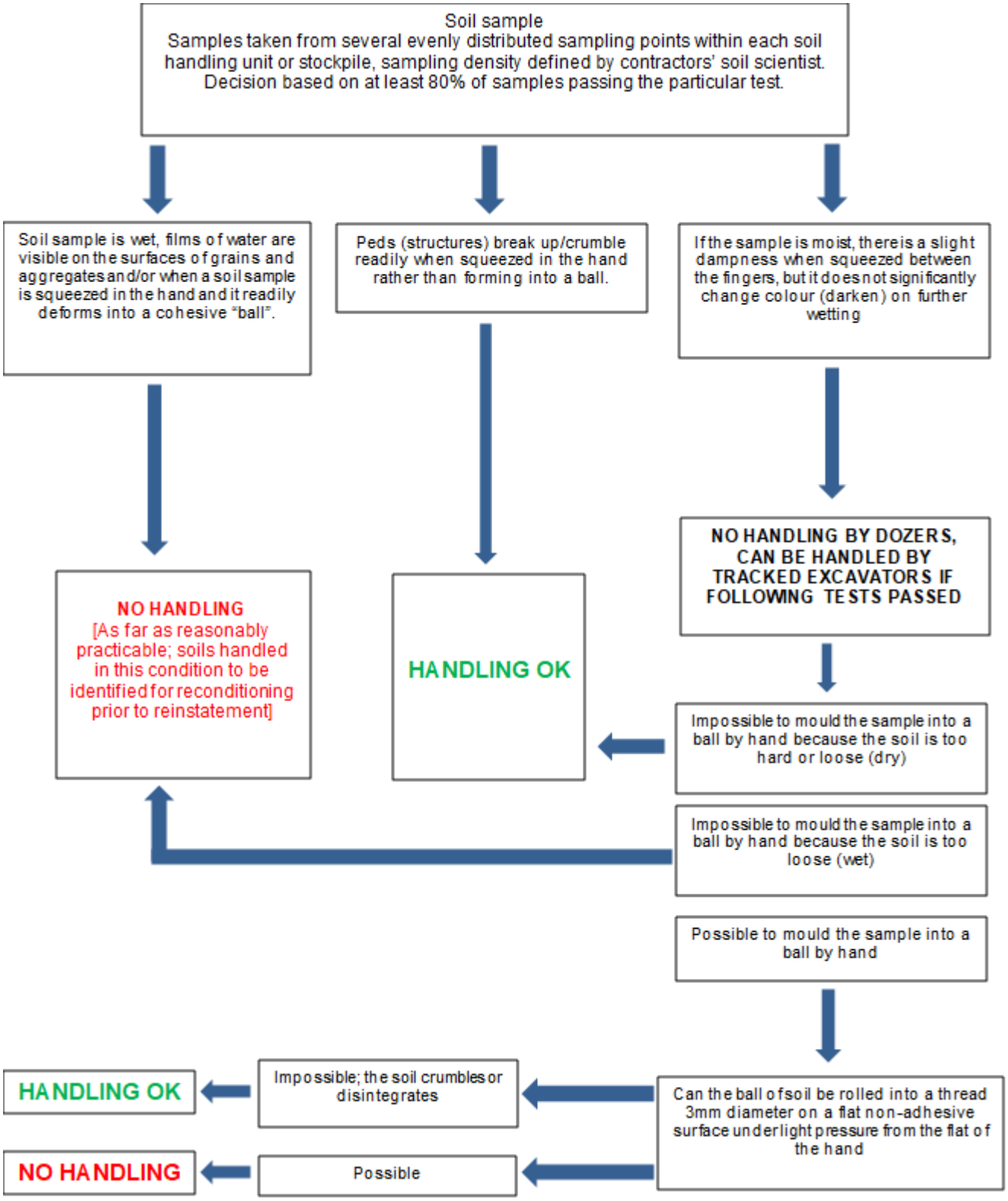
B.3.8 Attempt to roll the ball into a thread of 3 mm diameter on a flat non-adhesive surface using light pressure from the flat of the hand.

Table B.3 Consistency test (part 2)

Criteria	Action
Impossible; the soil crumbles or disintegrates	HANDLING OK
Possible	HANDLING NOT RECOMMENDED- if handled, the stockpiled material is to be recorded as plastic

Appendix C

Wet Weather Cessation Criteria



Appendix D

Soil Stripping Methodology

D.1.1 This appendix sets out the approach to be followed for soil stripping.

Existing Vegetation

D.1.2 Woodlands/hedges shall be pre-treated before soil stripping, in two stages:

- Each tree shall be felled and removed from site, including all branches/brash.
- Tree stumps and associated large roots (>20 mm diameter) shall be lifted using a suitable excavator.

D.1.3 All woody materials (tree trunks, stumps, branches and brash, etc), including wood chippings, shall be removed from the area being stripped and will be managed in accordance with the Site Waste Management Plan. Excessive amounts of woody material will not be incorporated with the stripped soils. The only exception would be where deadwood forms a component of the surface features; in such circumstances a proportion of existing dead wood will be salvaged and used to recreate this habitat.

D.1.4 Any temporary stockpiles of woody materials shall be constructed with a small 'core' to minimise the risk of spontaneous combustion and monitored as appropriate.

D.1.5 Other vegetation will be cleared using an appropriate method. All arisings will be removed prior to soil stripping commencing to ensure significant quantities of green materials are not incorporated with the stripped topsoil as this can lead to the development of anaerobic conditions within the stockpiled soil.

Access routes

D.1.6 Access to each area/compartment to be stripped shall be created by stripping the topsoil, followed by subsoil, to expose the 'basal layer'. The intention is that the receiving dump truck for the rest of the area/compartment shall run on the basal layer to prevent damage to the topsoil or subsoil.

D.1.7 Access shall be created wide enough to permit access for the dump trucks which shall transport the stripped soils to the storage area.

Topsoil Stripping

D.1.8 In advance of stripping, the topsoil shall be cleared of all foreign matter or waste materials e.g. building rubble and fill materials.

D.1.9 All topsoil shall be stripped using tracked dozers and transported using dump trucks, unless being stockpiled to one side of the construction area in accordance with the guidance set out in Ministry of Agriculture Fisheries and Food (MAFF (2000) as shown in the plates below.

D.1.10 The tracked dozer shall run on the surface of the subsoil and push up the topsoil in a single pass into a temporary row at the end of its run. Using a hydraulic exactor, the stripped topsoil shall be loaded onto a dump truck for transportation to the designated stockpile location.

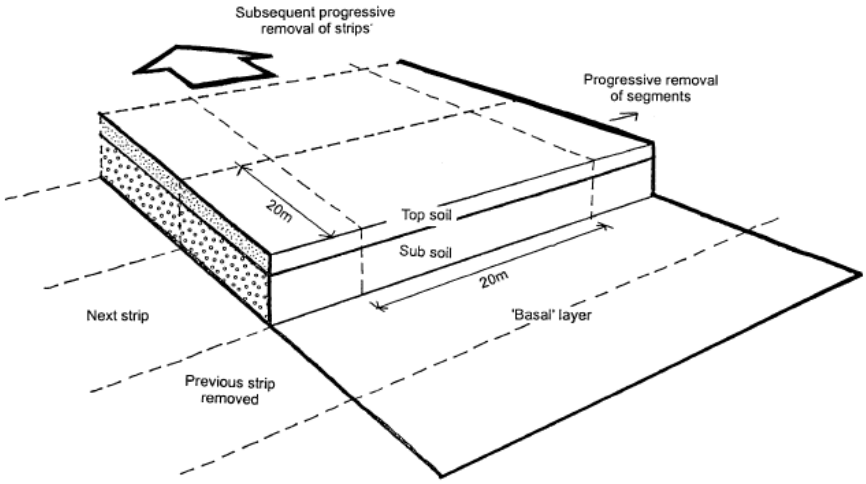


Plate D.1 Soil stripping with bulldozers and dump trucks: the bed and segment system

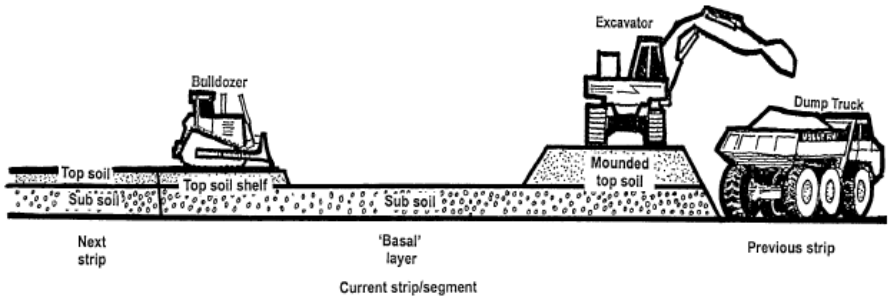


Plate D.2 Soil stripping with bulldozers and dump trucks: Topsoil

D.1.11 The depth of strip shall be as set out on the Soil Stripping Plan. The aim of the topsoil strip is to enable the majority of the topsoil to be recovered without the inclusion of significant quantities of underlying subsoil. Some variation in topsoil depths is expected and therefore some discretion shall be made by the machine operator (based on soil colour and/or firmness) during the topsoil strip to maximise topsoil recovery without compromising the quality of the soil resource.

D.1.12 Once loaded, the dump truck shall transport the topsoil along the pre-designated access route to the desired stockpile location.

D.1.13 These operations shall be closely monitored to ensure that the correct soil type is recovered without the inclusion of other soils or wastes. Cross contamination with subsoil could significantly degrade the quality of the topsoil.

Subsoil Stripping

D.1.14 All subsoil shall be stripped using tracked dozers and transported using dump trucks.

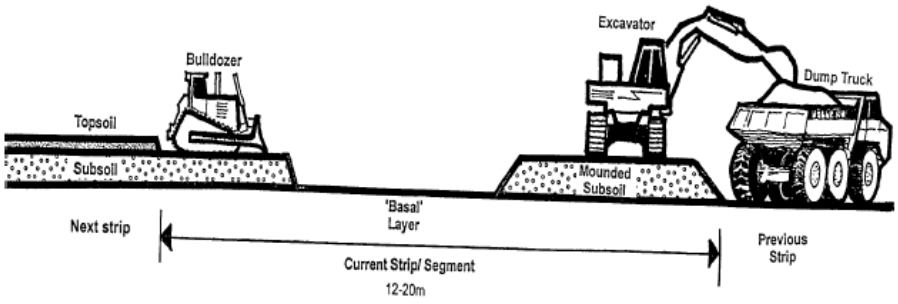


Plate D.3 Soil stripping with bulldozers and dump trucks: Subsoil

D.1.15 The tracked dozer shall run on the surface of the basal layer and push up the subsoil in a single pass into a temporary row at the end of its run. Using a hydraulic exactor fitted with a toothed[2] bucket, the stripped subsoil shall be loaded onto a dump truck for transportation.

D.1.16 Once loaded, the dump truck shall transport the subsoil along the pre-designated access route to the desired stockpile location.

D.1.17 These operations shall be closely monitored to ensure that the correct soil type is recovered without the inclusion of other soils or wastes. Cross contamination with deeper subsoil/parent material could significantly degrade the quality of the subsoil.

[2] Note that any potential for services to be present should be checked and the risk of using a toothed bucket (as compared to a smooth bucket) should be assessed.

Appendix E

Soil Stockpiling Methodology

E.1.1 This appendix sets out the approach for the storage (stockpiling) of soils.

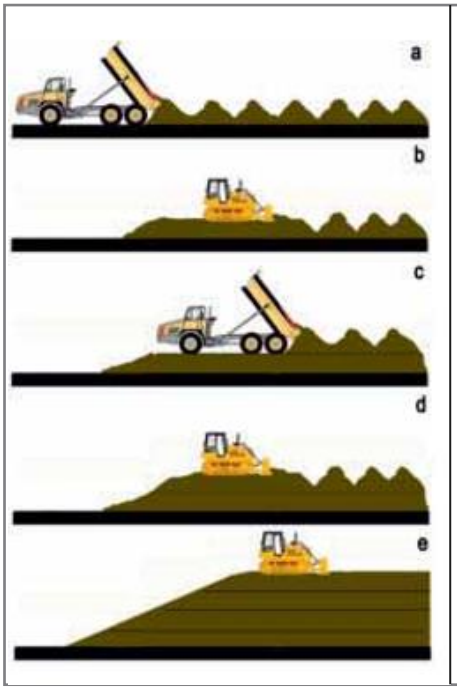
E.1.2 Stockpiling will ensure that topsoil and subsoil resources are stored separately and, where required, soil resources with differing characteristics are also stockpiled separately.

E.1.3 Stockpile locations will be identified in advance and clearly shown on relevant plans such that they do not interfere with other site operations and the risk of stockpiled soil resources becoming contaminated, tracked over etc. is minimised.

E.1.4 The area(s) designated for soil storage shall be cleared of vegetation and stripped, where required ahead of stockpile construction. Topsoil will be stored on top of in situ topsoil, with a marker layer of straw placed first to ensure, at the time of soil recovery, it is clear where the base of the stockpiled material lies. Subsoil will only be stored on subsoil (i.e. in an area where topsoil has been stripped).

Stockpiling Method

E.1.5 The approach illustrated in the graphic below will be used to stockpile non-plastic soils. Ideally, plastic soils will be reconditioned as shown in Appendix F prior to final stockpile creation.



The process requires the soil to be transported to the storage area in a dump truck, and 'loose tipped' in a line of heaps to form a windrow (a).
Once the heaps cover the storage area, a tracked dozer (e.g. D6 Caterpillar) shall level the heaps to form a level, stable platform for dump trucks to travel across to tip a second layer of topsoil. (b and c) This sequence shall be repeated until the maximum stockpile height is achieved (d).
Assuming that the topsoil is reasonably dry and friable during the stripping and storage operation, it shall be heaped to its maximum permitted height for this site.
To protect from wet weather once the final height is achieved, the excavator or blade shall regrade the sides and top of the stockpile to firm the surface by tracking across it to form a smooth gradient. The aim is to seal in the dry topsoil and reduce rainfall/infiltration and stabilise the surface (e).
Once the stockpile has been completed, the area shall be cordoned off to prevent any disturbance or contamination by other construction activities. Any emergent vegetation shall be managed to a maximum height of 300mm and not allowed to 'set seed'.

Plate E.1 Stockpiling Method

Appendix F

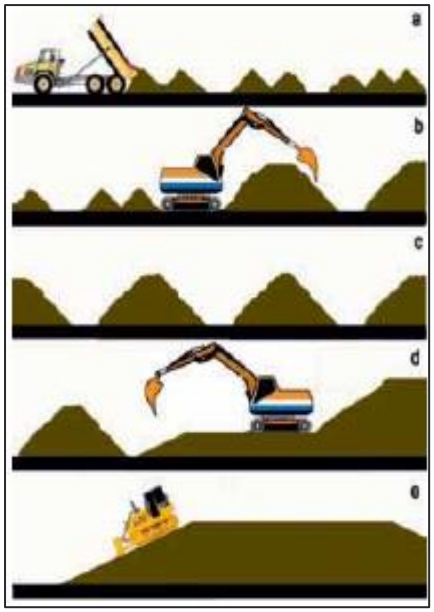
Soil Reconditioning Methodology

F.1.1 This appendix presents the methods for reconditioning plastic soils. All topsoil and subsoil which are plastic in consistency shall be reconditioned using the method presented here.

F.1.2 Soils shall be reconditioned in area(s) of the site where they will not interfere with other site operations so that they can be left undisturbed by other construction activities.

F.1.3 The area(s) designated for soil reconditioning shall be cleared of its' vegetation and stripped of topsoil and subsoil (see Appendix D) ahead of soil reconditioning activities if needed. Where possible soil reconditioning can be undertaken at the re-use location, ensuring that in doing so does not prevent the required preparation of underlying layers.

F.1.4 The Soil Reconditioning Method illustrated in Plate F1.1 below shall be applied to recondition plastic soils in windrows. The method below shows re-stockpiling of soils once reconditioned soils can also be used in restoration immediately.



The soil is tipped in a line of heaps to form a 'windrow', starting at the furthest point in the storage area and working back toward the access point (a).

Any additional windrows are spaced sufficiently apart to allow tracked plant to gain access between them so that the soil can be heaped up to a maximum height of 2m (b).

To avoid compaction, no machinery, even tracked plant, traverses the windrow.

Once the soil has dried out and is non-plastic in consistency (this usually requires several weeks of dry and windy or warm weather), the windrows are combined to form larger stockpiles, using a tracked excavator (d).

The surface of the stockpile is then regarded and compacted (e) by a tracked machine (dozer or excavator) to reduce rainwater infiltration.

Plate F.1 Reconditioning Method

F.1.5 This method enables soil to be stored with a minimum footprint with a maximum stockpile core volume. This reduces the soils exposure to precipitation and ensures that non-plastic soils are kept dry, and their quality is maintained during the storage period.

Appendix G

Soil Placement Methodology

G.1.1 This appendix presents the methods for the placement of the soils. It comprises the following:

- soil handling considerations;
- placement and treatment of overburden;
- subsoil and topsoil placement and spreading; and
- cultivations and monitoring.

Soil Handling Considerations

G.1.2 To avoid further physical degradation during all phases of soil placement and handling (e.g. re-spreading/placement, overburden ripping/subsoiling and topsoil cultivation), these operations will be carried out when soil is non-plastic in consistency. As such, soil handling will be stopped during and after heavy rainfall, and not continue until the soil is again non-plastic in consistency.

G.1.3 Monitoring of the soil placement will be undertaken to ensure the placed soil is not structurally damaged and so any required remedial measures can be implemented as the works progress.

Placement and Treatment of Overburden

G.1.4 The finished surface, prior to the placement of subsoil and topsoil materials, will be loosened through the use of appropriate plant, such as a heavy duty subsoiler/ripper fixed to a tracked dozer. If access is limited, a single rigid tine fitted to a hydraulic excavator will be used to undertake this operation.

G.1.5 The depth of ripping of the overburden will be to 0.4 m, with tine spacing at a maximum of 1 m centres. Any oversized rocks (greater than 0.2 m diameter) that are uplifted to the soil surface during ripping will be picked and removed for use as infill elsewhere.

G.1.6 To ensure effective drainage, ripping shall include a straight run across the width of the area being reinstated at an angle of approximately 45° to any slope followed by a subsequent oblique pass. If assessed as necessary by the Project Soil Scientist, a third pass shall be run at an angle of 90° to the first pass to ensure that there are no remaining blocks of unbroken compacted soil.

G.1.7 As the areas being reinstated are generally narrow linear corridors ripping will be undertaken to ensure tie in with adjacent, non-worked land parcels such that the ripping does not result in subsequent drainage issues on those land parcels.

Subsoil and Topsoil Placement

G.1.8 A sequential approach to subsoil and topsoil placement will be undertaken as outlined below:

Subsoil Placement

G.1.9 Using hydraulic excavator fitted with toothed[3] bucket (to avoid smearing) remove subsoil from stockpiles.

G.1.10 Transport with dump truck to the appropriate re-use location.

G.1.11 Tip subsoil in a line of heaps at the edge of the ripped/subsoiled area to avoid recompaction of the overburden

G.1.12 Spread the subsoil using either a tracked dozer or tracked excavator.

G.1.13 Subsoil depths to be checked by the Soil Scientist to ensure correct subsoil depth is achieved across the reinstatement area.

Topsoil Spreading

G.1.14 Once satisfactory subsoil placement has been achieved, topsoil shall be removed from stockpiles and spread following the same procedures for subsoil above, ensuring that placed and loosened subsoil and overburden is not tracked over.

G.1.15 Topsoil depths to be checked by the Soil Scientist to ensure correct topsoil depth is achieved.

Cultivations and Monitoring

G.1.16 Once the soil profile has been formed, final cultivation will be undertaken. Cultivation will only be undertaken when the soils are dry and friable to the full depth of working to avoid the risk of smearing the soil.

G.1.17 An appropriate tracked machine or tractor fitted with a wing-tine subsoiler will be used for loosening the subsoil (subsoiling). For inaccessible areas, a suitable tracked excavator, fitted with a single rigid tine (ripper tooth) will be used. Loosening will be undertaken to a minimum depth of 0.6 m below surface level at maximum 0.6 m centres.

G.1.18 To ensure good drainage, subsoiling will include a straight run across the width of the reinstatement area at an angle of approximately 45° to any slope followed by a subsequent oblique pass. If assessed as necessary by the Project Soil Scientist, a third pass shall be run at an angle of 90° to the first pass to ensure that there are no remaining blocks of unbroken compacted soil.

G.1.19 After subsoiling the Project Soil Scientist shall assess the subsoil layer to check the effectiveness of the operation. If compaction is still recorded, the above process will be repeated until this is removed.

G.1.20 Once subsoiling has been undertaken successfully, the topsoil will then be cultivated (with repeat cultivations as required) to its full depth using appropriate tillage equipment (e.g. chisel plough, power harrow or set of discs) to produce a suitable tilth. This operation will also help to re-aerate the topsoil after storage (if applicable).

[3] Note that any potential for services to be present should be checked and the risk of using a toothed bucket (as compared to a smooth bucket) should be assessed.

G.1.21 Where access is limited, the topsoil may be cultivated using a landscape rake attachment fitted to a suitable hydraulic excavator.

G.1.22 Any undesirable material brought to the surface during this exercise shall be removed by picking or raking. For example, stones, fill materials and coarse vegetation larger than 50 mm in any dimension.

G.1.23 After topsoil cultivation, the Soil Scientist shall assess the topsoil horizon to check the effectiveness of the operation and to confirm the condition of the topsoil is suitable for the intended end use.

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