The Great Grid Upgrade

North Humber to High Marnham

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North Humber to High Marnham

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Executive summary

Purpose of this Report

National Grid Electricity Transmission plc (National Grid) is developing the North Humber to High Marnham Project (the Project), a proposed new 400 kV electricity transmission connection between East Riding of Yorkshire and Nottinghamshire. The Project would reinforce the national electricity transmission network, enabling the connection of new low carbon energy generation and supporting the delivery of the UK Government's clean power and net zero ambitions. The Project is a Nationally Significant Infrastructure Project (NSIP) for which development consent is being sought through a Development Consent Order (DCO) under the Planning Act 2008 (HM Government, 2008). It is recognised as a critical reinforcement to provide the network capacity required to meet future electricity demand and support the transition to a low-carbon energy system.

This Outline Soil Management Plan (Outline SMP) has been produced for the purpose of setting out the overarching principles, procedures and responsibilities for the sustainable handling, protection, storage and reinstatement of soils during the construction (including mobilisation and pre-mobilisation), operation, maintenance, demobilisation and reinstatement phases of the North Humber to High Marnham Project (the Project).

The Outline SMP establishes a clear framework to safeguard soil resources in accordance with national policy, industry guidance and best practice. It recognises soil as a finite and valuable natural resource that underpins agricultural productivity, biodiversity, water regulation and wider ecosystem services.

The Outline SMP is supported by site-specific survey information detailed in **Application Document 6.13.A2 Environmental Statement Appendix 13.2 Agricultural Land Classification Survey Report**, and identifies key soil constraints, including sensitive soil characteristics. These baseline characteristics inform the soil protection strategy and the specific control measures required during any soil handling works.

The Outline SMP sets out:

- A Soil Protection Strategy to avoid, minimise and mitigate adverse effects on soil structure, function and quality;
- Roles and responsibilities of the Environmental Manager(s) and/or the Environmental Advisor(s), Soil Scientist/Practitioner and Contractor, supported by a checklist to ensure compliance;
- Detailed soil handling measures, including vegetation clearance, soil stripping, segregation of topsoil and subsoil, stockpiling methods, haul route management, soil reconditioning and reinstatement;
- Weather-related controls and criteria for cessation of works to prevent compaction, rutting and structural damage;
- Specific management measures for sensitive soil types, including peaty soils and stoneless soils; and

- Monitoring, reporting and corrective action procedures to ensure that soil handling accords with agreed standards.

This Outline SMP will be developed into the Final SMP pre-construction to reflect final design parameters, construction methodologies and phasing, and site-specific constraints, and submitted to the relevant planning authority and any relevant consultees for discharge prior to the commencement of the development.

1. Introduction

1.1 Overview

1.1.1 National Grid Electricity Transmission plc (National Grid) owns and maintains the national high voltage electricity transmission network throughout England and Wales.

1.1.2 The transmission network connects the power from where it is generated to the regional distribution network operators who then supply businesses and homes.

1.1.3 National Grid holds the Transmission Licence for England and Wales, and its statutory duty is to develop and maintain an efficient, coordinated and economical system of electricity transmission and to facilitate competition in the generation and supply of electricity, as set out in the Electricity Act 1989 (HM Government, 1989).

1.1.4 National Grid has developed plans for the North Humber to High Marnham Project (the Project). The Project would support the UK government's net zero target through the connection of new low carbon energy generation and by reinforcing the transmission network.

1.1.5 The Project would establish a new 400 kilovolt (kV) transmission connection approximately 90 kilometres (km) in length between a new substation to be built in the vicinity of Birkhill Wood, located to the north of Hull near Creyke Beck in the East Riding of Yorkshire, and a new substation at High Marnham in Nottinghamshire.

1.1.6 The reinforcement is needed because the existing transmission network, even with current upgrading, will not have sufficient capacity for the new renewable energy (a substantial proportion of which would be generated by offshore wind) that is expected to connect to the network over the next 10 years and beyond. Completion of the Project, together with other new reinforcements across the country, will meet this future energy transmission demand across the UK.

1.1.7 The Project is a Nationally Significant Infrastructure Project (NSIP), and National Grid is seeking development consent under the Planning Act 2008. NSIPs require a type of planning permission known as a Development Consent Order (DCO). Instead of applying to the local authority for planning permission, the developer must apply to the Secretary of State via the Planning Inspectorate for a DCO.

1.1.8 National Grid has submitted an application for development consent to the Planning Inspectorate for the Project. The Examining Authority (consisting of one or more examining inspectors), after a period of public examination, will make its recommendation to the Secretary of State for Energy Security and Net Zero, who in turn will decide on whether development consent should be granted.

1.1.9 The Project has been identified as being critical to delivering a network which supports the clean power pathways for 2030 delivery.

1.2 Purpose and Structure of the Document

1.2.1 The purpose of this Outline SMP is to provide strategy, guidance and methodology in relation to the soil mitigation measures required to protect soil resources during the stages of pre-commencement operations, construction, post-construction, and operation (including maintenance). Implementation of these measures will ensure the land can be restored to its previous condition or condition suitable for the proposed end use following the completion of the construction phase and any required aftercare period. It will also ensure any surplus soils are suitable for sustainable re-use.

1.2.2 The document provides the overarching principles that are applicable to all areas that form part of the Project with regards to soil management. This includes all land within the Order Limits where soils will be disturbed by the Project (including mobilisation, construction, maintenance and reinstatement).

1.2.3 All pre commencement operations must be carried out in accordance with this document unless otherwise agreed with the relevant planning authority and implement all applicable environmental commitments and monitoring requirements identified in **Application Document 7.3 Register of Environmental Actions and Commitments**.

1.2.4 The Final SMP will be used as a tool by National Grid and the appointed 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 for the Project (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).

1.2.5 The Outline SMP is structured as follows:

- **Section 1:** Introduces the Outline SMP and its purpose;
- **Section 2:** Sets out the guidance used to inform the development of the Outline SMP;
- **Section 3** Presents the soil protection strategy;
- **Section 4:** Defines the roles and responsibilities for implementing the Outline SMP;
- **Section 5:** Summarises the soil baseline information;
- **Section 6:** Provides the basis for calculating soil volumes;
- **Section 7:** Sets out the soil protection and management measures to be applied during the works, including stripping, stockpiling, reinstatement and the management of sensitive soils; and
- **Section 8:** Describes the monitoring, reporting and corrective action requirements.

1.2.6 The supporting appendices to this Outline SMP are as follows:

- **Appendix A:** British Society of Soil Science Competencies;
- **Appendix B:** Soil Plasticity;
- **Appendix C:** Wet Weather Cessation Criteria;

- **Appendix D:** Soil Stripping;
- **Appendix E:** Soil Stockpiling;
- **Appendix F:** Soil Reconditioning; and
- **Appendix G:** Soil Placement.

1.2.7 This Outline SMP will evolve and subsequently further developed into the Final Soil Management Plan (SMP) by the Main Works Contractor(s) prior to construction commencing, taking account of, for example, detailed construction approaches and the Project programme, with more site-specific soil measures added as required.

1.2.8 The Final SMP will be informed by both the detailed Agricultural Land Classification (ALC) surveys undertaken as part of the Environmental Impact Assessment (EIA) process, and soil resource surveys undertaken pre-construction in areas which were not covered by the detailed ALC surveys.

1.2.9 The Final SMP will be produced by the Main Works 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 be returned to agriculture;
- Maps of the soil handling units for topsoil, upper subsoil and lower subsoil (where subsoil resources will be stripped);
- Maps showing the areas to be stripped and those to be left in situ;
- Soil test data where required (such as to inform re-use options);
- 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 Project Description

1.3.1 The Project is a new 400 kilovolt (kV) electricity transmission connection of approximately 90 kilometres (km) in overall length between two proposed new substations: the 400 kV Birkhill Wood Substation and 400 kV High Marnham Substation.

1.3.2 The Project comprises:

- Approximately 90 km of new overhead line (Route Code 4AF) between the proposed new 400 kV Birkhill Wood Substation and 400 kV High Marnham Substation;

- Replacement and re-alignment of a section of the existing 400 kV overhead line (Route Code 4ZQ) between Brantingham and east of Broomfleet;
- Replacement and re-alignment of a section of the existing 400 kV overhead line (Route Code ZDA) between Ealand and west of Keadby;
- Line entry connections to a proposed new 400 kV Birkhill Wood Substation;
- Line entry connections to a proposed new 400 kV High Marnham Substation; and
- The Project would include other required works, for example, temporary diversions for works on existing overhead line routes, temporary access roads, highway works, temporary works compounds, work sites and ancillary works. The Project would also include utility diversions and drainage works. There would also be land required for environmental mitigation, offsetting, compensation and Biodiversity Net Gain (BNG).

1.3.3 The substations are subject to a separate planning application and as such are not covered by this Outline SMP.

1.3.4 A full description of the Project is provided in **Application Document 6.4 Environmental Statement Chapter 4 Description of the Project**.

2. Guidance

2.1.1 This section sets out the guidance used to inform the development of this Outline SMP. The guidance followed in developing the requirements set out in this document are as follows:

- Construction Code of Practice for the Sustainable Use of Soils on Construction Sites (Department for Environment, Food and Rural Affairs, 2009);
- Safeguarding our Soils: A Strategy for England (Department for Environment, Food and Rural Affairs, 2009);
- Good Practice Guide for Handling Soils in Mineral Workings (The Institute of Quarrying, 2021);
- BS 3882:2015 Specification for topsoil (British Standards Institution, 2015); and
- BS 8601:2013 Specification for subsoil and requirements for use (British Standards Institution, 2013).

2.1.2 The development of this Outline SMP is supported by an ALC survey (**Application Document 6.13.A2 Environmental Statement Appendix 13.2 Agricultural Land Classification Survey Report)**, providing baseline information on the soil resources present and the grade of the agricultural land present within the Order Limits.

3. Soil Protection Strategy

3.1.1 Soil is a vulnerable and non-renewable resource; therefore, care must be taken throughout all handling, transporting, and stockpiling activities so that soil resources are protected and conserved for future use. Section 4 to 8 of this Outline SMP describe how the management of soils will be controlled, and how soils will be protected and their quality conserved throughout all stages of the work.

3.1.2 Where soils are handled or disturbed, appropriate controls are required to maintain soil condition and minimise the potential to impacts on soil quality or function. Without suitable controls, soil handling activities may increase the likelihood of the following effects:

- Soil erosion, which reduces soil volume, rooting depth and nutrient availability and may increase sediment loading to adjacent watercourses;
- Changes in soil organic matter, which can influence nutrient availability, soil moisture-holding capacity and soil fertility, with potential implications for vegetation establishment and long-term growth;
- Soil compaction which can affect of soil structure, permeability, aeration and rooting potential; and
- Changes in soil biological activity.

3.1.3 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.

3.1.4 Measures provided in this Outline SMP on how soils on-site will be stripped, handled, and stored appropriately for re-use (where relevant) will be further developed in the Final SMP.

4. Roles and Responsibilities

4.1 Overview

4.1.1 The effective implementation of the soil management measures will be the responsibility of the Environmental Manager(s) and/or the Environmental Advisor(s) of the Main Works Contractor(s). They will have sufficient training and expertise in assessing soils, soil conditions and soil handling operations to ensure the measures outlined within this Outline SMP can be implemented, supervised and monitored effectively.

4.1.2 Where works are being undertaken on existing overhead or underground third party services (for example Distribution Network Operator) low voltage power lines or telecommunication lines and are not being undertaken by the Main Works Contractor(s) (i.e. are being undertaken by or on behalf of the asset owner) the approach to soil management set out in the works plans will be in accordance with the relevant aspects of the Final SMP.

4.1.3 The Environmental Manager(s) and/or the Environmental Advisor(s) will be supported by a Soil Scientist/Practitioner appointed by the Main Works Contractor(s), who will provide the training required and who will undertake the monitoring visits and audits. The Soil Scientist/Practitioner will have the necessary training, qualifications and experience, having achieved the Soil Professional Competence Standards No. 1 (Foundation skills in field soil investigation, description, and interpretation) and No. 4 (Soil science in soil handling and restoration), as set out by the British Society of Soil Science Competencies).

4.1.4 Further details of the responsibilities of these roles are set out below. Once developed the Final SMP will expand on the roles detailed below and will describe the roles of all who have responsibility for the implementation of the requirements of the SMP.

4.2 Environmental Manager and/or Environmental Advisor

4.2.1 The Environmental Manager(s) and/or the Environmental Advisor(s) will be responsible for planning, overseeing and carrying out routine inspections of soil management activities to ensure these are being undertaken in line with the requirements of the SMP.

4.2.2 Where appropriate, the Environmental Manager(s) and/or the Environmental Advisor(s) may delegate these activities to individuals with sufficient training and expertise where required. The Environmental Manager(s) and anyone with delegated responsibility will undertake training provided by the appointed Soil Scientist/Practitioner.

4.2.3 The Environmental Manager(s) and/or the Environmental Advisor(s) will be responsible for ensuring:

- Access arrangements are managed so that construction traffic follows the proposed access track alignments wherever practicable, with off-route access avoided unless required to enable specific works and controlled through the measures set out in this Outline SMP;

- Effective vegetation and foreign matter clearance prior to soil stripping commencing;
- Undertaking of soil plasticity testing (methodology and description in Appendix B) ahead of soil stripping commencing, with additional checks undertaken if rainfall results in works having to be stopped/recommenced due to rainfall/wet ground conditions;
- Effective separation of soil types and layers during stripping and in stockpiles;
- Effective stockpile construction and monthly visual inspections of stockpile condition; and
- Effective backfilling of each layer in the correct sequence (where backfilling is required).

4.2.4 The Environmental Manager(s) and/or the Environmental Advisor(s) will be responsible for reporting on all soil stripping and stockpiling activities through recording the following:

- Confirmation of effective vegetation clearance and the removal of arisings;
- Confirmation that topsoil and subsoil resources have been correctly identified;
- Records of soil plasticity test results;
- Data relating to the volume and type of topsoil and subsoil excavated, transported and stockpiled;
- Stockpile location and condition, with reference to finalised site and landscaping plans; and
- Thickness of each layer replaced, where soil reinstatement is required, with reference to finalised site and landscaping plans.

4.3 Soil Scientist/Practitioner

4.3.1 The appointed Soil Scientist/Practitioner will be responsible for the provision of expert and technical soils advice throughout the earthworks and the subsequent site reinstatement activities. The role includes liaison with the Site Manager and any other personnel/organisations, as relevant to works affecting soils.

4.3.2 The appointed Soil Scientist/Practitioner will be responsible for training key site staff in the identification of topsoil and subsoil which are suitable for re-use, so that accurate segregation of these resources can be achieved. The Soil Scientist/Practitioner will also provide training on the assessment of soil plasticity status based on the field technique provided in
Soil Plasticity.

4.4 Roles and Responsibilities Checklist

4.4.1 Table 4.1 summarises the split of responsibilities across the two roles described above.

Table 4.1 – Roles and responsibility checklist

Main activity	Sub-activities	Frequency	Responsible	Qualifications
Training	Presentation of key aspects of soil management	Once, at start of site preparation works	Soil Scientist/Practitioner	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	Once, at start of site preparation works		
	Soil plasticity assessment	Once, at start of site preparation works		
	Toolbox talks	To be agreed with Environmental Manager(s)		
Checks and inspections	Adherence to construction access track alignments and compliance with no off-route access, including determining appropriate locations for the use of soil stabilisation if this approach is proposed.	Throughout soil stripping operations	Environmental Manager(s) and/or the Environmental Advisor(s)	In-house training provided by qualified Soils Scientist/Practitioner (with monitoring by the Soil Scientist/Practitioner to check works)
	Vegetation and foreign matter clearance	Ahead of soil stripping		
	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		

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		
	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		
	Stockpile construction	Continuous until soil stockpiling complete, and stockpiles prepared for storage period		
	Inspection of soil storage stockpiles	Monthly		
	Assessment of soil condition (including plasticity) within stockpiles prior to re-use	Prior to re-use from each stockpile	Soil Scientist/Practitioner	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)	Throughout soil stripping operations		
	Inspections of restored soil profiles	Continuous until soil placement complete		

Main activity	Sub-activities	Frequency	Responsible	Qualifications
		Checks will be undertaken as each layer is backfilled		
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/Practitioner	An individual with the necessary 'Foundation Skills', having achieved the soil professional competence standards set out by the British Society of Soil Science
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)		
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 until the end of construction for that phase.	Monthly audits will be undertaken internally by the Soil Scientist/Practitioner or appropriately qualified delegate. Annual audits will be undertaken by an appropriate member of the Quality Team.	

5. Soil Baseline

5.1 Desk Study

5.1.1 The soil baseline will be incorporated into the SMP, including soil data from the ALC survey and additional soil data collected from pre-construction soil surveys in areas not covered by the detailed ALC survey. The soil baseline includes, but is not limited to, the following information:

- Soil types (including soil textures and the main soil types present);
- Soil type map of the different topsoil and subsoil resources;
- Thicknesses of topsoil and subsoil;
- Soil depth map;
- Potential site-won soil volume; and
- Estimated soil balance (based on average thicknesses of soil horizons and areas/depths to be stripped) where potential for surplus to be generated.

5.1.2 Detailed ALC survey information for land within the Order Limits is set out in **Application Document 6.13.A2 Environmental Statement Appendix 13.2 Agricultural Land Classification Survey Report**.

5.1.3 Based on published mapping, the soil associations expected within the Order Limits comprise:

- Aberford: Shallow, locally brashy, well-drained calcareous fine loamy soils over limestone. Parent material: Permian, Jurassic, and Eocene limestone.
- Andover 1: Shallow, well-drained calcareous silty soils over chalk on slopes and crests. Deep calcareous and non-calcareous fine silty soils in valley bottoms. Striped soil patterns locally. Parent material: Chalk.
- Blackwood: Deep, permeable sandy and coarse loamy soils. Parent material: Glaciofluvial drift.
- Blacktoft: Deep, stoneless, permeable calcareous fine and course silty soils. Some calcareous clayey soils. Groundwater controlled by ditches and pumps. Flat land. Parent material: Marine alluvium.
- Brockhurst 2: Slowly permeable, seasonally waterlogged reddish fine loamy over clayey and clayey soils. Some reddish clayey alluvial soils affected by groundwater. Parent material: Permo-Triassic reddish mudstone and alluvium.
- Burlingham 2: Deep, fine loamy soils with slowly permeable subsoils and slight seasonal waterlogging. Some slowly permeable, seasonally waterlogged fine loamy soils. Some well-drained, fine and coarse loamy soils. Parent material: Chalky till.
- Compton: Seasonally wet, deep, stoneless, mostly reddish clayey soils affected by groundwater. Parent material: Reddish river alluvium.

- Downholland 2: Deep, stoneless, clayey or calcareous silty soils, mainly with a humose surface horizon. Parent material: Marine alluvium.
- Foggathorpe 2: Slowly permeable, seasonally waterlogged stoneless clayey and fine loamy over clayey soils. Parent material: Glaciolacustrine clay.
- Holderness: Slowly permeable, seasonally waterlogged fine loamy soils and similar soils with only slight waterlogging. Some narrow strips of clayey alluvial soils. Parent material: Chalky till.
- Hunstanton: Deep, well-drained, often reddish fine loamy and course loamy soils. Some similar calcareous soils over chalk. Parent material: Till and glaciofluvial drift over chalk.
- Isleham 2: Deep, permeable sandy and peaty soils affected by groundwater. Parent materials: Glaciofluvial drift and peat.
- Landbeach: Permeable calcareous coarse loamy soils affected by groundwater over chalky gravel. Parent material: Glaciofluvial sand and gravel.
- Newchurch 2: Deep, stoneless, mainly calcareous clayey soils. Groundwater controlled by ditches and pumps. Flat land. Risk of flooding in places. Parent material: Marine alluvium.
- Newport 1: Deep, well-drained sandy and coarse loamy soils. Parent material: Glaciofluvial drift.
- Panholes: Well-drained calcareous fine silty soils over chalk. Associated similar shallow soils and deeper non-calcareous fine silty soils. Parent material: Chalk.
- Romney: Deep, stoneless, permeable calcareous course and fine silty soils. Flat land. Groundwater controlled by ditches and pumps. Parent material: Marine alluvium.
- Whimple 3: Reddish fine loamy or fine silty over clayey soils with slowly permeable subsoils and slight seasonal waterlogging. Some similar clayey soils on brows. Slowly permeable, seasonally waterlogged fine loamy and fine silty over clayey soils on lower slopes. Parent material: Drift over Permo-Triassic and Carboniferous reddish mudstone.
- Willingham: Extremely calcareous silty and clayey soils, in places humose and often over peat. Parent material: Lake marl, tufa and peat.
- Worcester: Slowly permeable, non-calcareous and calcareous reddish clayey soils over mudstone, shallow on steeper slopes. Associated with similar non-calcareous fine loamy over clayey soils. Slight risk of water erosion. Parent material: Permo-Triassic reddish mudstone.

5.2 ALC Survey

5.2.1 The ALC survey (**Application Document 6.13.A2 Environmental Statement Appendix 13.2 Agricultural Land Classification Survey Report**) establishes soil baseline information across the Project detailing soil physical properties, which supports decisions regarding the approaches to outline soil handling management, soil sustainable re-use (i.e., supporting landscape design and planting) and soil export, if required.

5.2.2 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 limitation; for full methodology please see **Application Document 6.13.A2 Environmental Statement Appendix 13.2 Agricultural Land Classification Survey Report**).

5.2.3 The distribution of grades, and presence of Best and Most Versatile (BMV) land, based on the detailed ALC surveys by area and percentage, is set out in Table 5.1 below.

5.2.4 The detailed ALC site surveys undertaken for the Project have confirmed the presence of BMV land within the Order Limits, as shown on **Application Document 6.13.F7 Figure 13.7 Detailed Agricultural Land Classification Survey Map**. In larger areas where the ALC surveys could not be undertaken due to landowner access constraints, ALC grades were determined using predictive ALC mapping. These larger areas, distinguished from directly surveyed sections, are represented by the hatched infill on **Application Document 6.13.F7 Figure 13.7 Detailed Agricultural Land Classification Survey Map**, clearly indicating where predictive mapping has been applied.

Table 5.1 – ALC grade distribution

Route Section	Grade Distribution (ha) & Percentage (%)							Subtotal	
	1	2	3a	3b	4	5	Other	BMV*	Non-BMV
A	13.04	36.07	165.74	197.58	16.32	0.17	51.97	214.84	266.04
B	149.36	43.75	20.68	39.54	0.00	0.00	17.25	213.78	56.79
C	21.99	29.38	40.56	9.63	0.00	0.00	14.22	91.92	23.85
D	39.70	39.03	67.05	90.09	0.00	0.00	12.10	145.78	104.18
E	4.33	89.85	213.82	104.08	0.00	0.00	12.98	308.00	117.06
F	0.00	35.19	35.42	4.82	0.00	0.00	1.86	70.60	6.68
TOTAL	**228.41 [14.10%]**	**273.26 [16.87%]**	**543.26 [33.54%]**	**445.73 [27.52%]**	**16.32 [1.01%]**	**0.17 [0.01%]**	**112.37 [6.94%]**	**1044.93 [64.52%]**	**574.60 [35.48%]**

* 58.8 % of the total BMV land has been determined by Predictive ALC mapping

6. Calculation of Soil Volumes

6.1.1 The Final SMP will detail soil stripping, storage, and reinstatement plans based on soil volume calculations using the data collected from pre-construction surveys. This information will also be used to develop the Final 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 6.13.A2 Environmental Statement Appendix 13.2 Agricultural Land Classification Survey Report** for the current available survey dataset.

6.1.2 The tracking of actual moved and stockpiled volumes of both topsoil and subsoil will be undertaken (through the use of stripping and stockpile records) to allow the reinstatement 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).

6.1.3 Where land is to be returned to agricultural use, there is a commitment to return the land to pre-construction condition, including ALC grades (as set out in **Application Document 6.13 Environmental Statement Chapter 13 Agriculture and Soils**). 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.

6.1.4 Where land is to be restored in accordance with **Application Document 7.8 Outline Landscape and Ecology Management Plan** which details the habitats to be created, topsoil and subsoil resources may need to be mixed to create the suitable soil resources required for the reinstatement of the land. The Final SMP will align with **Application Document 7.8 Outline Landscape and Ecology Management Plan** and will detail where soil horizons will need to be mixed to ensure both adequate volumes of material, as well as minimising any surplus soil materials.

6.1.5 Where target habitats, such as species-rich grassland, are proposed, soil testing in line with BS 3882:2015 (British Standards Institution, 2015) will be undertaken to ensure that soil resources are suitable for establishing and maintaining the intended plant communities. 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/Practitioner to design and undertake the required testing, as well as develop further reconditioning or amendment treatments, where soils do not meet requirements. 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.

7. Soil Protection Measures

7.1 Introduction

7.1.1 This Outline SMP describes procedures for soil stripping, handling, transporting, storing, and reinstatement of soils to maintain, as far as practicable, their soil quality and viability as required for the proposed end uses.

7.1.2 There will be a number of control measures implemented at each stage of the works, a summary of which is outlined below and described in more detail in the following sections.

7.1.3 Early soil protection measures:

- Measures for *in situ* soil protection during early site access and clearance activities;
- Soil recovery and storage (soil stripping and stockpiling);
- 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.

7.1.4 Soil reconditioning (for use where required):

- Measures to recondition wet and plastic soil resources before re-use; and
- Measures to ensure correct segregation of different topsoil and subsoil resources; measures for handling and to optimise soil drying and re-aeration.

7.1.5 Soil reinstatement methods:

- Soil requirements 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 in accordance with the need for a Site Waste management Plan (Commitment Reference GG24; **Application Document 7.3 Register of Environmental Actions and Commitments**).

7.1.6 Monitoring:

- Monitoring programme: Soil assessment procedures for (a) soil stripping and storage, (b) soil reconditioning, and (c) reinstatement activities;
- Acceptability criteria for soil storage, reconditioning and soil replacement activities; and
- Failures of acceptability criteria and corrective actions.

7.1.7 Quality control and auditing measures:

- Quality control, auditing procedures and plans;
- Criteria for cessation of works;
- Non-compliances and corrective actions; and
- Use of toolbox talks for staff training.

7.2 Use of Toolbox Talks

7.2.1 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 at the site.

7.2.2 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);
- Stockpile creation;
- Assessment of soil plasticity using the techniques set out in Soil Plasticity; and
- Soil reinstatement approach (where required).

7.2.3 The suite of toolbox talks will be developed by the Soil Scientist/Practitioner, in collaboration with the Environmental Manager(s).

7.3 Wet Weather Working and Cessation of Works

7.3.1 Soils shall only be trafficked and handled when they are in a reasonably dry and friable state, where they have passed the test for soil plasticity (as described in Soil Plasticity), which is when soil structural units are least susceptible to damage by compaction and smearing.

7.3.2 The soil plasticity tests shall apply to all soil materials that are to be tracked over and handled (to include stripping, stockpiling and reinstatement). All soil plasticity tests shall be carried out by a competent Soil Scientist/Practitioner, or an individual who has been trained by the appointed Soil Scientist/Practitioner.

7.3.3 Soil stripping operations must be suspended under the following conditions, and not restarted until the ground has had at least a full dry day, or the soil moisture criteria set out in Soil Plasticity have been met, to allow the restarting of soil handling operations:

- Sustained heavy rainfall (e.g. >10 mm in 24 hours) which leads to waterlogged soils or pools or water on the ground surface.
- The ground surface is frozen or covered by snow

7.3.4 The Environmental Manager(s) and/or the Environmental Advisor(s) (in collaboration with the Soil Scientist/Practitioner, 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.

7.3.5 The ALC survey results (**Application Document 6.13.A2 Environmental Statement Appendix 13.2 Agricultural Land Classification Survey Report**) will be used to identify areas of ground which are most likely to be affected by waterlogging, for example those with Wetness Class IV, V or VI; and soil associations such as Foggathorpe 2 and Newchurch 2 which are noted as being of high sensitivity to handling (soils with high clay proportions in areas with Field Capacity Days over 150). These areas will be defined and works scheduled to prioritise these areas during drier months where possible.

7.3.6 In some exceptional cases, it may be necessary to 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/Practitioner prior to work commencing. Where soil handling operations continue when soils have become plastic, the soil materials will be clearly tracked as plastic so that effective reconditioning measures can be implemented at the appropriate time.

7.4 Public Notification and Communications

7.4.1 The Main Works Contractor(s) will implement a system for the provision of information to local residents and occupiers about the works. A community relations team will be appointed to provide dedicated community relations and external communication support during construction. The information to be provided to local residents will be specific to the works to be carried out, describing the nature of the works, the location and extent of the works, the duration of works, and the hours to be worked.

7.4.2 Local residents will be informed of the commencement and likely duration of the construction work activities through community liaison in accordance with control and management measure GG28 detailed in **Application Document 7.3 Register of Environmental Actions and Commitments**. The letter(s) will be tailored to a specific area and will reflect the works to be carried out and the duration of works. The letter will include a contact telephone number for public information. In addition, an emergency number will be displayed at the entrance to the compounds.

7.4.3 The name and contact details for the Project will be displayed at the entrance to the main site compound. This will include an emergency telephone number. In addition, details of the works, including contact details, will be provided to the relevant community groups, such as the local parish councils and landowners before work commences.

7.4.4 A free telephone Project helpline and Project website will be maintained and managed by the National Grid community relations team. The Project helpline and website information will be visible on boards placed in appropriate locations where they will be visible to the public, including the main site compound. The telephone number and Project website details will be provided to the relevant LPA and other relevant parties.

7.4.5 The community relations team will record the details of any complaints and how these are to be investigated and appropriately managed. Further details about the complaints procedure can be found in **Application Document 7.2 Outline Code of Construction Practice**.

7.5 General Soil Management Measures

7.5.1 This section sets out further details of soil management measures.

General Soil Protection Measures

7.5.2 Plant and other site vehicles will be managed so that they do not directly traffic across in situ topsoil. The exception to this would be where vehicles are required to track over in situ topsoil for access to enable specific works to be undertaken (to include access required to strip topsoil), and either the activity will not result in damage to soil resources, or the consequences can be managed through the measures set out in this Outline SMP. In cases where remedial measures would be required as a result of the trafficking, these will be agreed with the Soil Scientist/Practitioner.

7.5.3 Where required, trackway will be used if vehicle access is necessary over unstripped soils, and the access could result in irreversible compaction/rutting, particularly if soils are in a plastic state (based on the soil plasticity test set out in Appendix B). 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/Practitioner once the trackway is lifted. The assessment will identify the required remedial measures (such as depth of loosening required). Archaeological mitigation will be put in place prior to any soil decompaction measures being implemented (where necessary).

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

7.5.5 There will be no lay-down of materials, except for those materials required for specific ongoing construction activities, on top of unprotected topsoil outside designated storage areas.

7.5.6 Subject to ground conditions and confirmation from the Environmental Manager(s) and/or Soil Scientist/Practitioner, materials can be temporarily stored on topsoil if it is considered that this (both storage and access) will not be detrimental to soil quality.

7.5.7 All areas that will not be stripped will be clearly demarcated with appropriate signage to help prevent plant and other site vehicles from tracking across *in situ* topsoil, with any access outside demarcated areas avoided unless required to enable specific works and controlled through the measures set out in this Outline SMP. Other potential constraints, such as those relating to landowner boundaries, flood zones or archaeologically/ecologically sensitive features, will also be clearly demarcated, recorded on an operations site plan, and specific toolbox talks delivered in relation to any additional requirements. For all locations where soils will be disturbed (through stripping, tracking over or topsoil storage), reference should be made to the Written Schemes of Investigation (if required) to ensure all required archaeological mitigation is in place for that location.

7.5.8 If site access arrangements change as works progress, all personnel will be made aware of the new arrangements through a toolbox talk or site briefing which will be prepared by the Soil Scientist/Practitioner and delivered prior to the commencement of the works.

Removal of Existing Vegetation

7.5.9 Prior to soil stripping commencing, any vegetation will be cleared and arisings removed (where deemed necessary to ensure large quantities of green vegetative material or woody materials do not get mixed with the stockpiled soils). All vegetation clearance will be undertaken with the necessary ecological controls in place, as set out in **Application Document 7.3 Register of Environmental Actions and Commitments**.

7.5.10 The method used will depend on the nature of the vegetation present. The removal/coppicing operation should ensure the vegetation is removed to a suitable level and all arisings (including chipped wood material) are removed (where deemed necessary) prior to soil stripping. Vegetation clearance will be undertaken by best practicable methods (in line with the commitments secured in **Application Document 7.3 Register of Environmental Actions and Commitments**); however, blading off vegetation using a bulldozer or excavator will not be permitted.

7.5.11 All vegetation removal/coppicing 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.).

7.5.12 The potential risks from vegetation clearance will be identified by the Soil Scientist/Practitioner (or suitably briefed delegate) in a toolbox talk prior to the works commencing. Soil plasticity tests will be undertaken, as detailed in
Soil Plasticity, to minimise the risk of soil damage (as vegetation clearance will require tracking over unstripped topsoil).

Archaeological Works

7.5.13 Soil management measures to be implemented during pre-commencement archaeological works will be included in the Site Specific Written Scheme of Investigations (SSWSI) for that stage/sub-stage. The scope of pre-construction archaeological works, which includes on-site recording and off-site post-excavation assessment, analysis, publication and archiving, is detailed in the Outline Archaeological Written Scheme of Investigation (**Application Document 7.9 Outline Archaeological Written Scheme of Investigation**) and has been agreed with Historic England and the Archaeological Advisors to the relevant local planning authorities (LPAs).

7.5.14 In Line with commitment H02 (**Application Document 7.3 Register of Environmental Actions and Commitments**) the Archaeological Clerk of Works (ACoW) will verify that necessary archaeological works, if applicable for that construction area, have been completed and signed off by the relevant local authority archaeological advisor, as detailed in **Application Document 7.10 Outline Cultural Heritage Management Plan.** Areas within the Order Limits that require a level of pre-construction archaeological work are detailed in the Figures that accompany **Application Document 7.9 Outline Archaeological Written Scheme of Investigation**.

7.5.15 Where archaeological works are being carried out as part of the main Project (i.e. not pre-commencement operations), the measures in the SMP along with the requirements of the SSWSI will be followed. There may be additional archaeological investigations/mitigation required in areas where topsoil has not been stripped but

the surface has been tracked over and soil compacted. Where soil compaction is identified, an archaeological mitigation strategy will be developed and implemented.

7.5.16 Further details on the relationship between the measures secured in this outline SMP and the proposed archaeology mitigation can be found in **Application Document 7.10 Outline Cultural Heritage Management Plan**.

Subsoil stabilisation

7.5.17 Subsoil stabilisation techniques may be used in appropriate locations (as determined by the Soil Scientist/Practitioner) where arrangements can be agreed with landowners. These techniques have the potential to reduce the depth of stone required for the haul roads by approximately a third in ideal conditions, with the benefit of reducing vehicle movements. After the stripping of topsoil (to be stored in a separate bund to the side of the haul roads), and potentially the excavation of some subsoil material, one of a number of different treatments would be applied/mixed with the subsoil. The treatments use various means to bind the subsoil material together to form the base for the road and are then topped by imported stone (which may also be treated) to provide a running surface. Once any treated roads are no longer required, and after removal and recycling of the upper layers of stone surfacing, further treatments (chemical and/or mechanical) would be used to unbind the subsoil.

7.5.18 Any excavated material would be reused and replaced where practicable (ensuring topsoil is replaced above subsoil), with the site returned to its prior use and handed back to the landowner. Subsoil stabilisation would only be adopted where it would result in no materially different effects to those assessed in the Environmental Statement (ES). The Soil Scientist/Practitioner would develop an appropriate testing schedule to confirm the suitability of any soil stabilisation approach.

Soil Stripping

7.5.19 Before any soil stripping activities take place, the proposed works and phasing will be detailed by the Main Work Contractor(s) in associated Method Statements or Work Package Plans and issued to National Grid for acceptance.

7.5.20 Immediately prior to stripping, the soil shall be tested for plasticity using the methodology presented in
Soil Plasticity. The earthworks will be phased to ensure that the topsoil is stripped and stockpiled 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.

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

7.5.22 All stripped materials will be logged, tracked and labelled, in line with the movement and tracking systems.

7.5.23 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. Foreign matter is defined as construction materials (such as wood, metal and plastic) that have been imported onto the site. It also includes large natural stone materials that have been brought to the surface, and which would result in a change to the natural soil characteristics and ALC grade for that specific location. These would be removed

from the soil profile using an appropriate means (such as riddling) at the point of reinstatement.

7.5.24 Soil will be stripped in accordance with specific Method Statements or Work Package Plans agreed between the Main Works Contractor(s) and National Grid. An example methodology is set out in Soil Stripping Appendix D Soil Stripping.

The final methodology will follow published guidance and be designed to minimise the risk of compaction of either topsoil or subsoil materials.

7.5.25 Prior to soil stripping commencing, a toolbox talk will be provided by the Soil Scientist/Practitioner (or suitably briefed delegate) in conjunction with the Construction Manager, 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.

7.5.26 The Method Statements or Work Package Plans will define how soils will be transported to the landscape bund or stockpile locations where required.

Soil Stockpiling (excluding peaty soils)

7.5.27 Key issues for soil handling, storage and eventual re-use are soil moisture content and soil consistency (plasticity). During the works, soil plasticity status will be determined *in situ* prior to stripping (see Appendix B) and the test results recorded.

Stockpile formation

7.5.28 Locations of stockpiles will be determined when pre-construction information is available and will be decided in line with the SMP.

7.5.29 Appropriate stockpile heights 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. Good practice recommendations include mineral topsoil stockpiles no higher than 3 m and subsoil no higher than 5 m (Department for Environment, Food and Rural Affairs, 2009), with peaty soil stockpiles kept to <2 m. The precise size and height of the stockpile should be determined by the Environmental Manager(s) and/or Soil Scientist/Practitioner, taking into account 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 SMP.

7.5.30 These principles will be followed for all stockpiled materials, based on the example methodology presented in Appendix E (the final approach will be set out in Method Statements or Work Package Plans agreed between the Main Works Contractor and National Grid):

- Topsoil and subsoil materials will not be mixed, with separate stockpiles created for topsoil and subsoil (if subsoil stripping is required).
- Stockpiles within each soil horizon layer (i.e., topsoil, upper subsoil, lower subsoil) should be separated based on soil texture, with no mixing of soil textural groups (i.e., light textured sandy topsoil would not be stockpiled with heavy textured clay topsoil).
- Documentation and physical control measures (such as signing of stockpiles) will be put in place to prevent accidental mixing, to ensure soils are segregated according to source location, and to protect soils from being trafficked by plant or vehicles.

- 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 marker layer (such as straw or clear recording of ground level information) so that no mixing occurs, and the different materials can be effectively separated.
- Soil materials will also be stored on like-for-like basis (i.e., topsoil can be stockpiled on topsoil, but subsoil should only be stockpiled on subsoil), with a suitable marker layer (such as straw or clear recording of ground level information) used where topsoil is stockpiled in topsoil to ensure the *in situ* soils are not disturbed on stockpile removal.
- Stockpiles will not be positioned adjacent to ditches and not within 10 m of a watercourse where practicable (and if closer a risk-based assessment will be undertaken to ensure the aquatic environment is protected).
- Soil resources will be loose tipped in accordance with published guidance.
- The sides of stockpiles will be smoothed to ensure they shed water, and to reduce the risk of waterlogging within the core of the stockpile.
- 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 SMP.

Stockpile maintenance

7.5.31 Soil stockpiles will be managed and monitored throughout their lifetime so that they can be maintained in relation to stability and integrity. Measures to manage stockpiles are as follows:

- Soil stockpiles will be managed to maintain slope stability and prevent erosion or dust generation if they are to remain in place for longer than six months (for example through seeding with a grassland seed mix).
- Stockpiles without vegetation cover should be sprayed with water, where necessary, to firm the surface of the stockpile and create a crust to prevent the generation of dust.
- Soil stockpiles will be managed and monitored throughout their lifetime to maintain stability and integrity, and any weed growth can be managed in a timely manner.

Stockpile reconditioning (excluding peaty soils)

7.5.32 Prior to reinstatement activities taking place, soil resources may have been stored in stockpiles for extended periods and, in some exceptional cases, soils may have been handled and stockpiled in a plastic state. To confirm suitability of stockpiled soils for reinstatement, they should be visually inspected, and assessments carried out before their reinstatement (see Section 8).

7.5.33 If any soil is found to be plastic or display excessive anaerobic conditions, the materials should be reconditioned as detailed below. It will be the responsibility of the Soil Scientist/Practitioner to assess soil in each stockpile, and to recommend and record appropriate pre-treatment prior to soil placement, should it be required.

7.5.34 Soils which are plastic in consistency shall be reconditioned using an appropriate methodology such as the example presented in Appendix F (the final approach will

be set out in Method Statements or Work Package Plans agreed between the Main Works Contractor(s) and National Grid).

Soil Reinstatement

7.5.35 The works required to effectively reinstate a soil profile suitable for the proposed end use, and to 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.

7.5.36 The sequence required to reinstate the soil profile will be detailed by the Environmental Manager(s) and/or Soil Scientist/Practitioner and communicated as a toolbox talk.

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

- Creation of the required combination of topsoil and/or subsoil to create a soil profile with the characteristics required for the proposed use, or re-create the soil profile in line with pre-existing soils, where reinstatement to previous land use and land quality is required; and
- Prevention through careful handling and placement of soils, of compaction within the restored soil profiles that may limit vegetation establishment and growth, restrict water infiltration.

7.5.38 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. 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; and
- Verification, by suitably qualified personnel, that the created soil profile is suitable for the proposed end use (Table 4.1 –).

7.5.39 Where soils stripped during the construction phase will not be reinstated and cannot be re-used on-site, they may (subject to landowner agreement) be removed off-site for re-use (i.e. no soil resources will be sent to landfill). Prior to any potential removal off-site, the quantity and characteristics of available soil materials will be assessed in accordance with the requirements of the Site Waste management Plan (Commitment Reference GG24; **Application Document 7.3 Register of Environmental Actions and Commitments**).

7.5.40 The soil profiles being reinstated 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 in the final landscape plans, and a soil re-use summary report will be produced by the Environmental Manager(s) and/or Soil Scientist/Practitioner to demonstrate how off-site disposal has been minimised.

7.5.41 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 the avoidance of mixing topsoil and subsoil where these materials are required for the reinstatement of agricultural land. Soil replacement will be undertaken in line with

published guidance; an example methodology is set out in Appendix G (the final approach will be set out in Method Statements or Work Package Plans agreed between the Main Works Contractor(s) and National Grid).

Aftercare

7.5.42 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.

7.5.43 The Main Works Contractor(s) will prepare an Aftercare Management Plan which will define:

- Purpose and scope: confirm it applies to soils reinstated after construction and aims to support the reinstatement of soil structure/function for the intended end use (e.g., agriculture, landscaping, habitat/Biodiversity Net Gain (BNG)) and ensure links to other plans (such as **Application Document 7.8 Landscape and Ecological Management Plan**) as required.
- Success criteria (including anticipated timeframe) for each area/land use.
- Aftercare area and end uses: define the land parcels covered (plan-based) and the intended after use for each area.
- Aftercare stages and duration: duration should be up to 5 years, with scope for early completion if success criteria are met.
- Activities for each year/season set out in the tabular format.
- Roles and responsibilities: who delivers aftercare measures (contractor/operator/landowner) and who oversees it (e.g. Soils Scientist/Practitioner).
- Management commitments: controls on trafficking, timing of operations, vegetation establishment/management, and access control (e.g. fencing).
- Monitoring programme: parameters (structure, depths/mixing, compaction, drainage/wetness, debris/contamination, vegetation performance, fertility) and frequency/timing of monitoring (to include post-reinstatement and periodic checks).
- Methods: for example, visual evaluation of soil structure (VESS)/soil pits, auguring and sampling, penetrometer testing, visual drainage/erosion checks.
- Triggers and remedial actions: define how issues will be identified and required corrective measures (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, including post-reinstatement soil profile check and ALC verification timing (likely to be after one to three seasons as a minimum), where land returns to agriculture.

7.6 Peaty Soils Management

7.6.1 Peat is a particularly sensitive material that varies in its physical characteristics based upon its forming factors, such as location, climate, landform and parent material. Peatlands will often support or have the potential to support a range of sensitive habitats and species.

7.6.2 Failure to protect peat during disturbance can lead to their degradation with consequential environmental impacts.

7.6.3 There are areas of Willingham soil association in the Order Limits (extremely calcareous silty and clayey soils, in places humose, and often over peat). Due to its high content of organic matter, peaty soil will be separated from mineral soils during stripping, stockpiling and reinstatement but will follow similar measures and procedures in this Outline SMP.

7.6.4 Peaty soils will be stored during construction in stockpiles with as low a height as possible, depending on storage space available and volumes excavated, but always <2 m in height, to minimise drying out. Storage duration will also be as short as possible based on the works programme to further minimise the risk of drying out and wastage of the peaty soils.

7.6.5 The SMP will set out measures to manage the risk of water and wind erosion of stockpiled peaty materials, and to maintain the peaty soils in a damp state to limit increased deposition rates during storage.

7.6.6 The SMP will include detailed design for reinstated profiles of peaty soils and any hydrological management measures required.

7.6.7 More detailed measures for peaty soil mitigation will be developed and incorporated into the SMP pre-construction for peaty soil handling during construction, once full details of working areas and works programmes are understood.

7.7 Stoneless Soils Management

7.7.1 Stoneless soils are those identified through physical soil surveys as having less than 1 per cent stones by volume, with the stones that are present being <2 mm at their longest dimension. Stone-sensitive soils are soils commonly used to grow crops sensitive to the presence of stones, such as potatoes, sugar beet and carrots; in these cases, farmers are likely to have invested in ‘destoning’ at least once in every crop rotation.

7.7.2 While stoneless soils are naturally occurring and stone-sensitive soils are man-made, both are very important in the context of arable agriculture. For the purposes of this document, stoneless and stone-sensitive soils are considered to require the same management due to their function as a growing medium for high value crops and, from this point on, are jointly referred to as ‘stoneless soils’.

7.7.3 Stoneless soils are mapped as comprising some of the soil associations in the Order Limits, therefore avoiding these soil types is unlikely to be a realistic option.

7.7.4 Likely stoneless soils have been identified through desk studies and locations have been confirmed through ALC surveys. Where practicable, construction access track design will minimise the import of aggregate material, include measures to minimise lateral and vertical stone migration and ensure that all imported aggregate is carefully removed.

7.7.5 Details of construction access track design will be specified further as the Project develops through detailed design. When this Outline SMP is developed into the Final SMP, detailed strategies for minimising contamination and optimising reinstatement after works are complete will be included. All other measures set out in this Outline SMP apply to stoneless soils.

Minimising Contamination from Imported Stones

7.7.6 Minimising the impact of imported aggregates on stoneless soils will include, but not be limited to, the following:

- Developing a design where there is confidence that all imported stone material can be spread and removed (see section 7.8) and none will spread beyond any protective geomembrane used (for example, ensuring there is sufficient space between edge of placed stone and edge of geomembrane), supported by a clear and tested Method Statement applied across the entirety of the Project.
- Stripping and stockpiling of topsoil following good practice soil handling measures prior to the installation of the construction access tracks to maintain soil quality and prevent the introduction of foreign stone material, ensuring sufficient separation between stockpiled topsoil and any stone materials in use/storage.
- Using geotextiles laid beneath the road surface to provide structural support will reduce the extent of any downwards stone migration with information on possible geomembrane options sought along with data/examples of the extent to which they prevent vertical stone migration.
- Using temporary trackway systems which can be installed and removed post-construction to minimise impacts on stoneless soils where use is short-term, limited to few vehicle passes and not used during wet ground conditions.

7.8 Restoring Soils after Construction Access Track Removal

7.8.1 Following the removal of the construction access tracks, soils will be reinstated to their original condition or intended end-use, including the removal of all imported aggregate material.

7.8.2 Specific measures in relation to imported stone will include:

- Ensuring that all imported stone aggregate and/or membrane is fully removed prior to soil reinstatement.
- Setting out measures to remove stone contamination should this occur (this should include provision to remove natural stone brought to the surface as a result of ripping or subsoiling), recognising that the smaller the stone, the more invasive the process will need to be – for larger material hand picking may be an option but is unlikely to be feasible for large quantities of smaller diameter stone.
- Setting out measures in the Aftercare Management Plan to ensure checks are in place to identify if more stone has come to the surface and that appropriate measures are available to remediate this.

8. Monitoring

8.1 Monitoring Requirements

8.1.1 To ensure that the quality of the soil materials is not detrimentally affected during the soil stripping, stockpiling and re-use/reinstatement works, monitoring by the Soil Scientist/Practitioner will be undertaken as detailed in Table 8.1.

8.1.2 Responsibility for some repeated tasks, as indicated in Table 8.1 below, can be delegated to a suitably experienced and trained person following the initial monitoring. Training would be provided by the Soil Scientist/Practitioner.

Table 8.1 – Monitoring requirements

	Monitoring requirement	Responsible
1	Effective clearance of vegetation and arisings from the soil surface – once prior to soil stripping commencing	Soil Scientist/Practitioner (can be delegated)
2	Soil plasticity state – prior to soil stripping commencing with additional tests following rainfall events	Soil Scientist/Practitioner (can be delegated)
3	Topsoil stripping – correct identification of base of topsoil and minimisation of subsoil incorporation throughout the soil stripping operations	Soil Scientist/Practitioner (can be delegated)
4	Subsoil stripping (if required) – correct identification of base of subsoil and minimisation of overburden incorporation throughout the soil stripping operations	Soil Scientist/Practitioner (can be delegated)
5	Stockpile construction to ensure no mixing of topsoil and subsoil – throughout the stockpile construction period	Soil Scientist/Practitioner (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	Soil Scientist/Practitioner (can be delegated)
7	General monitoring of soil handling operations	Soil Scientist/Practitioner
8	Reinstated soil profiles – check to confirm profile and soil condition is suitable for the proposed end use	Soil Scientist/Practitioner

8.1.3 A record of monitoring visits will be created to include those listed in Table 8.2.

Table 8.2 – 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
8	Reinstated soil profiles’ characteristics and condition
9	Sign off for each stage

8.2 Reporting of Findings

8.2.1 The findings of all examinations and assessments will be recorded and held by the Main Works Contractor(s) for record keeping and to enable any necessary corrective actions.

8.3 Corrective Actions

8.3.1 Where the monitoring set out in Table 8.1 above identifies aspects which are not in accordance with the requirements of the Final SMP, remedial measures will be identified by the Main Works Contractor(s) for acceptance by National Grid, with guidance provided by the Soil Scientist/Practitioner.

8.3.2 The measures will aim to ensure the land can be restored to its previous condition or condition suitable for the proposed end use following the completion of the construction phase and any required aftercare period and the maximisation of soil re-use (within the Project or off-site). Remedial measures may be implemented at the time an issue is identified or may be implemented as part of the aftercare period to minimise the risk of further damage to soils occurring (for example decompaction should only be carried out in dry conditions and so may need to be identified as a future action to be undertaken when ground conditions are suitable).

8.3.3 Once the affected area has been treated, it will be reassessed before sign-off.

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Appendix A
British Society of Soil Science Competencies

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Appendix A
British Society of Soil Science Competencies

DOCUMENT 1

Foundation skills in field soil investigation, description and interpretation

WORKING WITH SOIL
setting standards in soil science



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, full 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

DOCUMENT 1

Foundation skills in field soil investigation, description and interpretation

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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

WORKING WITH SOIL
setting standards in soil science



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

Soil science in soil handling and restoration

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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
Soil Plasticity

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Appendix B
Soil Plasticity

B.1 Overview

B.1.1 This appendix 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; and
- During soil re-spreading and decompaction/cultivation operations.

B.1.2 The procedure is outlined as:

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

B.2 Walkover/Visual Examination

B.2.1 The area/field or stockpile/windrow to be assessed shall first be walked to identify any apparent significant variability (e.g., evidence of poaching incidents or surface water ponding on 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 a hand 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 Soil Scientist/Practitioner, 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 five locations shall be sampled and assessed per field or stockpile/windrow.

B.4 Sample Assessment

B.4.1 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.4.2 The test sample shall be kneaded to break down any structure and ensure the mass is at a uniform moisture content and assessed in accordance with Table B.1.

Table B.1 – First stage of sample assessment for plasticity

Soil description	Handling recommendation
Peds (structures) break up/crumble readily when squeezed in the hand rather than forming into a “ball”.	Handling ok
The sample looks dry, is brittle and changes colour (darkens) if water is added.	Handling may be ok: undertake consistency test
The sample is moist and 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 Handling by tracked excavators may be ok: undertake consistency check
The soil sample is wet, with films of water 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

B.5 Consistency Check

B.5.1 An attempt shall be made to mould the soil sample into a ball by hand. The outcome of this attempt determines whether the soil should be handled, in accordance with the descriptions in Table B.2.

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

Criteria	Action
Possible	Proceed to Table B.3

B.5.2 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.

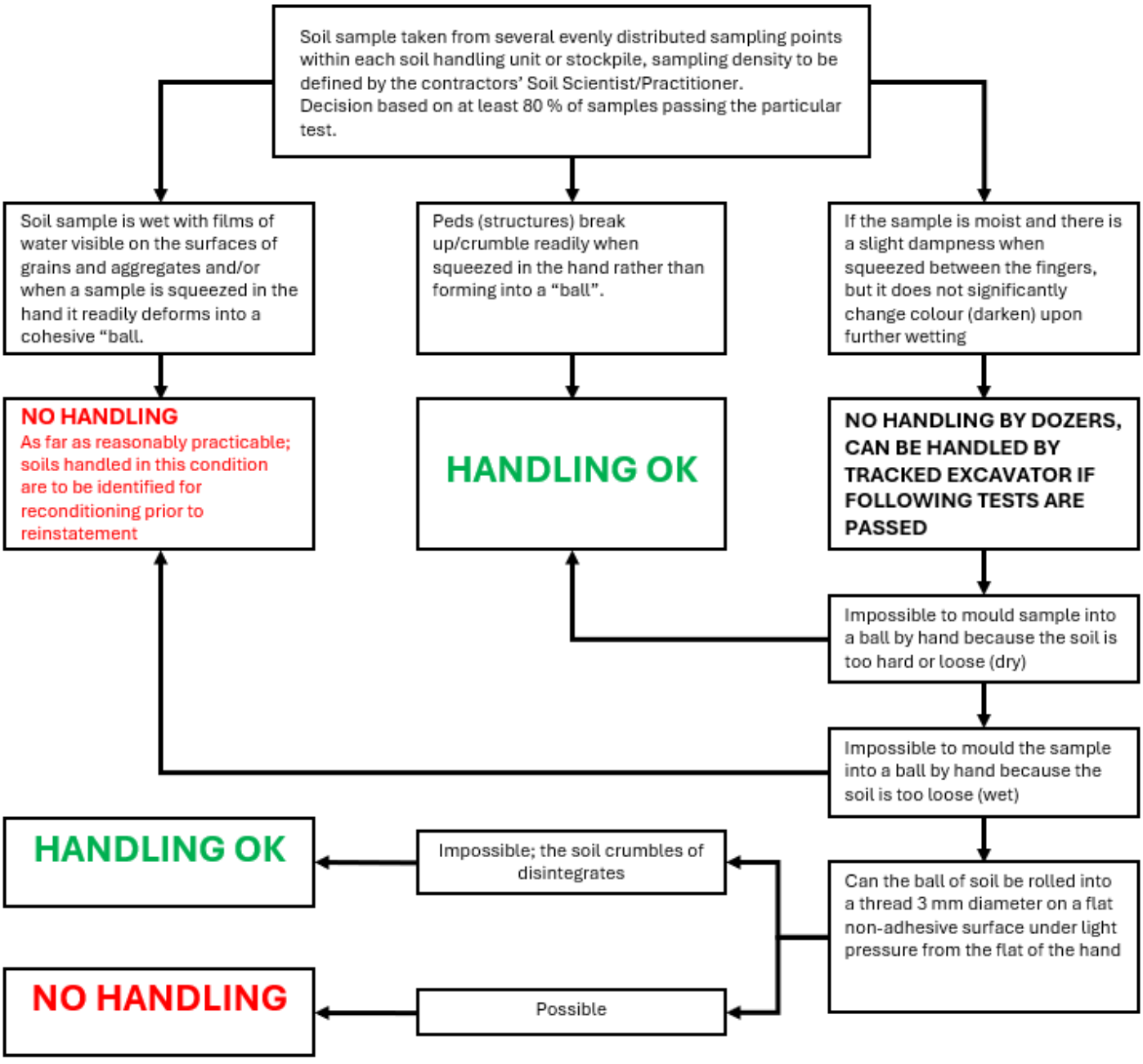
Table B.3 – Consistency test (part 2)

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

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Appendix C
Wet Weather Cessation Criteria



Appendix D
Soil Stripping

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Appendix D
Soil Stripping

D.1 Overview

D.1.1 This appendix sets out an example approach for soil stripping. The specific methodology will be defined in bespoke Method Statements or work Package Plans which will be based on published guidance.

D.1.2 Before stripping commences, the soil shall be confirmed as being in a non-plastic state, i.e. suitable for handling. The assessment shall be made using guidance in Soil Plasticity and will be overseen by the Environmental Manager(s).

D.2 Existing Vegetation

D.2.1 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; and
- Tree stumps and associated large roots (>20 mm diameter) shall be lifted using a suitable excavator.

D.2.2 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.2.3 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.2.4 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.

D.3 Access Routes

D.3.1 Access to each area/compartment to be stripped shall be created by stripping the topsoil, followed by subsoil (if required), to expose the ‘basal layer’. The intention is that, as far as possible, plant will then run on the basal layer.

D.3.2 Access shall be created wide enough to permit access to enable construction plant to strip, move and store soils to facilitate the works proposed for each location.

D.4 Topsoil Stripping

D.4.1 In advance of stripping, the topsoil shall be cleared of all foreign matter or waste materials, e.g., building rubble and fill materials.

D.4.2 All topsoil shall be stripped, for example using a dozer, and transported using suitable plant, unless the soil can be directly stockpiled to one side of the construction area. If this is undertaken, it will be in accordance with the guidance (Department for Environment, Food and Rural Affairs, 2009) and as shown in Image D.1 and Image D.2.

D.4.3 In the below example, 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, and then a hydraulic exactor would be used to load the stripped topsoil onto suitable plant for transportation to the designated stockpile location.

Image D.1 – Soil stripping with bulldozers and dump trucks using modified layer-by-layer practice

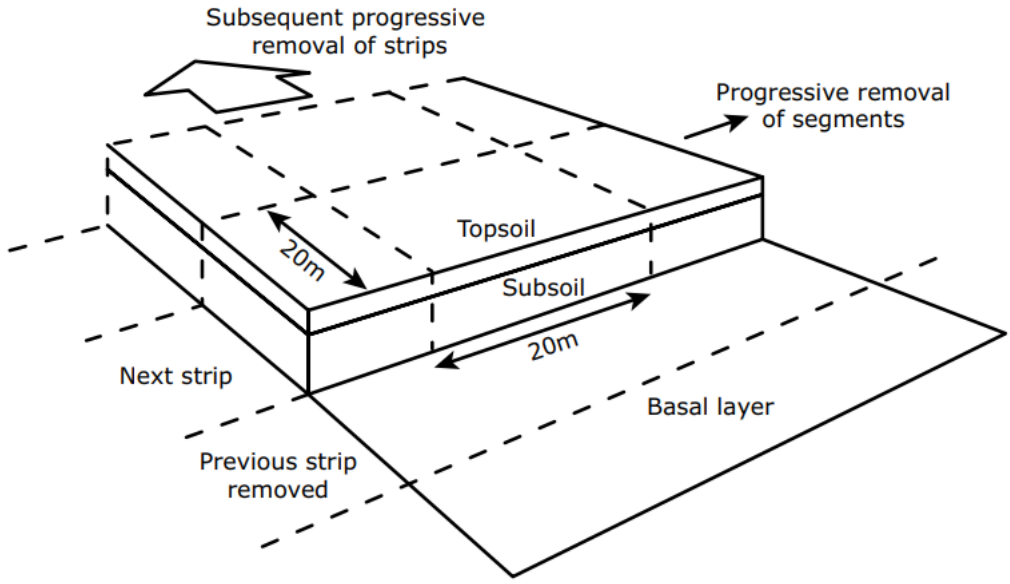
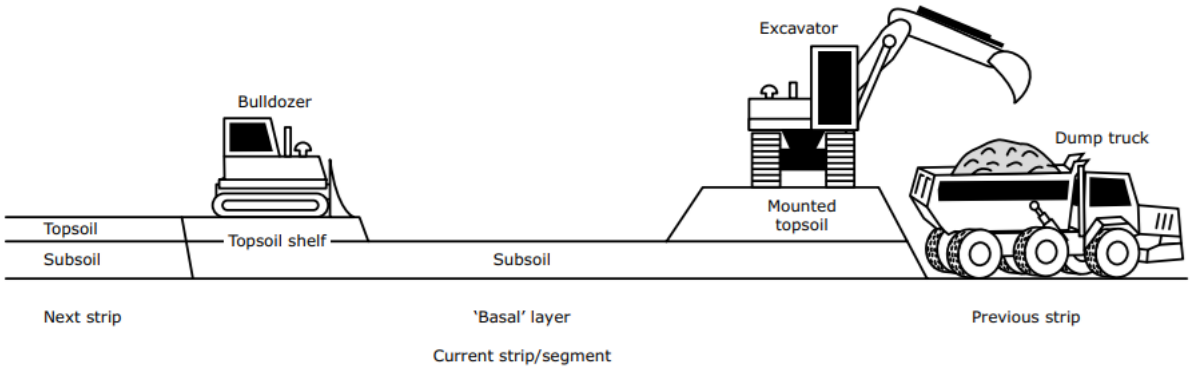


Image D.2 – Soil stripping with bulldozers and dump trucks: topsoil



D.4.4 The depth of strip shall be as set out prior to works commencing and communicated via a toolbox talk or briefing. 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 (to maximise recovery and opportunity for re-use). Some variation in topsoil depths is expected; therefore, some discretion shall be made by the machine operator (based on soil colour and/or firmness) during the topsoil stripping to maximise topsoil recovery without compromising the quality of the soil resource.

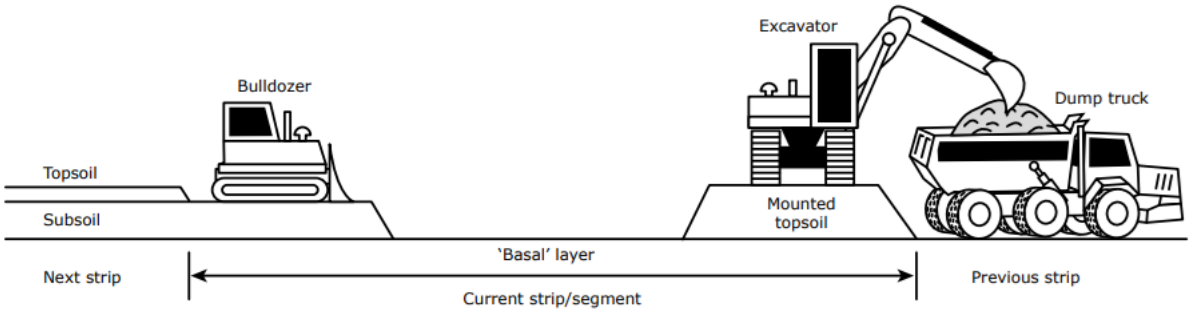
D.4.5 Once loaded, the soil will be transported along the pre-designated access route to the desired stockpile location.

D.4.6 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.

D.5 Subsoil Stripping

D.5.1 In the below example, subsoil is shown as being stripped using tracked dozers and transported using dump trucks, as shown in Image D.3.

Image D.3 – Soil stripping with bulldozers and dump trucks: subsoil



D.5.2 In this example, 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. And then a hydraulic exactor fitted with a toothed bucket would load the stripped subsoil onto suitable plant for transportation.

D.5.3 Once loaded, the subsoil shall be transported along the pre-designated access route to the desired stockpile location.

D.5.4 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.

Appendix E
Soil Stockpiling

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Appendix E
Soil Stockpiling

E.1 Overview

E.1.1 This appendix sets out an example approach for soil stockpiling. The specific methodology will be defined in bespoke Method Statements or work Package Plans which will be based on published guidance..

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.

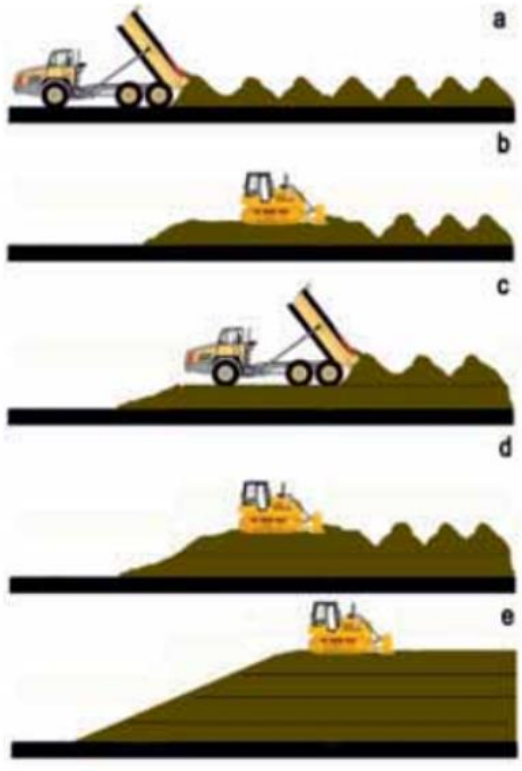
E.1.3 Stockpile locations will be identified in advance and clearly shown on relevant plans to ensure they do not interfere with other site operations and that the risk of stockpiled soil resources becoming contaminated or tracked over is minimised.

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).

E.2 Stockpiling Method

E.2.1 The approach illustrated in Image E.1. I s an example of how non-plastic soils could be stockpiled. Ideally, plastic soils will be reconditioned as shown in Soil Reconditioning, prior to final stockpile creation.

Image E.1 – Stockpiling Methodology



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 dozers (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 300 mm and not allowed to 'set seed'.

Appendix F
Soil Reconditioning

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Appendix F
Soil Reconditioning

F.1 Overview

F.1.1 This appendix sets out an example approach for soil reconditioning. The specific methodology will be defined in bespoke Method Statements or work Package Plans which will be based on published guidance.

F.1.2 This Outline SMP requires all soils to be handled when non-plastic, but should this not happen, or should plastic soils be identified in stockpiles prior to re-use, reconditioning will be required.

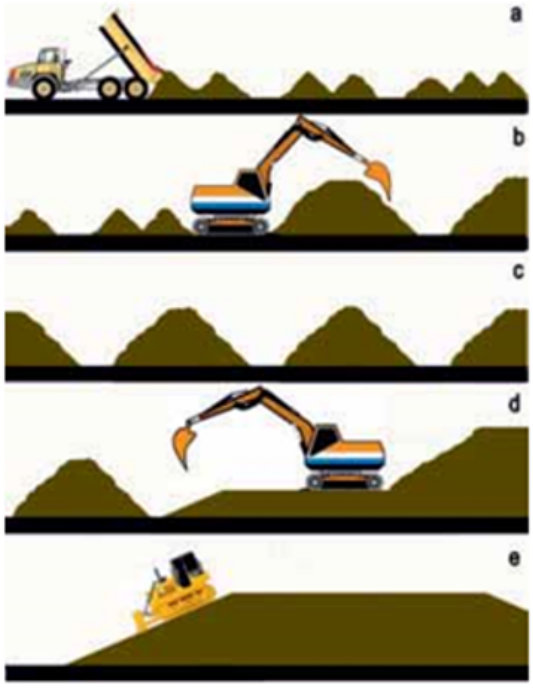
F.1.3 Reconditioning will be undertaken in area(s) of the site where it will not interfere with other site operations, to minimise the risk of reconditioned soils becoming contaminated or tracked over.

F.1.4 The area(s) designated for soil reconditioning shall be cleared of vegetation. Soil materials will only be windrowed on compatible soil types/layers. Where possible, reconditioning at the re-use location will reduce the amount of handling required.

F.2 Soil Reconditioning Method

F.2.1 The example approach illustrated in Image F.1 involves the placement of the plastic soils into windrows to allow the soil to dry over a period of several weeks (assuming suitable weather conditions). The reconditioned soil can then be used to reinstate areas or re-stockpiled in a non-plastic state.

Image F.1 – Plastic soil reconditioning methodology



Excavate soil from existing stockpile using a hydraulic excavator fitted with a toothed bucket. Load into dump truck and move to reconditioning area.

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

Once the soil had dried out and is non-plastic in consistency (this usually requires several weeks of dry and windy or warm weather and for the windrows to be turned at least once) (c), the windrows are combined to form large stockpiles to the maximum height for this site using a tracked excavator (d).

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

Appendix G
Soil Placement

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Appendix G
Soil Placement

G.1 Overview

G.1.1 This appendix sets out an example approach for soil placement. The specific methodology will be defined in bespoke Method Statements or work Package Plans which will be based on published guidance.

The approach will define:

- Soil handling considerations;
- Placement and treatment of overburden;
- Subsoil and topsoil placement and spreading; and
- Cultivations and monitoring.

G.2 Soil Handling Considerations

G.2.1 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 will not continue until the soil is again non-plastic in consistency.

G.2.2 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.

G.3 Placement and Treatment of Overburden

G.3.1 The finished surface, prior to the placement of subsoil and topsoil materials, will be loosened using 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.3.2 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.3.3 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 Soil Scientist/Practitioner, 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.3.4 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.

G.4 Subsoil and Topsoil Placement

G.4.1 A sequential approach to subsoil and topsoil placement will be undertaken as outlined in the example below.

- Subsoil Placement
  - Using a hydraulic excavator fitted with toothed bucket (to avoid smearing), remove subsoil from stockpiles.
  - Transport to the appropriate re-use location.
  - Tip subsoil in a line of heaps at the edge of the ripped/subsoiled area to avoid re-compaction of the overburden.
  - Spread the subsoil using suitable plant.
  - Subsoil depths to be checked by Soil Scientist/Practitioner to ensure correct subsoil depth is achieved across the reinstatement area.
- Topsoil Placement
  - 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.
  - Topsoil depths to be checked by the Soil Scientist/Practitioner to ensure correct topsoil depth is achieved.

G.5 Cultivations and Monitoring

G.5.1 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.5.2 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.5.3 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 Soil Scientist/Practitioner, 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.5.4 After subsoiling, the Soil Scientist/Practitioner 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.5.5 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).

G.5.6 Where access is limited, the topsoil may be cultivated using a landscape rake attachment fitted to a suitable hydraulic excavator.

G.5.7 Any undesirable material (i.e. not in keeping with the baseline soil characteristics for that location) 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.5.8 After topsoil cultivation, the Soil Scientist/Practitioner 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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