

Havant Thicket Reservoir Project

Framework Soil Management Plan

Framework Soil Management Plan

Portsmouth Water Ltd.

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1. Introduction

Background

- 1.1. This Framework Soil Management Plan (SMP) was commissioned by Portsmouth Water Limited to set out a methodology for identifying and safeguarding the soil resources (topsoil and subsoil) on land required for the construction of the Havant Thicket Reservoir ('the Approved Scheme') at Havant Thicket, located to the north of Havant, Hampshire, PO9 5HD ('the Site'). The approximate centre of the Site is located at National Grid Reference (NGR) reference SU715101. The location and boundary of the Site are shown on Appendix A.

Competency

- 1.2. This Framework SMP has been prepared by a Chartered Scientist (CSci), who is a Fellow (F.I. Soil Sci) of the British Society of Soil Science (BSSS). The author meets the requirements of the BSSS Professional Competency Standard (PCS) scheme for 'Soil Science in Soil Handling and Restoration', which is endorsed, amongst others, by Natural England, the Science Council, and the Institute of Environmental Assessment and Management (IEMA).

Aims and Objectives

- 1.3. The aim of the Framework SMP is to maintain the quality and quantity of soil resources (i.e., topsoil and subsoil) at the Site in its current physical condition (e.g., soil depth, soil texture, soil structure, soil drainage status), chemical condition (for example pH level, nutrient status of available phosphorus, available potassium, available magnesium, total nitrogen, and potentially toxic elements (PTE)) and soil organic matter (SOM) content, in order to maintain soil functions (see Section 1.8 below) during the construction the Proposed Scheme.
- 1.4. This Framework SMP Plan (dated 30 June 2022) is submitted to discharge Planning Condition 39 for Phase 1 (Northern Access and Northern Access Route). The requirement is a condition of the Approved Scheme (Reservoir) Planning Permission (application ref APP/20/00990 and 51680/001):
- Condition 39: No phase of the development approved under Condition 4 shall commence until a Soil Management Plan has been submitted to and approved in writing by the Local Planning Authority.*
- The Plan shall include separate management of ancient woodland soils for restoration. The Plan shall include a timetable for the carrying out of the works, once approved. The development shall be carried out in accordance with the approved details and timetable.*
- Reason: To support reinstatement of the landscape disturbed by the construction works.*
- 1.5. The Framework SMP with input on the detail and timing of works from the Contractor will be included, in the Construction Environmental Management Plan (CEMP) for Phase 1 and will provide the framework to inform soil management for subsequent phases.
- 1.6. The objectives of this Framework SMP are to set out the appropriate methodology to:
- Determine the location, extent and quality of in-situ soil resources (topsoil and subsoil) at the Site prior to construction (i.e., baseline soil status) by carrying out a desk-based assessment of published information on climate, geology, soils. This would involve carrying out a detailed Soil Resource Survey (SRS) on Site prior to the commencement of construction.
 - Determine types (units) of soil according to their resilience to damage (e.g., compaction) during soil handling prior to the commencement of construction.
 - Produce maps showing the location and extent of soil resources (topsoil and subsoil) in separate units identified in (ii) prior to the commencement of construction.
 - Ensure vehicular traffic over the land is restricted to tracks, haul roads or on land in appropriate weather conditions and soil-wetness state during the construction, operational and decommissioning phases.
 - Where necessary, to strip, store and respread soil resources in appropriate weather conditions and soil-wetness state during the construction and decommissioning phases.
- 1.7. A separate methodology to manage ancient woodland soils will also be provided to inform restoration.

- 1.8. The access junction on and adjoining the B2149 is subject to a Section 278 Highway Agreement with Hampshire County Council as this will become adopted Highway. The access area adjoining this and the access route to the reservoir comprise the Phase 1 Scheme. The works along the B2149 which are part of the s278 Agreement are inextricably linked to the Phase 1 Scheme and are encompassed within this framework.

Soil Functions

- 1.9. Following an Ecosystem Services approach, soil functions are general capabilities of soils that are important for various agricultural, environmental, nature protection, landscape architecture and urban applications. Six key soil functions are:
1. Food and other biomass production.
 2. Environmental interaction: storage (including carbon sequestration), filtering, and transformation.
 3. Biological habitat and gene pool.
 4. Source of raw materials.
 5. Physical and cultural heritage; and
 6. Platform for man-made structures: buildings, highways.

Soil Receptor Sensitivity/Resilience

- 1.10. When considering soil as a growing medium and a habitat which supports microbial, plant, and animal life, its sensitivity to change is largely dependent on its resilience to structural damage during cultivation and soil handling (i.e., soil stripping, storing in stockpiles, and re-spreading). As detailed in numerous guidelines for soil handling, including the Code of Practice for Sustainable Management of Soil on Construction Sites (2009)¹, the key to understanding soil resilience to structural damage during soil handling is the interaction between soil texture and soil moisture, and the effect of this interaction on soil structure.

Soil Texture

- 1.11. Soil texture describes how the mineral element of soil comprises a mixture of mineral particles of different size, and a different texture class can be ascribed according to the proportion of (according to the British Standards Institution):
- clay (<0.002 mm).
 - silt (0.002 mm to 0.06 mm).
 - sand
 - fine sand (0.06 mm to 0.2 mm).
 - medium sand (0.2 mm to 0.6 mm); and
 - coarse sand (0.6 mm to 2.0 mm).

Soil Moisture

- 1.12. The amount of moisture in the soil is known to affect key soil properties, including:
- **soil strength** (i.e., cohesion, internal friction). This is an important feature of soils in relation to their response to soil handling, and importantly to their resistance to fracture, compression, smearing, moulding and compaction; and
 - **soil consistency**. This is commonly used to describe the 'feel' of the soil and includes properties such as friability, plasticity, stickiness and resistance to compression and shear. Changes in consistence are sometime described in terms of various limits (for which there are British Standard Institute (BSI) methodologies):
 - The Plastic Limit (or Lower Plastic Limit), i.e., the moisture content at which the soil changes from friable to plastic and is taken to be the minimum moisture content at which the soil can be puddled. This can be measured in a laboratory under BS1377:1990 'Methods of test for

¹ Department for Environment, Food and Rural Affairs (2009). 'Code of Practice for the Sustainable Management of Soil on Construction Sites'. Available online @ <https://www.gov.uk/government/publications/code-of-practice-for-the-sustainable-use-of-soils-on-construction-sites> Last accessed June 2022

soils for civil engineering purposes' by rolling threads of soil that shear longitudinally and transversely at approximately 3 mm diameter; and

- The Liquid Limit (or Upper Plastic Limit), i.e., the water content at which soil cohesion is so reduced that the soil mass will flow when a force is applied.

Soil Structure

- 1.13. The most important structural features of soils are the size, shape, and stability of the peds (soil aggregates), which influences how the soil is penetrated by water, air and roots. In general terms, a soil with a good structure is well drained and well aerated and are conducive to soil flora and fauna.
- 1.14. When a soil is handled when it is too wet (i.e., the moisture content is at or exceeds the lower plastic limit), then soil strength is reduced, and it becomes prone to structural damage, i.e., it has less resistance to compression and shear. By introducing a force, such as a mechanical excavator, the wet (or plastic) soil can lose its structure and become compacted.
- 1.15. In the worst-case scenario, a well-structured and aerated soil can become poorly structured (even massive) by soil handling when it is too wet (plastic). If it is stored in this state, it can become anaerobic, with distinctive grey colouration and associated 'sour' smell. Poor drainage and anaerobic conditions cause stress and often death to plants (crops) and soil fauna.
- 1.16. The Soil Survey of England and Wales has developed a methodology for assessing the interaction between soil texture and soil moisture in order to determine a soil wetness class (WC). Relevant Meteorological Office climate data also predicts the number of days that the soil profile is predicted to be at field capacity (i.e., the maximum amount of water a soil profile can hold following free drainage).
- 1.17. For the purpose of the SMP, the methodology for assessing soil wetness should be utilised to place the different soil types at the Site into one of three soil handling units which have different resilience (i.e., high resilience, medium resilience and low resilience) to structural damage according to their respective soil cohesion and soil strength and resistance to compression and smear at different soil moisture contents. These three categories of resilience should be related to the prevailing climate, namely Field Capacity Days, as set out in the Table 1.1 below.

Table 1-1 - Soil Handling Units

Soil Handling Unit	Resilience to structural damage during soil handling	Soil Texture Class
A (Green)	High	Light textured soils: sand (S), loamy sands (LS), sandy loam (SL), sandy silt loams (SZL); where fewer than 225 Field Capacity Days (FCD) (Average Annual Rainfall (AAR) less than 1000 mm).
B (Orange)	Medium	Above textures where there are 225 FCD or more (AAR 1000 mm or greater). Medium textured soils with less than 27% clay content: silt loam (ZL), medium silty clay loam (MZCL), medium clay loam (MCL), sandy clay loam (SCL); where there are 225 FCD or fewer (AAR 1000mm or less). Heavy textures below (i.e., more than 27% clay content) where fewer than 150 FCD (AAR less than 700 mm).
C (Red)	Low	Medium textures above where there are more than 225 FCD (AAR greater than 1000mm). Heavy textures soils with more than 27% clay content: heavy silty clay loams (HZCL), heavy clay loam (HCL), sandy clay (SC) silty clay (ZC) clay (C); where FCD are 150 or more (AAR 700 mm or greater). Organic and peaty soils.

Structure of the Remainder of this Report

- 1.18. The remainder of this report is structured as follows:
- Section 2 – Preliminary Soil Resource Assessment.
 - Section 3 – Framework Soil Management Plan; and
 - Section 4 – Phase 1 Northern Access Soil Management.

2. Preliminary Soil Resource Assessment

Introduction

- 2.1. Part 1 of this section of the Framework SMP sets out the findings of a desktop study of relevant published information on climate, topography, geology, soil. As well as the findings of provisional soil resource surveys that included an investigation of grassland areas in 2020, and a reconnaissance soil auger and soil pit investigation of ancient woodland areas in March 2022.
- 2.2. Part 2 sets out an appropriate Soil Resource Survey (SRS), which should be carried out prior to commencing each construction phase of the Proposed Scheme.

Part 1: Desk-based Assessment of Site Characteristics and Soil Resources

- 2.3. This part of the report describes site characteristics which are pertinent to soil management, as follows:
- Climate (e.g., opportunity for soil handling in suitably dry conditions).
 - Topography and gradient (e.g., to help identify potential risks of soil erosion by wind and/or water); and
 - Published information on geology and soils.

Climate

- 2.4. Interpolated climate data relevant to the determination of soil wetness class at Havant Thicket Reservoir (Grid Reference SU715101) is given in Table 2.1.

Table 2-1 - Interpolated Climate Data for Havant Thicket Reservoir²

Climate Parameter	Data for SU 715 101
Average Altitude (m)	40
Average Annual Rainfall (mm)	835
Accumulated Temperature above 0°C (January – June)	1505
Field Capacity Days (FCD)	180

- 2.5. Of relevance to soil management, it is clear the Site receives moderately high levels of rainfall over the year, i.e., Average Annual Rainfall (AAR) of 835 mm, as compared to lowland Central England which receives approximately 750 mm per year³.
- 2.6. In addition, the soil is predicted to be at field capacity (i.e., the amount of soil moisture or water content held in the soil after excess water has drained away) for 180 Field Capacity Days (FCD) per year, in comparison with central lowland England which has approximately 150 FCD⁴.

² Natural England (1989) 'Climatological Data for Agricultural Land Classification (ALC010)' Available online at <http://publications.naturalengland.org.uk/publication/6493605842649088> Last accessed in June 2022

³ J.M.Ragg et al. (1984) Figure 6 'Average Annual Rainfall (mm), 1941 – 70 (Meteorological Office data) in 'Soils and their use in Midland and Western England. Soil Survey of England and Wales Bulletin 12. Harpenden.

⁴ J.M.Ragg et al. (1984) Figure 9 'Median Field Capacity Period (days), 1941 – 70 (Meteorological Office data) in 'Soils and their use in Midland and Western England. Soil Survey of England and Wales Bulletin 12. Harpenden.

- 2.7. For soil handling purposes, the Havant Thicket Reservoir site is located in Climate Zone 2, as shown on Figure 4.1 'Indicative on-average months when vegetated soil might be in a sufficiently dry condition according to geographic location, depth of soil, and clay content'⁵, given in Appendix B.

Topography and Gradient

- 2.8. The altitude at the Site ranges from an elevation of approximately 75 metres (m) Above Ordnance Datum (AOD) at the highest point in the north, to approximately 20m AOD along the boundary with urban development in Havant in the south. The gradient of the slopes on Site should be considered in the SMP in order to help assess the risk of soil erosion by water (e.g., rainfall), especially during soil stripping and soil storage during the construction phase.

Published Geology/Soil Parent Material

- 2.9. British Geological Survey (BGS) information available online⁶ has been utilised to identify the Bedrock underlying the Site and any Superficial (Drift) Deposits over the Bedrock. This information helps to determine the parent material from which the soil has formed.
- 2.10. The BGS information (1:50,000) indicates from north to south the land at the Site is underlain by bands of:
- Clay, Silt and Sand in the London Clay Formation in the west and south.
 - Clay, Silt and Sand in the Lambeth Group in the centre of Havant Thicket and in the north of The Avenue, and along the north-east boundary.
 - Sand in the London Clay Formation in the centre of the Site, to the south of Havant Thicket and west of the Avenue; and
 - A pocket of Sand in the Bognor Sand Member on low ground along the south-west boundary with Havant.
- 2.11. The BGS information (1:50,000) for superficial deposits indicates the bedrock underlying the Site is not covered by any superficial deposits, apart from some Head (Clay, Silt, Sand and Gravel) in the south-west quarter of the Site.

Published Information on Soil

- 2.12. The Soil Survey of England and Wales (SSEW) soil map of Wales (Sheet 6) at a scale of 1:250,000 and accompanying Bulletin No. 15 'Soils and their Use in South Eastern England', and a National Soil Resources Institute (NSRI) Soil Site Report for Havant Thicket Reservoir⁷ (copy given as Appendix C), report that land at the Site is covered by soils grouped into the Wickham 3 Association.
- 2.13. As described by the SSEW, the Wickham 3 Association is most extensive on Tertiary clays and loams in Berkshire, Surrey, Hampshire and Dorset but occurs also on the lowest beds of the Oxford Clay in north Wiltshire and on Cretaceous Wealden beds in the Isle of Purbeck. The land is gently undulating but there are moderate slopes locally. The predominant Wickham series, which belongs to the typical stagnogley soils, is developed in fine loamy or fine silty drift over clay. Most of these soils have slowly permeable clayey subsoils and excess water is disposed of by lateral flow after prolonged periods of heavy rain in winter. Where undrained, Wickham and Denchworth soils are waterlogged for long periods in winter (Wetness Class IV and V) and remain seasonally waterlogged (Wetness Class III) even where field drainage has been installed.

Provisional Soil Resource Survey

Provisional investigation of soil in grassland areas 2020

- 2.14. A provisional investigation of soil in grassland areas over the Site was carried out by others in 2020. This involved examination of 13 trial pits and sending a sample of topsoil from each trial pit to an accredited laboratory for analysis against BS 3882:2015 'Specification for Topsoil'. The Certificates

⁵ Institute of Quarrying's Good Practice Guide for Handling Soil (2021). Available online @ <https://www.quarrying.org/soils-guidance> Last accessed June 2022

⁶ British Geological Survey 'Geology of Britain Viewer'. Available online @ <http://www.bgs.ac.uk/discoveringGeology/geologyOfBritain/viewer.html> Last accessed June 2022

⁷ National Soil Resources Institute (2022) Soils Site Report for location 471559E, 110035N, 3km x 3km, National Soil Resources Institute, Cranfield University

of Laboratory Analysis are given as Appendix D. This confirms the presence of silty clay loam topsoil over slowly permeable and seasonally waterlogged clay subsoil, i.e., similar to soil grouped in the Wickham 3 Association.

Reconnaissance soil survey in Ancient Woodland Areas

- 2.15. As described in the Environmental Statement (ES), The Avenue, Middle Clearing and Round Wood are classified as Ancient Semi-Natural Woodland (ASNW). The Corsican Pine Plantation is classified as Plantation on Ancient Woodland Sites (PAWS). A significant part of Havant Thicket woodland to the north is also listed as PAWS. Also located within the wider reservoir site, is the Blendworth Fragment, located to the north of Havant Thicket, which is listed as ASNW, and Bells Copse, located to the west, which is listed as partly ASNW and partly PAWS.
- 2.16. A reconnaissance soil survey involving the examination of five soil pits (Pits 1-5) was carried out in March 2022 in order to examine soil profiles in (i) The Avenue (Pits 1 and 2), and (ii) along the existing access track used for forestry operations in Havant Thicket Ancient Woodland (Pit 3), (iii) Blendworth Fragment (Pit 4), and for sake of comparison grassland on Deerslaughter Plain (Pit 5). Soil profile data including a location plan provided in Appendix E.
- 2.17. Samples of topsoil from Soil Pits 1-5 were sent to a quality assured laboratory for analysis of the following chemical parameters (following the approach of Natural England's Technical Information Note 035 'Soil Sampling for Habitat Recreation and Restoration'):
- pH (1:2.5 water);
 - Available phosphorus (P) (mg/l);
 - Available potassium (K) (mg/l);
 - Available magnesium (Mg) (mg/l);
 - Total nitrogen (N) (% w/w dry basis) – Dumas method; and
 - Organic matter (% w/w dry basis) - Loss on Ignition.
- 2.18. The results of the laboratory analysis are given on the Certificates of Analysis as Appendix F, and summarised in Table 2.2 below.

Table 2-2 - Laboratory Analysis of Topsoil Samples

Soil Pit	Mean pH (1:2.5 water)	Mean Available Phosphorus (P) (mg/l)	Mean Available Potassium (K) (mg/l)	Mean Available Magnesium (Mg) (mg/l)	Mean Total Nitrogen (N) (% w/w)	Organic Matter (% w/w)
Pit 1 (Ancient woodland in The Avenue) 5-20cm	5.5	3.4	130	186	0.133	4.3
Pit 1 (Ancient woodland in The Avenue) 20- 40cm	5.1	<2.5	33	89.7	0.069	3.1
Pit 2 (Ancient woodland in The Avenue) 10-20cm	4.6	4.2	72.9	64.6	0.193	6.1
Pit 2 (Ancient woodland in The Avenue) 20- 40cm	4.6	<2.5	70.1	48.5	0.095	3.8
Pit 3 (Grassland on verge of existing forestry track in	6.0	<2.5	120	167.0	0.282	8.3

Havant Thicket Ancient Woodland) 0-5cm						
Pit 3 (Grassland on verge of existing forestry track in Havant Thicket Ancient Woodland) within 5-20cm	5.8	<2.5	23.4	51.1	0.047	2.3
Pit 4 (Ancient woodland in the Blendworth Fragment) 5-10cm	4.0	12.6	86.6	94.7	0.723	22.7
Pit 4 (Ancient woodland in the Blendworth Fragment) 10-25cm	4.3	<2.5	45.1	29.8	0.085	3.7
Pit 5 (Grassland on the Deerslaughter Plain) 10-22cm	6.2	<2.5	116.0	615	0.162	6.2
Pit 5 (Grassland on the Deerslaughter Plain) 22- 40cm	5.9	3.2	138.0	427	0.348	9.6

2.19. As a guide to interpreting levels of fertility in topsoil, Table 1 'Topsoil Characteristics' in the British Standard 'Specification for Topsoil' (BS 3882:2015) specifies that 'Low Fertility' topsoil has the following chemical characteristics:

- pH (1:2.5 water): range 3.5 to 9.0;
- Available Phosphorus (P) (mg/l): <15;
- Available Potassium (K) (mg/l): <120;
- Available Magnesium (Mg) (mg/l): <600;
- Total Nitrogen (N) (% w/w): <0.1

2.20. Using the BS 3882:2015 parameters for 'Low Fertility' above, the ancient woodland soils in (i) The Avenue, (ii) the Blendworth Fragment and (iii) existing track within Havant Thicket have been determined to be acidic and of generally low fertility.

Provisional Soil Handling Units

2.21. By applying the criteria set out in Table 1.1 'Soil Handling Units' against the climate data (i.e., FCD and AAR) and soil information above, the soils at the Site may be assigned to provisional (indicative) soil handling unit as set out in Table 2.3 below.

Table 2-3 - Soil Handling Units

Soil Handling Unit	Resilience to structural damage during soil handling	Soil Texture Group
2 (Orange) – Medium Sensitivity	Medium	Soil Handling Unit 2: This unit of soils comprises medium clay loams and medium silty clay loam with less than 27% clay content. As per Table 1.1, these medium textured soils have a medium resilience (or medium susceptibility) to structural damage by vehicles trafficking over them, or during soil handling operations, in a climate area where there are 225 FCD or fewer (AAR 1000 mm or less).

Part 2: Soil Resource Survey (SRS)

- 2.22. This part of the Framework Soil Management Plan (FSMP) sets out an appropriate level of soil survey that should be carried out prior to commencing each construction phase of the Approved Scheme. The purpose of the survey is to identify different soil handling types of soil across the Site (i.e., low, medium or high sensitivity as per Table 1.1), and to determine their resilience to potential damage during soil handling operations, especially during the operational and decommissioning phases.
- 2.23. A detailed Soil Resource Survey (SRS) should be carried out prior to constructing the Approved Scheme. This is to confirm the location, extent and physical properties of Soil Handling Units, i.e., soils with similar texture and structure (re. soil texture classes set out in Table 1.1), and specifically to identify any soils with a peaty/organic surface horizon (unit).
- 2.24. The soil profile should be examined at each sample location to a maximum depth of approximately 1.2 m by hand with the use of a 50 mm diameter Dutch (Edleman) soil auger. This is to determine the depth of topsoil and subsoil. Subsoil is the weathered layer of soil between the topsoil and the soil parent material below. In some places there will be an upper subsoil horizon (layer) which is transitional in texture between the topsoil and a lower subsoil.
- 2.25. A soil pit should be excavated per main soil type/unit by hand with a spade in order to examine certain soil physical properties, such as stone content and the structural condition of the subsoil, more closely.
- 2.26. The locations of the auger bores and the soil pits should be shown on a soil map.
- 2.27. It is recommended the auger-bore locations are located using a hand-held Garmin E-Trec Geographic Information System (GIS) to enable the sample locations to be relocated for verification, if necessary.
- 2.28. The soil profile at each sample location should be described using the 'Soil Survey Field Handbook: Describing and Sampling Soil Profiles' (Ed. J.M. Hodgson, Cranfield University, 1997).
- 2.29. An appropriate number of samples of topsoil should be collected to represent the main soil types/units across the Site. The samples should be sent to an accredited laboratory for analysis against the physical and chemical parameters, including potentially toxic elements (PTE), under the British Standard for Topsoil (BS3882:2015). This includes particle size analysis, i.e., the proportions of sand, silt and clay, to determine the definitive texture class of the topsoil, especially with regard to distinguishing between medium clay loams (i.e., <27% clay) and heavy clay loams (27% to 35% clay). Laboratory analysis of topsoil to BS3882:2015 also includes the determination of Soil Organic Matter (SOM) content by loss on ignition (L.O.I); this is relevant as the desk-based assessment (above) indicates there are likely to be soils with a peaty/organic surface horizon/layer (c.f. Wilcock 1 Association).
- 2.30. A map should be produced to show the location and extent of the main soil types/soil handling units as per Table 1.1 determined during the SRS. Soils with a peaty/organic horizon/layer should be identified in a separate soil handling unit.
- 2.31. A map should be produced to identify where soil is to be stripped, e.g., access roads, and where the soil is to be left in-situ.

3. Framework Soil Management Plan

Introduction

- 3.1. This section of the Framework Soil Management Plan (FSMP) outlines general requirements for vehicular traffic over agricultural land, and where necessary soil handling, i.e., soil stripping, storage and placement/re-spreading for general landscaping purposes, during the construction of the Approved Scheme. Specific guidance for ancient woodland soils is given under 'Ancient Woodland Soils' in this section, and Section 4.0 for the Phase 1 Scheme (Northern Access). This general guidance is based on information collated in Section 2.0 of the FSMP and should be followed when handling all soils, i.e., ancient wood land soils and soils required for general landscaping purposes. It should be noted this FSMP has been prepared for Phase 1 and provides information to inform the construction of the northern access route. Additional information will be provided to inform subsequent construction phases on the reservoir site.
- 3.2. This FSMP should be read in conjunction with, and forms part of, the Construction Environmental Management Plan (CEMP) for Phase 1. The FSMP also provides the framework to inform soil management for subsequent phases.
- 3.3. Additional guidance for soil handling during the construction of Phase 1, including the recovery and reuse of soils in ancient woodland areas to be cleared, is given in Section 4.0.

General Requirements for Soil Handling

- 3.4. The quality and quantity of soil resources (topsoil and subsoil) within the Site shall be maintained by following the approach of the DEFRA 'Code of Practice for the Sustainable Management and Use of Soil on Construction Sites' (Defra, September 2009) (available online @ <https://www.gov.uk/government/publications/code-of-practice-for-the-sustainable-use-of-soils-on-construction-sites>). This is to achieve the following principal objectives:
 - The avoidance of unnecessary damage to all soil layers, especially by compaction and smearing;
 - The maintenance of a reasonable degree of fissuring, drainage and aerobic conditions in stored soils;
 - The reasonable replication of the original sequence of textural horizons and permeability of the soil profile when the materials are reinstated, based on a target restoration profile (i.e., the original/baseline soil profile determined in the SRS prior to commencement of construction);
 - The preservation of soil biodiversity and Soil Organic Matter (SOM).
- 3.5. All soil and soil forming materials shall be handled in accordance with the Institute of Quarrying's Good Practice Guide for Handling Soil (2021), Sheets A – E (handling soil using back-acters and dump-trucks)⁸.
- 3.6. Where encountered on Site, handling peaty/organic soils should aim to maintain peatland ecosystem services (such as carbon sequestration), minimise risks to ecosystem services (such as the loss of habitat, water quality, storage or ground stability, and retain excavated peat in storage as close to the point of extraction as practicable.
- 3.7. As described in Section 1.13, when a soil is handled when it is too wet (i.e., the moisture content is at or exceeds the lower plastic limit), then soil strength is reduced, and it becomes prone to structural damage, i.e., it has less resistance to compression and shear. By introducing a force, such as a mechanical excavator, the wet (or plastic) soil can lose its structure and become compacted. As described in Best Practice produced by the Institute of Quarrying⁸ (see 'Supplementary Note 4 – Soil Wetness' given in Appendix B),
'...The degree of effect due to soil handling is likely to vary between the soil textural class, structural condition, and organic matter content, the local climate and daily weather conditions, but also between the types and size of machinery used and handling practice adopted. The primary cause of

⁸ Institute of Quarrying's Good Practice Guide for Handling Soil (2021), Sheets A – E (handling soil using backacters and dumprucks). Available online @ <https://www.quarrying.org/soils-guidance> Last accessed April 2022

compaction arises from the compression caused by trafficking by the machinery and stockpiling of soil in storage. Whilst some degree of remedial actions might be possible, experience has demonstrated that minimising compaction by handling soil in a dry condition is the more effective and reliable, and likely most cost-effective option.'

Timing of Operations

- 3.8. Advice is given in Appendix B on the general timing of operations. A field-based determination of when the actual operations should start, cease or restart based upon actual soil wetness is provided. The final SMP should carefully consider the timing of (i) vehicles trafficking over the land and soil, and (ii) land-work and soil handling operations. The SMP should provide mitigation measures to avoid or reduce damage to soil structure, especially when the soil is wet, including a method for determining when land-work and soil handling operations should start, cease and restart based upon actual soil wetness. This may include determination of the Plastic Limit (see Section 1.11 of the different soil types/units in a laboratory to British Standard (BS) 1377: 1990 'Methods of test for soils for civil engineering purposes'.
- 3.9. Based on an 'Indicative on-average months when vegetated mineral soils might be in a sufficiently dry condition according to geographic location, depth of soil and clay content' (Table 4.1, Appendix B), the soil at Havant Thicket Reservoir is predicted to be in a sufficiently dry condition as follows:
- Soil Handling Unit 2 (medium sensitivity and resilience): medium silty clay loams (10-27% clay content) in Climatic Zone 2 = Late May to Early October.
- 3.10. This is a predicted period over the year when the different soil types are most likely to be suitable for handling. However, guidance for ceasing and restarting work during this period should be followed.
- 3.11. All soil shall only be moved when in a dry and friable condition. For all soil types, no soil handling should proceed during and shortly after significant rainfall, and/or when there are any puddles on the soil surface. An appropriate method for determining soil moisture content for soil handling is given as Appendix B. Alternatively, the Plastic Limit (see Section 1 above) of the different soil types/units should be determined in a laboratory to British Standard 1377: 1990 'Methods of test for soils for civil engineering purposes'. Soil handling should cease when the Plastic Limit is exceeded, and not recommenced until the land/soil has at least 24 hours after rainfall has ceased.
- 3.12. Throughout the period of working, the operator shall take all reasonable steps to ensure that drainage from areas adjoining the Site is not impaired or rendered less efficient by the permitted operations.
- 3.13. The operator shall take all reasonable steps, including the provision of any necessary works, to prevent damage by erosion, silting or flooding and to make proper provision for the disposal of all water entering, arising on or leaving the Site during the permitted operations.
- 3.14. Any oil, fuel, lubricant, paint or solvent within the site shall be so stored as to prevent such material from contaminating topsoil, subsoil, soil forming material, or reaching any watercourse.
- 3.15. Throughout the period of working, restoration and aftercare, the operator shall have due regard to the need to adhere to the precautions for preventing the spread of plant and animal diseases⁹.

Ground Preparation

- 3.16. Prior to stripping topsoil in grassland areas, all above-ground vegetation should be cleared off site in the areas to be stripped, so that the amount of vegetation within the topsoil strip is minimised (this is to minimise the amount of anaerobic decomposition of vegetation / organic matter that will occur within the topsoil stockpiles).

Haul Roads

- 3.17. Vehicles, e.g., heavy goods vehicles (HGV) delivering construction materials should not be permitted to traffic over agricultural land and be restricted to public highways, farm tracks, haul roads and storage compounds.

⁹ Government (2022). 'How to stop invasive non-native plants from spreading. Available online @ <https://www.gov.uk/guidance/prevent-the-spread-of-harmful-invasive-and-non-native-plants> Last accessed April 2022

- 3.18. Construction machinery should not traffic over agricultural land which is left in-situ (i.e., where the topsoil has not been stripped) when the soil is too wet. This is to avoid causing soil structural damage by compaction and smearing, and to avoid creating ruts/vehicle wheelings at the ground surface. See 'General Requirements for Soil Handling' above for guidance on appropriate soil moisture content for soil handling.
- 3.19. It is recommended using temporary haul road systems to minimise structural damage to the soil. This could involve the a heavy-duty composite plastic trackway system on a thin layer of stone, or no stone, e.g., GroundGuards Xtreme Mats 4 m x 2 m Large Mats (online @ <https://www.ground-guards.co.uk/product/xtreme-4m-x-2m-mat/>), or SignaRoad 3 m X 2 m Large Mats (online @ <https://www.ground-guards.co.uk/product/signaroad/>) or other similar geotextile material.
- 3.20. Where a peaty/organic layer is present, construction machinery, e.g., piling machines and telehandlers, should not traffic directly over land in any weather. In this case, a temporary haul road system is required to prevent structural damage, shrinkage, or erosion of the peat/Soil Organic Matter (SOM).

Soil Stripping

- 3.21. Before any part of the Site is excavated or is built upon, or used for the stacking of topsoil, subsoil or overburden, or as a machinery dump or plant yard, or for the construction of a road, all available topsoil and subsoil shall be stripped from that part.

Soil Storage

- 3.22. Bunds for the storage of soils for general landscape purposes shall conform to the following criteria (note that specific guidance for ancient woodland soils is given in paragraphs 3.41-45 below and Section 4.0 for Phase 1 Northern Access):
- Topsoil and subsoil (referred to as overburden) in the different soil handling units shall be stored separately;
 - Where continuous bunds are used, dissimilar soils shall be separated by a third material;
- Soil with Low Sensitivity/High Resilience**
- Topsoil and subsoil with medium sensitivity/moderate resilience shall be stored in bunds which do not exceed 5m in height.
- Soil with Medium Sensitivity/Moderate Resilience**
- Topsoil and subsoil with medium sensitivity/moderate resilience shall be stored in bunds which do not exceed 4m in height.
- Soil with High Sensitivity/Low Resilience**
- Topsoil and subsoil with high sensitivity/low resilience shall be stored in bunds which do not exceed 3m in height.
- 3.23. All topsoil and subsoil for general landscaping purposes shall be retained on the Site. Opportunities should be considered for reusing surplus general-purpose soils in constructing embankments around the reservoir, for example. This is to seek to minimise the transport of soil by vehicles following sustainable best practice, e.g. Defra Code of Construction Practice for the Sustainable Management of Soil on Construction Sites (September, 2009). Specific guidance for ancient woodland soils is given below and in Section 4.0 for Phase 1 Northern Access.
- 3.24. Bunds for the storage of soils shall conform to the following criteria:
- Topsoil and subsoil shall be stored separately.
 - Where continuous bunds are used, dissimilar soils shall be separated by a third material.
 - Materials shall be stored like upon like, so that topsoil shall be stripped from beneath subsoil bunds, and subsoil from beneath overburden bunds.
- 3.25. All storage bunds containing soils for general landscape purposes which are intended to remain in situ for more than 6 months or over the winter period are to be grassed over and weed control and other necessary maintenance carried out.

Ancient Woodland Soils

- 3.26. As stated in the Parliamentary Office of Science and Technology's Note on Ancient Woodland (Number 465, June 2014), '*...ancient woods are defined in the UK as areas that have been continuously wooded since 1600 (or 1750 in Scotland). Ancient woods have been used by humans for centuries, providing timber and grazing for livestock, and can be divided into two types:*
- Ancient Semi-Natural Woodland (ASNW), which is composed of native trees and shrubs, though it may have been previously managed; and*
- Plantations on Ancient Woodland Sites (PAWS), which were planted with (often non-native) broadleaved trees and conifers after the First and Second World Wars. PAWS are often less biodiverse than ASNW, but can retain some features of ancient woods...*'
- 3.27. As described in Section 2.0, The Avenue, Middle Clearing and Round Wood are classified as Ancient Semi-Natural Woodland (ASNW). The Corsican Pine Plantation is classified as Plantation on Ancient Woodland Sites (PAWS). A significant part of Havant Thicket woodland to the north is listed as PAWS. Also located within the wider reservoir site, is The Blendworth Fragment, located to the north of Havant Thicket, which is listed as ASNW, and Bells Copse, located to the west, which is listed as partly ASNW and partly PAWS.
- 3.28. This section of the FSMP sets out specific provisions for ancient woodland soil (ASNW/PAWS) to be translocated from a donor site to a receptor site. The objective of the FSMP is to restore a soil profile at a suitable receptor site which comprises on average a 150 mm layer of translocated ancient woodland (ASNW/PAWS) topsoil, including leaf litter (encompassing the seed bank, fauna and mycorrhiza, i.e., a symbiotic system of fungus and the roots of vascular plants). Although this reduces to 50 mm along the existing track within Havant Thicket.
- 3.29. The FSMP aims to minimise damage to soil structure, and maintain soil characteristics in terms of healthy soil aeration (and gaseous exchange), adequate drainage, and levels of fertility.
- 3.30. By implementing the FSMP, it is predicted that biological life in the soil (including fauna such as earthworms) will re-establish in the short to mid-term (1-5 years). It is accepted that more complex mycorrhizal systems associated with undisturbed ancient woodland soils will take a long time to develop (Natural England, 2012), but the aim of this scheme is to present the best opportunity for re-developing suitable soil conditions for the successful recreation of an ancient woodland ecosystem in the long-term.
- 3.31. Where the Approved Scheme involves some temporary storage of ancient woodland soil (ASNW/PAWS soils), a specification for soil storage has been devised to minimise adverse effects of stockpiling, as set out below.
- 3.32. A review of current best practice for habitat translocation (including CIRIA C600 'Habitat translocation: a best practice guide, 2003) and other relevant articles and publications (see references in Section 5.0), has determined that:
- there has been little research conducted on translocating woodland soils, including ancient woodland;
 - some habitats can be successfully translocated in under a decade e.g., wetlands, salt marshes, reed beds, pond systems (Ryan, 2013);
 - ancient woodland is formed from unique geological and historical features, and it takes years for the ecosystem to redevelop (Natural England, 2012);
 - the donor site must match up well with receptor site, or the project will fail to even get close to replication of the original ecosystem; Anderson (2003) reported that the translocation of Biggins Wood (Kent, Channel Tunnel Project, 1988) was unsuccessful, as the receptor site did not match the donor site; and
 - translocation of ancient woodland soils has the potential to disrupt mycorrhizal associations (Ryan, 2013).
- 3.33. Therefore, to avoid the pitfalls and draw upon successful techniques identified in the literature search above, the overarching aims of this FSMP are:
- i. to identify suitable receptor sites which has a similar climate, geology, hydrology (drainage) and soil type to that of the ancient woodland (ASNW/PAWS) donor sites;

- ii. to translocate the ancient woodland (ASNW/PAWS) soils through direct placement as far as possible (i.e. to minimise the need to store soil in stockpiles and minimise double-handling of soil); and
- iii. to move ancient woodland (ASNW/PAWS) soils when they are in a suitably dry condition (again, to minimise damage to soil structure).

Recovery of Ancient Woodland Soils

- 3.34. The general requirements for soil handling set out in Section 3.0 above shall be followed.
- 3.35. Prior to stripping the ancient woodland (ASNW/PAWS) topsoil, the trees should be felled and all above-ground vegetation should be cleared off site, so that only the tree stumps remain.
- 3.36. As described in Section 2 for Pits 1, 2, 3 & 4, the shallow depth of ancient woodland soils shall be scraped off with an excavator with a back-hoe from around the tree stumps and placed in a dumper truck and transported directly to a receptor site where possible, or in a place of storage.
- 3.37. A receptor site should be of comparable soil type (e.g., Soil Association, Soil Series)¹⁰, soil nutrient status and drainage status (Wetness Class), topography, hydrology, and climate zone as the donor site.
- 3.38. The excavator should begin from the outside of the ancient woodland area and work inwards progressively, to not traverse over the ancient woodland soil.
- 3.39. Tree stumps shall be removed once the ancient woodland soil has been stripped off. This is to avoid excessive mixing of the shallow topsoil layer with the subsoil beneath, which could occur when the tree stumps and roots are grubbed up.
- 3.40. Opportunities to retain some stumps that are not in the footprint of construction operations either to regenerate or dieback and provide saprophytic habitat for invertebrates should be considered with Portsmouth Water. This would be in areas outside the area identified for stripping of ancient woodland soils. For example the retention of stumps in the Corsican Pine Plantation to increase habitat complexity and biodiversity value is proposed within and adjacent to the wetland footprint.

Storage of Ancient Woodland Soils

- 3.41. Where possible, the ancient woodland soil should be stripped and transported directly for spreading at a receptor site.
- 3.42. Where direct placement of ancient woodland soil is not possible, the ancient woodland soil should be stored in low, loose-tipped soil storage bunds as follows.
- 3.43. Where necessary, it is assumed the topsoil stripped from ancient woodland areas will be stored temporarily, i.e., not exceeding six months, on-site in a grassland area outside of the reservoir construction area. The grassland topsoil should be stripped from the storage area following guidance in Section 3.0 and stored in soil storage bunds not exceeding 3m in height.
- 3.44. The ancient woodland soil should be loose-tipped in the prepared soil storage area in soil bunds not exceeding 1m in height. This is to allow water to drain through the stockpile and prevent the soil in the bund from becoming anaerobic, i.e., deficient of oxygen.
- 3.45. As the ancient woodland soil is not be stored in bunds for longer than six months, it should not be sown with grass but rather be left to revegetate naturally noting that due to the ecological sensitivity of the habitat no herbicide should be used as a means of weed control.

Re use of Ancient Woodland Soils

- 3.46. Following the general guidance in Section 3.0, once the receptor site has been prepared, the ancient woodland soil should be spread over the receptor site at a depth of at least 150 mm unless otherwise specified or agreed with Portsmouth Water.

¹⁰ LandIS Cranfield University (2022) 'Soils Guide' Available online at <http://www.landis.org.uk/soilsguide/index.cfm> Last accessed April 2022

4. Phase 1 Northern Access Soil Management

Background

- 4.1. This section of the FSMP provides guidance for the recovery, storage and reuse of ancient woodland soil within the construction footprint of and along the verges of the proposed northern access junction with the B2149 (part of the s278 highway works), and the Phase 1 Scheme, i.e. the Northern Access within Blendworth Fragment (ASNW) and to the south of Blendworth Fragment through Havant Thicket (PAWS).
- 4.2. The Phase 1 Scheme for the most part will consist of a single lane 3.65 m wide carriageway with passing bays and 0.5 m verges with 0.9 m embankment slopes and a 6.45 m wide footprint. It is noted that it has been designed to minimise the impact on the ancient woodland and adjacent root protection areas.
- 4.3. From a reconnaissance soil investigation carried out in March 2022 (see Section 2) it was determined:
- 4.4. In Blendworth Fragment, the presence of an approximately 50 mm thick layer of leaf litter above an approximately 100 mm layer of black to dark grey (humic), medium silty clay loam topsoil, over slowly permeable and seasonally waterlogged clay subsoil. See Plate 4.1 (Blendworth Fragment (Pit 4)) below.

Plate 4.1: Ancient woodland soil profile (Blendworth Fragment (Pit 4))



- 4.5. The existing access track used for forestry purposes, which will accommodate the northern access route, comprises a compacted gravel road, and the verges/low embankments either-side of the track are covered with a thin (approximately 50 mm thick) layer of topsoil, which is vegetated with grass, as per Plates 4.2 and 4.3 below.

Plate 4.2: View of existing forestry track in March 2022



Plate 4.3: Shallow soil profile on verge of existing forestry track (Pit 3)



Recovery Storage and Reuse of Ancient Woodland Soils

- 4.6. Before works commence on the northern access junction with the B2149 and Phase 1 Scheme, the trees will have been felled by Portsmouth Water's contractor Tilhill and the stumps removed.
- 4.7. A pre-construction vegetation survey shall be undertaken by a competent botanist¹¹ to map the locations of notable and noteworthy species within the construction footprint.
- 4.8. The vegetation survey is required to identify species that should be protected in situ where possible or if not, salvaged and relocated to a location agreed with Portsmouth Water. As well as identifying areas where ancient woodland soil should not be spread over the more unusual acid grassland areas or where there are other noteworthy vegetation assemblages for which it would not provide an appropriate growing medium. This is to ensure that ancient woodland soil is only placed where they will provide a benefit (net gain), and not be placed in areas where they will have no additional benefit, and potentially do more harm than good.
- 4.9. The construction footprint is shown on Northern Access - Indicative Soil Stripping and Reinstatement Layout Plan Reference Number HTR-ATK-ZZ-ZZ-DR-L-0049 in Appendix G,

¹¹ who has prior knowledge of the site (preferably by John Norton of ECOSA who undertook the previous survey)

includes three sections of soil management that reflect the scope of works and analysis of the soil pits in Table 2.2:

- Northern Access Junction/B2149 within Blendworth Fragment
- Northern Access within Blendworth Fragment.
- Northern Access south of Blendworth Fragment.

- 4.10. The general requirements for soil handling set out in Section 3.0 shall be followed.
- 4.11. Prior to soil stripping, unless otherwise instructed by Portsmouth Water, the vegetation within the construction footprint should be cleared and removed. This is to minimise the incorporation of vegetation/plant material into the soil strip.
- 4.12. The contractor shall store all soils, including ancient woodland soils, separately in adjacent areas outside of the construction footprint. The contractor shall a) avoid root protection zones of existing trees and b) protect adjacent areas where advised by the ecologist, using a suitable method for example geotextile agreed with Portsmouth Water.
- 4.13. Where possible, the soils, including ancient woodland soils, shall be stripped and transported directly for spreading along the verges of the constructed Northern Access. i.e., direct placement is preferred to storage and then spreading.
- 4.14. Where direct placement of ancient woodland soils is not possible, the contractor shall store ancient woodland soils separately in low, loose-tipped soil storage bunds, not exceeding 1m in height. This is to allow water to drain through the stockpile and prevent the soil in the bund from becoming anaerobic, i.e., deficient of oxygen. The contractor shall avoid mixing soils, including ancient woodland soils.
- 4.15. The ancient woodland soils shall not be stored in bunds for longer than six months. The bunds should not be sown with grass seed but rather be left to revegetate naturally.

Soil Management Sections along Northern Access

Northern Access Junction/B2149 within Blendworth Fragment

Northern Access Junction/B2149 - Dig Construction

- 4.16. Once the surface vegetation has been cut and removed along the B2149 verges, a 150 mm depth of ancient woodland topsoil (including approximately 50 mm leaf litter) shall be stripped and stored separately at a suitable location within this section prior to the commencement of the highway and access construction work. On completion the stripped topsoil shall be respread on the B2149 verges within the construction footprint of this section.

Northern Access within Blendworth Fragment.

Blendworth Fragment - Dig Construction Chainage 20 - 160

- 4.17. Once the surface vegetation has been cut and removed within the construction footprint of this section within Blendworth Fragment. A 150 mm depth of ancient woodland topsoil (including approximately 50 mm leaf litter) shall be stripped and stored separately at a suitable location prior to the commencement of the access construction work. On completion the topsoil shall be respread along the verges and embankments of the Northern Access in this section.
- 4.18. Surplus ancient woodland topsoil shall be translocated to donor areas agreed with Portsmouth Water along the Northern Access south of Blendworth Fragment Chainage 190 – 1430.

Blendworth Fragment - No Dig Construction Chainage 160 - 190

- 4.19. Ancient woodland topsoil shall be retained in situ and no soil will be stripped to avoid impacting the root protection areas of existing trees within the footprint of the Northern Access as shown on landscape plans reference HTR-ATK-RZ-RE-DR-L-0027 – 0030.
- 4.20. The Northern Access includes a potential park pale at Chainage 190, a potential non designated heritage asset. The contractor's approach shall be informed by the Archaeological Mitigation Strategy and Written Scheme of Investigation.

Northern Access south of Blendworth Fragment.

Northern Access South of Blendworth Fragment - No Dig Construction Chainage 190 - 1210

- 4.21. Ancient woodland topsoil shall be retained in situ and no soil will be stripped to avoid impacting the root protection areas of existing trees within the footprint of the Northern Access as shown on landscape plans reference HTR-ATK-RZ-RE-DR-L-0027 – 0030.
- 4.22. Beyond the root protection areas of existing trees shown on landscape plans reference HTR-ATK-RZ-RE-DR-L-0027 – 0030. once the surface vegetation has been cut and removed, the thin covering of ancient woodland topsoil (approximately 50 mm) on the verges alongside the existing forestry track shall be stripped. The soil shall be stored at a suitable location as close as possible to the area where it will be respread to minimise soil being transported too far. The contractor shall agree the extent of soil stripping and storage location with Portsmouth Water.

Northern Access South of Blendworth Fragment - Dig Construction Chainage 1210 – 1430

- 4.23. Once the surface vegetation has been cut and removed, the thin covering of ancient woodland topsoil (approximately 50 mm) on the verges alongside the existing forestry track should be stripped. The topsoil shall be stored separately at a suitable location as close as possible to the area where it will be respread to minimise soil being transported too far. The contractor shall agree the extent of soil stripping and storage location with Portsmouth Water.

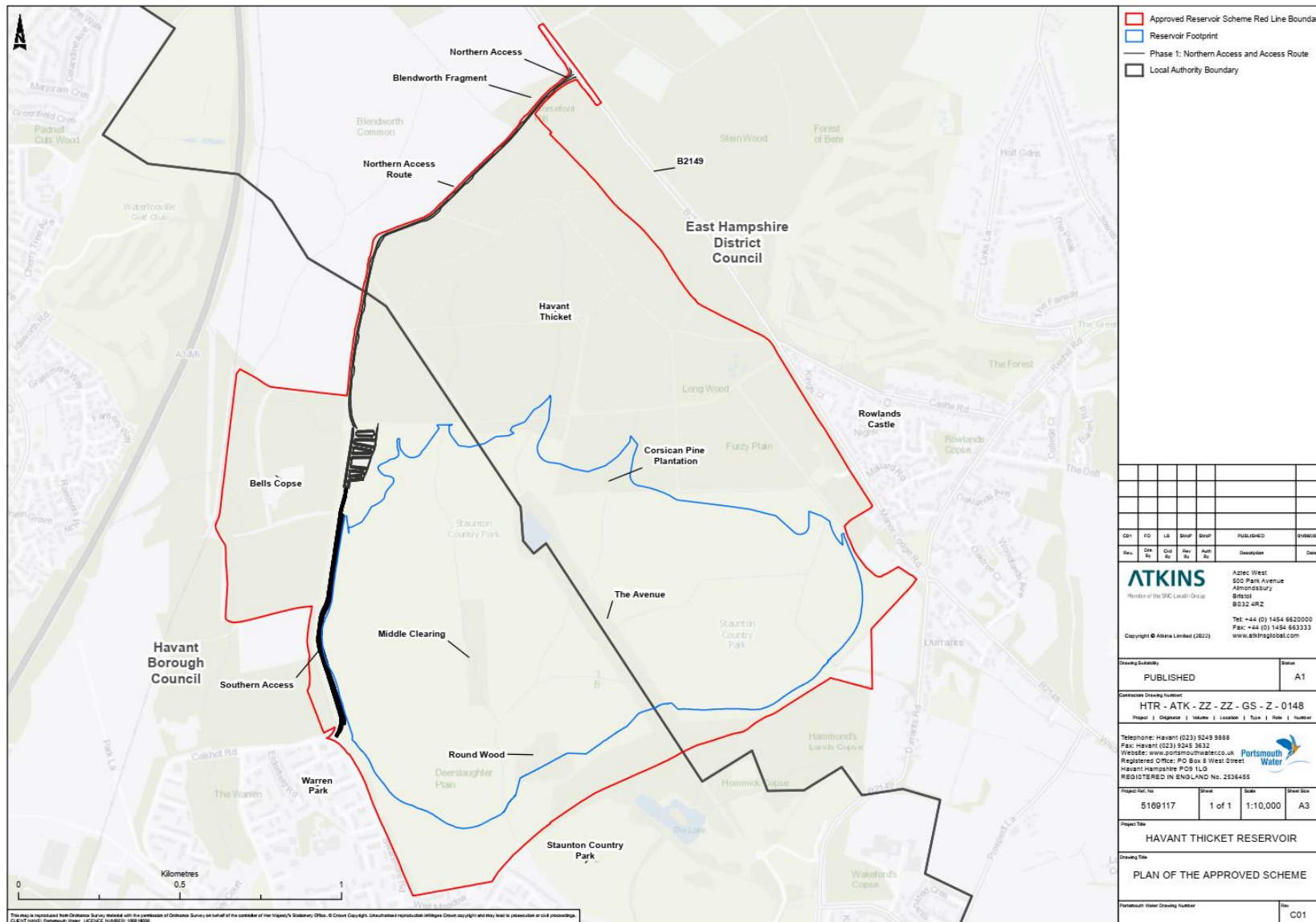
Northern Access South of Blendworth Fragment - Construction of Retention Basin/Dry Pond in Bells Copse Approximate Chainage 1375 1390

- 4.24. Once the surface vegetation has been cut and removed within the construction footprint of the Retention Basin/Dry Pond within Bells Copse, a 150 mm depth of ancient woodland topsoil (including approximately 50 mm leaf litter) shall be stripped and stored at a suitable location. On completion the topsoil shall be respread within the Retention Basin/Dry Pond and along the verges and embankments in this section.

Turning Circle on junction of Northern Access with the Forestry England Category A haulage route

- 4.25. Once the surface vegetation has been cut and removed, the thin covering of ancient woodland topsoil (approximately 50 mm) on the verges alongside the existing forestry track should be stripped. The topsoil shall be stored separately at a suitable location as close as possible to the area where it will be respread to minimise soil being transported too far. The contractor shall agree the extent of soil stripping and storage location with Portsmouth Water.
- 4.26. Once the surface vegetation has been cut and removed within the construction footprint of the turning circle:
- 150 mm of ancient woodland topsoil (including approximately 50 mm leaf litter) shall be stripped from the ancient woodland of Havant Thicket where impacted within the construction footprint and stored separately at a suitable location.
 - 150 mm of lowland meadow topsoil shall be stripped south of the Forestry England Category A haulage route within the construction footprint and stored separately in a suitable location.
- 4.27. On completion:
- At least 50mm of ancient woodland topsoil shall be respread along the verges and embankments in this section including ditches.
 - At least 150mm of ancient woodland topsoil will be spread on the proposed landscape area within the turning circle.
 - To the south of the junction of the Northern Access junction with the Forestry England Category A haulage route, a minimum of 50mm of lowland meadow topsoil shall be respread along the verges and embankments including ditches.

Appendix A Approved Reservoir Scheme Site Location Plan



Appendix B. IQ Supplementary Guidance on Soil Wetness

Supplementary Note 4 Soil Wetness

Soil wetness is a major determinant of land use, and environmental and ecosystem services in the UK. It is also a factor in the occurrence of significant compaction arising from handling soils with earth-moving machines and the practices used (Duncan & Bransden, 1986).

Relative soil wetness can range from the waterlogged to moist (mesic) or dry (xeric) depending on rainfall distribution and depth to a water-table and duration of waterlogging. In the UK, soil wetness is largely seasonal with higher evapo-transpiration rates potentially exceeding rainfall in the summer resulting in the soil profile becoming drier where there is vegetation. Whilst soil wetness is largely weather system and equinox (climate) driven, it varies with geographical and altitudinal locations, and importantly the physical characteristics of the soil profile, such as texture structure, porosity, and depth to the water-table and topography including flood risk (MAFF, 1988). The Soil Wetness Class is based on the expected average duration of waterlogging at different depths in the soil throughout the year (days per year), and can be determined by reference to soil characteristics and local climate (MAFF, 1988). The likely inherent wetness and resilience status of a soil should be indicated in the SRMP (see **Part 1, Table 2 & Supplementary Note 1**), reflecting potential risks for soil handling such as low permeability, permanently high groundwater, or a wet upland climate.

Wet soils can also be a result of other circumstances. For example, the interception of water courses, drainage ditches and field land drains. Where these occur, the provisions are to be made in the SRMP to protect the soils being handled and the operational area.

Soils, when in a wet condition generally have a lower strength and have less resistance to compression and smearing than when dry. Lower strength when soils are wet also affects the bearing capacity of soils and their ability to support the safe and efficient operation of machines than when in a

dry state.

In terms of resilience and susceptibility to soil wetness, the clay content of the soil largely determines the change from a solid to a plastic state (the water content at which this occurs is called the 'plastic limit' (MAFF, 1982)). This is the point at which an increasing soil wetness has reduced the cohesion and strength of the soil and its resistance to compression and smearing.

Whilst coarse textured sandy soils are not inherently plastic when wet, they are still prone to compaction when in a wet condition. Hence, handling all soils when wet will have adverse effects on plant root growth and profile permeability, which may be of significance for the intended land use and the provision of services reliant on soil drainage and plant root growth. It may be less so in other circumstances where wet soil profiles, perched water tables and ponding are the reclamation objectives, though drainage control, for example to control flooding, may still be important in these contexts.

In cases of permanently wet soils, such as riverine sites, upland or deep organic soils where there is a persistent high water-table throughout the seasons within the depth of soil to be stripped and/or the soil profile remains too wet, a strategic decision has to be made to be able to proceed with the development of the mineral resource. This may mean alternative and less favourable soil handling practices have to be agreed with the planning authority.

Predicting & Determination of Soil Wetness

There are well established methods to predict and determine soil wetness of undisturbed and restored soil profiles (Reeve, 1994). The challenge has been the prediction of the best time for soil stripping. Models based on soil moisture deficits and field capacity dates for a range of soil textures can provide indicative regional summaries (**Table 4.1**) that can help with planning operations at broad scale but cannot be relied upon in practice for deciding operationally whether to proceed on the ground given the actual variation in weather events from year to year and within years.



Soil Clay Content	Climatic Zones		
	1	2	3
Soil Depth <30cm			
<10%	Mid Apr - Early Oct	Late Mar - Early Nov	Late Mar - Early Dec
10 -27%	Late May - Early Oct	Early May - Early Nov	Early Apr - Early Dec
Soil Depth 30-60cm			
<10%	Late Apr - Early Oct	Mid Apr - Early Nov	Early Apr - Early Dec
10-27%	Late May - Early Oct	Early May - Early Nov	Early Apr - Early Dec
>27%	Late June - Early Oct	Early June - Early Nov	Late May - Early Dec
Soil Depth >60cm			
<10%	Late Apr - Early Oct	Mid Apr - Early Nov	Early Apr - Early Dec
10-18%	Late May - Early Oct	Early May - Early Nov	Early Apr - Early Dec
18-27%	Late June - Early Oct	Early June - Early Nov	Late May - Early Dec
>27%	Mid July - Mid Sept	Early July - Mid Oct	Late June - Mid Oct

Table 4.1: Indicative on-average months when vegetated mineral soils might be in a sufficiently dry condition according to geographic location, depth of soil and clay content

The timing of most soil handling operations takes place between April and September. Although in western (Zone 1) and central (Zone 2) areas it typically can be a later start in May with an earlier termination in August. Whilst the return to climatically 'excess rainfall' is later in the eastern counties (Zone 3) and can be as late as November/early December, there is a need to maintain transpiring vegetation to keep the soils being handled in a dry as possible condition and to establish new vegetation covers as soon as possible (on replaced soils and storage mounds). Hence, soil handling operations generally need to be completed no later than the end of September (Natural England, 2021), unless appropriate provisions can be assured.

Where data is available, more realistic local and real-time predictions can be made, however, because weather patterns and events differ between and within years, and soils can be very locally in their condition. Experience has shown that the most practical approach for operations is to inspect the site and soils in question near to/at the time when soil handling is to take place. Professional soil surveyors can advise on the best time for soil handling (stripping, storage & replacement) and carry out site assessments of soil wetness condition prior to the start of operations.

A Practical Method for Determining Soil Wetness Limitation

During the soil handling season (see Table 4.1 above), prior to the start or recommencement of soil handling soils should be tested to confirm they are in suitably dry condition (**Table 4.2**). The 'testing' during operations can be done by suitably trained site staff and reviewed periodically by the professional soil surveyors.

The method is simply the ability to roll intact threads (3mm diameter) of soil indicating the soils are in a plastic and wet condition (MAFF, 1982; Natural England, 2021). Representative samples are to be taken through the soil profile and across the area to be stripped. It is the best available indicator of soils being too wet to be handled and operations should be delayed until a thread cannot be formed. For coarse textured soils which do not roll into threads, a professional's view as to soil wetness and the risk of compaction may have to be taken.

Table 4.2: Field Tests for Suitably Dry Soils

Soil tests are to be undertaken in the field. Samples shall be taken from at least five locations in the soil handling area and at each soil horizon to the full depth of the profile to be recovered/replaced. The tests shall include visual examination of the soil and physical assessment of the soil consistency.

i) Examination

- If the soil is wet, films of water are visible on the surface of soil particles or aggregates (e.g. clods or peds) and/or when a clod or ped is squeezed in the hand it readily deforms into a cohesive 'ball' means **no soil handling to take place**.
- If the sample is moist (i.e. there is a slight dampness when squeezed in the hand) but it does not significantly change colour (darken) on further wetting, and clods break up/crumble readily when squeezed in the hand rather than forming into a ball means **soil handling can take place**.
- If the sample is dry, it looks dry and changes colour (darkens) if water is added, and it is brittle means **soil handling can take place**.

ii) Consistency
First test

Attempt to mould soil sample into a ball by hand:

- Impossible because soil is too dry and hard or too loose and dry means **soil handling can take place**.
- Impossible because the soil is too loose and wet means no soil handling to take place.
- Possible - Go to second test.

Second test

Attempt to roll ball into a 3mm diameter thread by hand:

- Impossible because soil crumbles or collapses means soil handling can take place.
- Possible means no soil handling can take place.

N.B.: It is possible to roll most coarse loamy and sandy soils into a thread even when they are wet. For these soils, the Examination Test alone is to be used.

A Rainfall Protocol to Suspend & Restart Soil Handling Operations

Local weather forecasts of possible rainfall events during operations and the occurrence of surface lying water have been used to advise on a day-to-day basis if operations should stop (Natural England, 2021). Single events such as >5mm/day in spring and autumn months, and >10mm/day in the summer have been suggested as more precise triggers for determining soil handling operations (Reeve, 1994). However, in practice the following generic guidelines are often used:

- In light drizzle soil handling may continue for up to four hours unless the soils are already at/near to their moisture limit.
- In light rain soil handling must cease after 15 minutes.
- In heavy rain and intense showers, handling shall cease immediately.

In all of the above it is assumed that soils were in a dry condition. These are only general rules, and it is at the local level decisions to proceed or stop should be based on the actual wetness state of the soils being handled. After the above rain event has ceased, the soil tests in **Table 4.2** above should be applied to determine whether handling may restart, provided that the ground is free from ponding and ground conditions are safe to do so. There can be extreme instances where soil horizons have become very dry and are difficult to handle resulting in dust and windblown losses. In these conditions the operation should be suspended. The artificial wetting of extremely dry soils is not usually a practice recommended but has been successful in some cases.

References

- [Duncan N A and Bransden B E. 1986. The effects on a restored soil caused by soil moving under different moisture contents. Applied Geography, 6, 3, pp 267-273](#)
- MAFF, 1982. Reference Book 441: Techniques for measuring soil physical properties. Her Majesty's Stationery Office, London
- [MAFF. 1988. Agricultural Land Classification Of England and Wales](#)
- [Natural England. 2021. Planning and aftercare advice for reclaiming land to agricultural use](#)
- Reeve M J, 1994. Improving land restoration in Britain by better timing of soil movement, pp 28-37. In, Proceedings American Society of Mining and Reclamation. DOI: 10.21000/JASMR94030028

Appendix C. Extract from NSRI Soil Report

National Soil Resources Institute



1. Soil Thematic Maps

This section contains a series of maps of the area surrounding your selected location, presenting a number of themes relating to the characteristics of the soils. These provide an overview of the nature and condition of the local soil conditions. It is these conditions that may be used to infer the response of an area to certain events (with the soil as a receptor), such as pollution contamination from a chemical spill, or an inappropriate pesticide application and the likelihood of these materials passing through the soil to groundwater. Other assessments provide an insight into the way a location may impact, by corrosive attack or ground movement, upon structures or assets within the ground, for example building or engineering foundations or pipes and street furniture.

Soil is a dynamic environment with many intersecting processes, chemical, physical and biological at play. Even soils 'sealed' over by concrete and bitumen are not completely dormant. The way soils respond to events and actions can vary considerably according to the properties of the soil as well as other related factors such as land-use, vegetation, topography and climate. There are many threats facing our national soil resource today and importance should be given to identifying the best measures aimed towards soil protection and ensuring the usage of soils in the most sustainable way. This report is therefore a useful snapshot of the soil properties for your given area, providing a summary of a broad range of ground conditions

To learn more about the soil system, the functions and ecosystems services performed by soil as well as the range of pressing contemporary threats and concerns for soils in the UK and world-wide, visit our free educational web resources:

Soil-net www.soil-net.com

SoilsWorldwide www.soilsworldwide.net

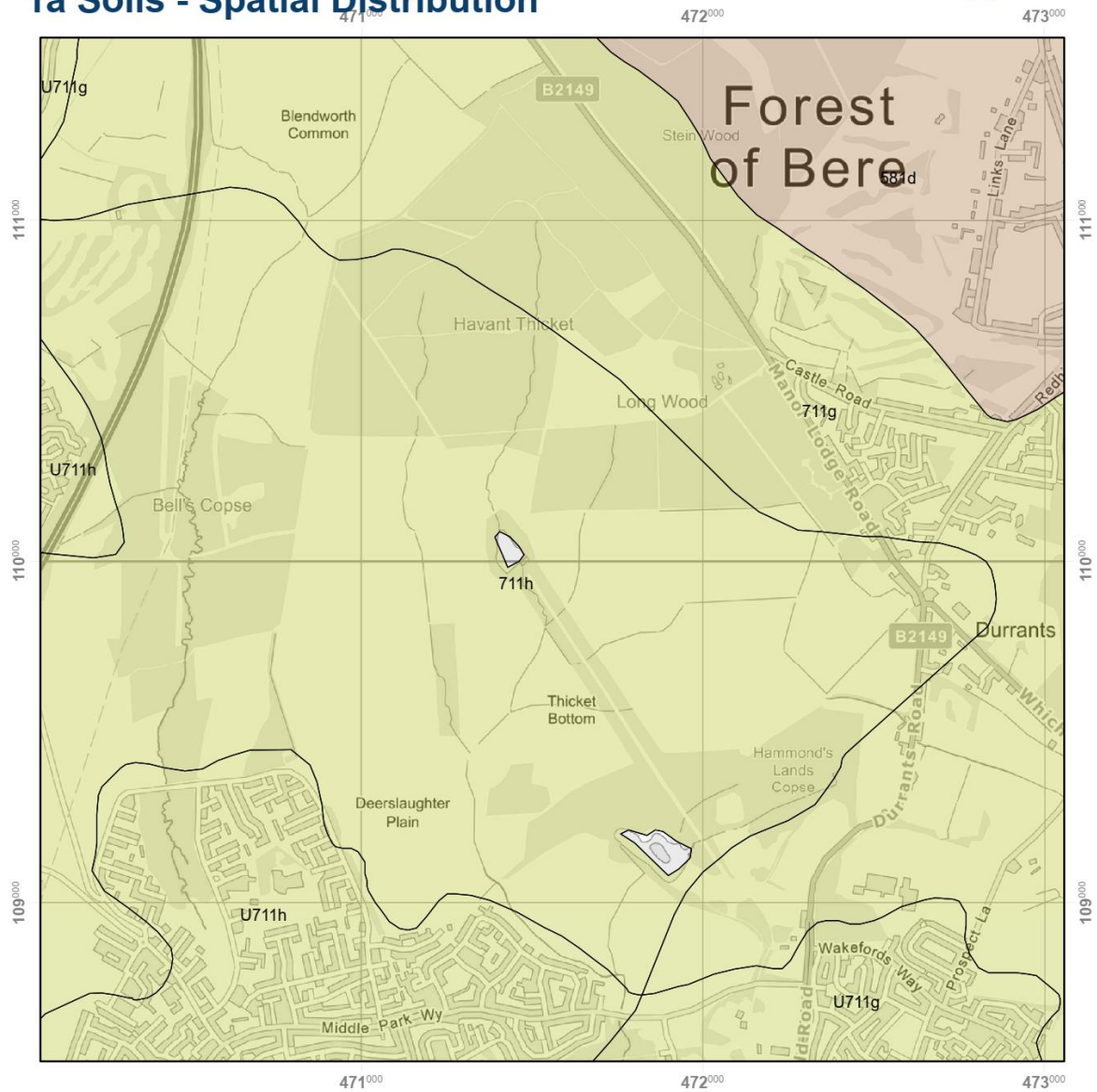


Figure 1: Location of study area

National Soil Resources Institute

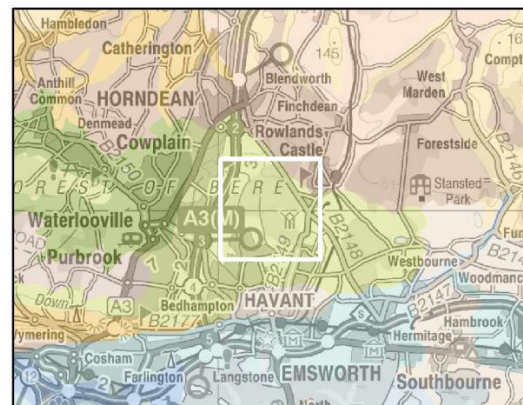


1a Soils - Spatial Distribution



Soils Data © Cranfield University (NSRI)
and for the Controller of HMSO 2022

Contains OS data © Crown Copyright
and database right 2017



National Soil Resources Institute



Soils - Spatial Distribution Key

-  **581d CARSTENS**
Well drained fine silty over clayey, clayey and fine silty soils, often very flinty.
-  **711g WICKHAM 3**
Slowly permeable seasonally waterlogged fine loamy over clayey and coarse loamy over clayey soils and similar more permeable soils with slight waterlogging.
-  **711h WICKHAM 4**
Slowly permeable seasonally waterlogged fine loamy over clayey and fine silty over clayey soils associated with similar clayey soils often with brown subsoils.

SOIL ASSOCIATION DESCRIPTION

Soil associations represent a group of soil series (soil types) which are typically found occurring together, associated in the landscape (Avery, 1973; 1980; Clayden and Hollis, 1984). Soil associations may occur in many geographical locations around the country where the environmental conditions are comparable. For each of these soil associations, a collection of soil types (or soil series) are recorded together with their approximate proportions within the association. Soil associations have codes as well as textual names, thus code '554a' refers to the 'Frilford' association. Where a code is prefixed with 'U', the area is predominantly urbanised (e.g. 'U571v'). The soil associations for your location, as mapped above, are described in more detail in Section 2: Soil Association Descriptions.

Appendix D. Soil Analysis 2020

Our Ref: EFS/204820 (Ver. 1)
Your Ref: A9031-19
February 26, 2020

Neil Cooke
SOCOTEC UK Doncaster
Askern Road
Carcroft
Doncaster
South Yorkshire
DN6 8DG



Environmental Chemistry
SOCOTEC UK Limited
Bretby Business Park
Ashby Road
Burton-on-Trent
Staffordshire
DE15 0YZ

Telephone: 01283 554400
Facsimile: 01283 554422

For the attention of Neil Cooke

Dear Neil Cooke

Sample Analysis - A9031-19 Havant Thicket Winter Storage

Samples from the above site have been analysed in accordance with the schedule supplied.
The sample details and the results of analyses for these samples are given in the appended report.

An invoice for this work will follow under a separate cover.

Where appropriate the samples will be kept until 27/02/20 when they will be discarded. Please call 01283 554400 for an extension of this date.

Please be aware that our policy for the retention of paper based laboratory records and analysis reports is 6 years.

The work was carried out in accordance with SOCOTEC UK Limited (Multi-Sector Services) Standard Terms and Conditions of Contract.

If I can be of any further assistance please do not hesitate to contact me.

Yours sincerely

for SOCOTEC UK Limited



L. Moore
Project Co-ordinator
01283 554400

TEST REPORT



Report No. EFS/204820 (Ver. 1)

SOCOTEC UK Doncaster
Askern Road
Carcroft
Doncaster
South Yorkshire
DN6 8DG

Site: A9031-19 Havant Thicket Winter Storage

The 13 samples described in this report were registered for analysis by SOCOTEC UK Limited on 16-Jan-2020. This report supersedes any versions previously issued by the laboratory.

The analysis was completed by: 26-Feb-2020

Tests where the accreditation is set to N or No, and any individual data items marked with a * are not UKAS accredited. Opinions and interpretations expressed herein are outside the scope of UKAS accreditation.

The following tables are contained in this report:

Table 1 Main Analysis Results (Page 2)
Subcontracted Analysis Reports (Pages 3 to 8)
The accreditation status of subcontracted analysis is displayed on the appended subcontracted analysis reports.
Analytical and Deviating Sample Overview (Page 9)
Table of Method Descriptions (Page 10)
Table of Report Notes (Page 11)
Table of Sample Descriptions (Appendix A Page 1 of 1)

On behalf of
SOCOTEC UK Lim 
Becky Batham
Operations Manager
Energy & Waste Services

Date of Issue: 26-Feb-2020

Tests marked '^' have been subcontracted to another laboratory.

Where samples have been flagged as deviant on the Analytical and Deviating Sample Overview, for any reason, the data may not be representative of the sample at the point of sampling and the validity of the data may be affected. SOCOTEC UK Limited accepts no responsibility for any sampling not carried out by our personnel.

Page 2 of 11

Certificate of Analysis

Client : SOCOTEC UK Doncaster Job Number : 19 Havant Thicket Winter S
 Client Site : A9031-19 Havant Thicket Winter Storage Date Received : 16/01/2020
 Suite ID : BS3882 : 2015 - Multipurpose Grade Date Reported : 26/02/2020

Soil Sample Reference : 0.05 TSS 0.10 TSS 0.10 TSS 0.10 TSS 0.10

Particle Size Distribution*		(UK Classification)									
Clay (<0.002mm)	%	16	✓	12	✓	38	✗	24	✓	10	✓
Silt (0.002-0.06mm)	%	70	✗	20	✓	53	✓	44	✓	56	✓
Sand (0.06-2.0mm)	%	14	✓	68	✓	9	✓	32	✓	34	✓
Textural Class		ZL	✗	SL	✓	ZC	✗	CL	✓	SZL	✓

Stone Content (Dry Weight Basis)											
Stones 2-20mm	%w/w	9	✓	21	✓	1	✓	12	✓	19	✓
Stones 20-50mm	%w/w	3	✓	13	✗	0	✓	18	✗	8	✓
Stones >50mm	%w/w	0	✓	0	✓	0	✓	0	✓	0	✓

Soil Reaction & Soluble Salts										
pH Value ‡	units	6.7 ✓	6.7 ✓	5.8 ✓	6.5 ✓	6.1 ✓				
Electrical Conductivity (CaSO ₄)†	µS/cm	2010 ✓	2090 ✓	2130 ✓	2080 ✓	2040 ✓				

Organic Matter & Nutrient Status											
Organic Matter (LOI)	%	5.90	✓	4.3	✓	3.2	✗	2.5	✗	5.7	✓
Total Nitrogen	%	0.23	✓	0.17	✓	0.13	✗	0.09	✗	0.15	✓
Carbon : Nitrogen Ratio		15:1	✓	15:1	✓	14:1	✓	16:1	✓	22:1	✗
Extractable Phosphate	mg/l	10.9	✗	7.58	✗	26.9	✓	9.26	✗	10.9	✗
Extractable Potassium	mg/l	223	✓	148	✓	283	✓	137	✓	135	✓
Extractable Magnesium	mg/l	257	✓	72	✓	273	✓	85	✓	50	✗

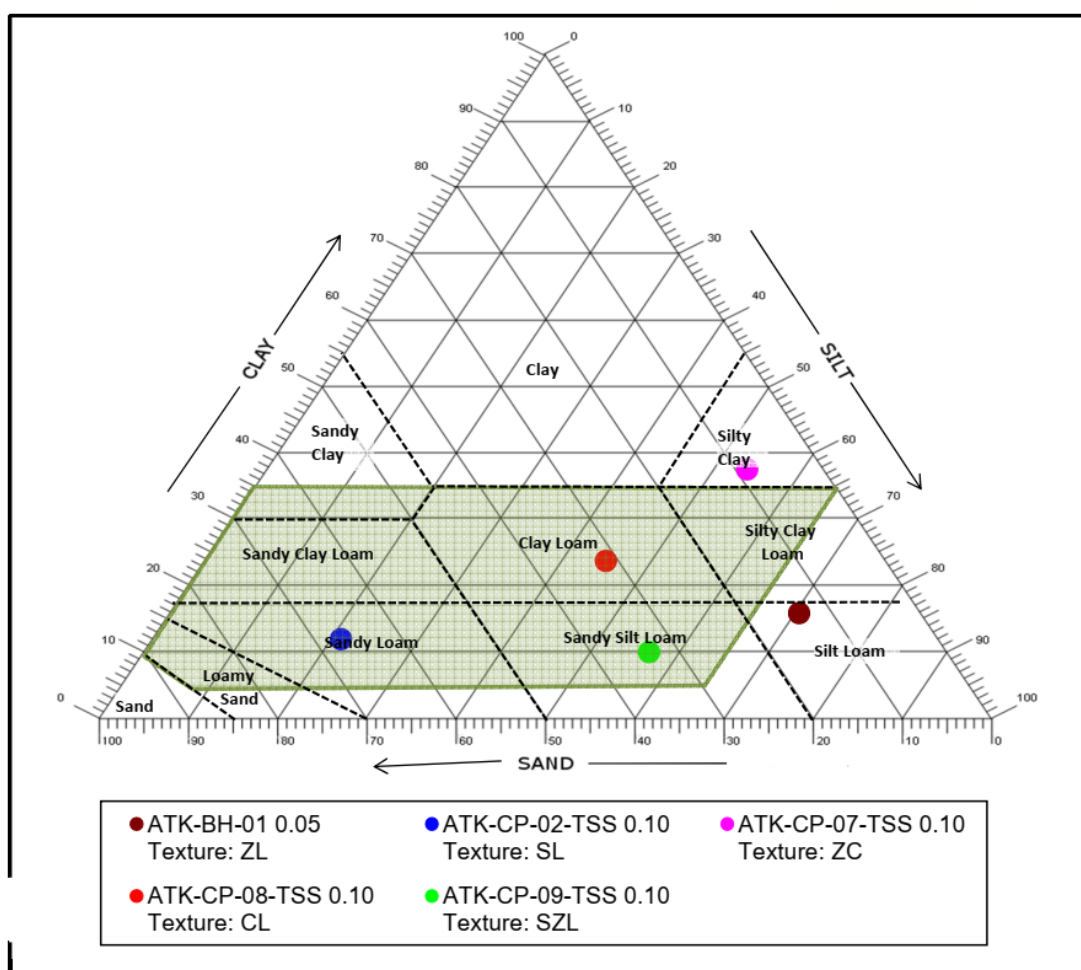
Phytotoxic Metals [†]											
Zinc (Zn)	mg/kg	32.1	✓	16.7	✓	31.5	✓	21	✓	31.7	✓
Copper (Cu)	mg/kg	6.55	✓	6.4	✓	8.51	✓	3.95	✓	12.1	✓
Nickel (Ni)	mg/kg	8.44	✓	4.19	✓	9.01	✓	5.4	✓	5.32	✓

Visible Contaminants (Dry Weight Basis)											
Total foreign matter > 2 mm	%w/w	<0.5	✓	<0.5	✓	<0.5	✓	<0.5	✓	<0.5	✓
... of which plastics	%w/w	<0.25	✓	<0.25	✓	<0.25	✓	<0.25	✓	<0.25	✓
... of which sharps	%w/w	0	✓	0	✓	0	✓	0	✓	0	✓

Soil Description

Notes:		UK Soil Texture Classification			
☒	Conforms to BS3882 : 2015 - Multipurpose Grade	C	Clay	ZC	Silty Clay
☒	Fails to conform to BS3882 : 2015 - Multipurpose Grade	SC	Sandy Clay	ZCL	Silty Clay Loam
		CL	Clay Loam	SZL	Sandy Silt Loam
		SL	Sandy Loam	ZL	Silt Loam
		SCL	Sandy Clay Loam	S	Sand
		LS	Loamy Sand		

* LASER diffraction
‡ 1:2.5 water extract
† CaSO₄ extract
' Total metals
ne not evaluated



Certificate of Analysis

Client :	SOCOTEC UK Doncaster	Job Number :	19 Havant Thicket Winter S
Client Site :	A9031-19 Havant Thicket Winter Storage	Date Received :	16/01/2020
Suite ID :	BS3882 : 2015 - Multipurpose Grade	Date Reported :	26/02/2020

Soil Sample Reference :	TSS 0.10	TSS 0.10	TSS 0.10	TSS 0.10	TSS 0.10
-------------------------	----------	----------	----------	----------	----------

Particle Size Distribution*		(UK Classification)									
Clay (<0.002mm)	%	16	✓	23	✓	21	✓	20	✓	36	✗
Silt (0.002-0.06mm)	%	60	✓	31	✓	36	✓	35	✓	53	✓
Sand (0.06-2.0mm)	%	24	✓	46	✓	43	✓	45	✓	11	✓
Textural Class		SZL	✓	CL	✓	CL	✓	CL	✓	ZC	✗

Stone Content (Dry Weight Basis)											
Stones 2-20mm	%w/w	9	✓	10	✓	3	✓	24	✓	1	✓
Stones 20-50mm	%w/w	11	✗	4	✓	3	✓	10	✓	0	✓
Stones >50mm	%w/w	42	✗	0	✓	0	✓	0	✓	0	✓

Soil Reaction & Soluble Salts											
pH Value ‡	units	6.2	✓	6	✓	6.1	✓	6.5	✓	6.1	✓
Electrical Conductivity (CaSO ₄)†	µS/cm	2060	✓	2080	✓	2110	✓	2100	✓	2180	✓

Organic Matter & Nutrient Status											
Organic Matter (LOI)	%	3.80	✓	3.5	✗	3.5	✗	4.5	✓	6.1	✓
Total Nitrogen	%	0.13	✗	0.12	✗	0.14	✗	0.12	✗	0.15	✓
Carbon : Nitrogen Ratio		17:1	✓	17:1	✓	15:1	✓	22:1	✗	24:1	✗
Extractable Phosphate	mg/l	6	✗	6.74	✗	9.26	✗	9.26	✗	6	✗
Extractable Potassium	mg/l	183	✓	140	✓	5	✗	122	✓	230	✓
Extractable Magnesium	mg/l	108	✓	89	✓	5	✗	92	✓	224	✓

Phytotoxic Metals'											
Zinc (Zn)	mg/kg	32.7	✓	21.2	✓	30.7	✓	27.6	✓	35.9	✓
Copper (Cu)	mg/kg	6.92	✓	4.38	✓	5.98	✓	4.54	✓	6.5	✓
Nickel (Ni)	mg/kg	8.19	✓	5.46		5.41	✓	5.7	✓	7.28	✓

Visible Contaminants (Dry Weight Basis)											
Total foreign matter > 2 mm	%w/w	<0.5	✓	<0.5	✓	<0.5	✓	<0.5	✓	<0.5	✓
... of which plastics	%w/w	<0.25	✓	<0.25	✓	<0.25	✓	<0.25	✓	<0.25	✓
... of which sharps	%w/w	0	✓	0	✓	0	✓	0	✓	0	✓

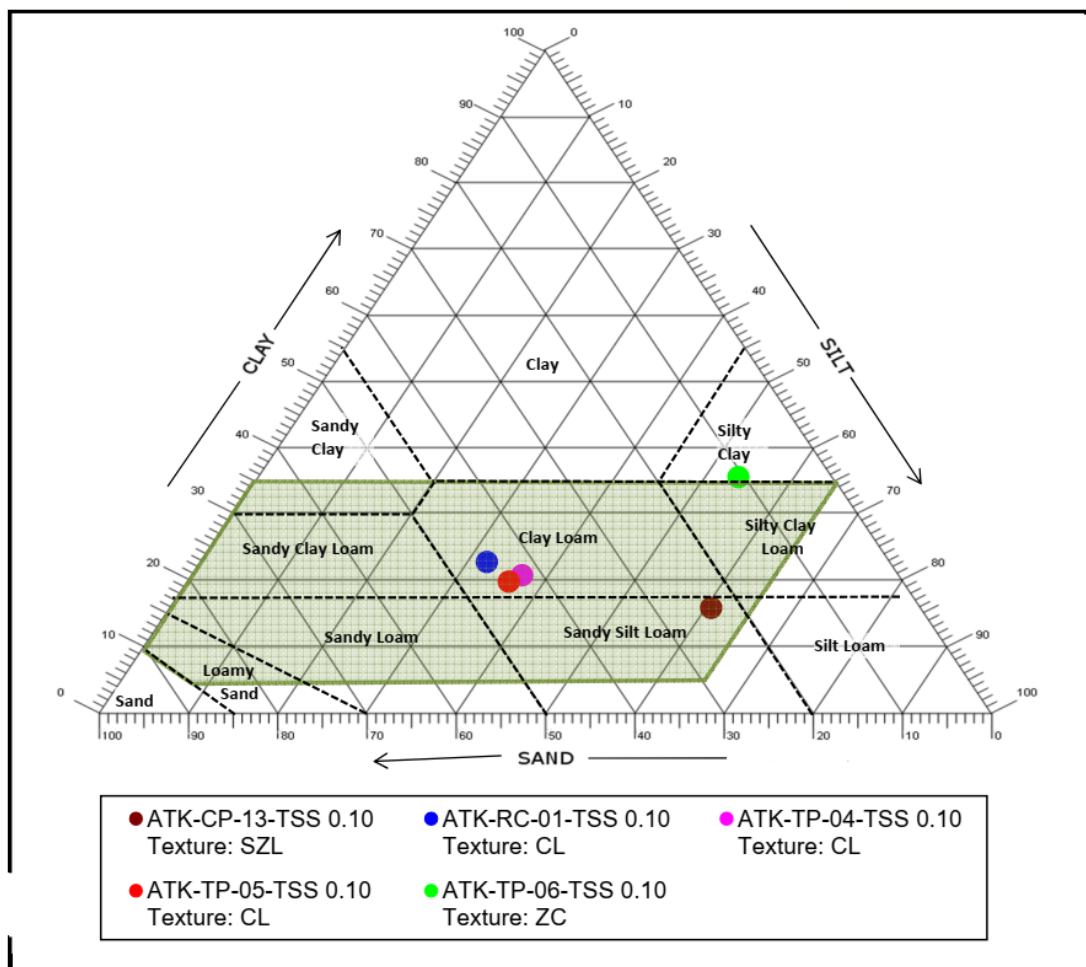
Soil Description

Notes:				UK Soil Texture Classification			
☒	Conforms to BS3882 : 2015 - Multipurpose Grade	C	Clay	ZC	Silty Clay		
☒	Fails to conform to BS3882 : 2015 - Multipurpose Grade	SC	Sandy Clay	ZCL	Silty Clay Loam		
		CL	Clay Loam	SZL	Sandy Silt Loam		
		SL	Sandy Loam	ZL	Silt Loam		
		SCL	Sandy Clay Loam	S	Sand		
		LS	Loamy Sand				

* LASER diffraction
 ‡ 1:2.5 water extract
 † CaSO₄ extract
 ' Total metals
 ne not evaluated

SOCOTEC UK, Environmental Chemistry, Bretby Business Park, Ashby Rd, Burton on Trent, Staffs. DE15 0YZ. Tel: 01283 554400

Top soil - Certificate of Analysis v1.001



Certificate of Analysis

Client :	SOCOTEC UK Doncaster	Job Number :	19 Havant Thicket Winter S
Client Site :	A9031-19 Havant Thicket Winter Storage	Date Received :	16/01/2020
Suite ID :	BS3882 : 2015 - Multipurpose Grade	Date Reported :	26/02/2020

Soil Sample Reference :	TSS 0.10	0.10	TSS 0.10
-------------------------	----------	------	----------

Particle Size Distribution*		(UK Classification)			
Clay (<0.002mm)	%	15	✓	34	✓
Silt (0.002-0.06mm)	%	61	✓	63	✓
Sand (0.06-2.0mm)	%	24	✓	3	✓
Textural Class		SZL	✓	ZCL	✓

Stone Content (Dry Weight Basis)					
Stones 2-20mm	%w/w	28	✓	4	✓
Stones 20-50mm	%w/w	5	✓	0	✓
Stones >50mm	%w/w	0	✓	0	✓

Soil Reaction & Soluble Salts					
pH Value ‡	units	6.3	✓	6.2	✓
Electrical Conductivity (CaSO ₄)†	µS/cm	2110	✓	2380	✓

Organic Matter & Nutrient Status					
Organic Matter (LOI)	%	4.60	✓	6.7	✓
Total Nitrogen	%	0.17	✓	0.32	✓
Carbon : Nitrogen Ratio		16:1	✓	12:1	✓
Extractable Phosphate	mg/l	6	✗	6	✗
Extractable Potassium	mg/l	239	✓	264	✓
Extractable Magnesium	mg/l	81	✓	486	✓

Phytotoxic Metals'					
Zinc (Zn)	mg/kg	20.4	✓	40.7	✓
Copper (Cu)	mg/kg	6.52	✓	7.59	✓
Nickel (Ni)	mg/kg	5.78	✓	8.82	✓

Visible Contaminants (Dry Weight Basis)					
Total foreign matter > 2 mm	%w/w	<0.5	✓	<0.5	✓
... of which plastics	%w/w	<0.25	✓	<0.25	✓
... of which sharps	%w/w	0	✓	0	✓

Soil Description

Notes:

- ☒ Conforms to BS3882 : 2015 - Multipurpose Grade
- ☒ Fails to conform to BS3882 : 2015 - Multipurpose Grade

* LASER diffraction

‡ 1:2.5 water extract

† CaSO₄ extract

' Total metals

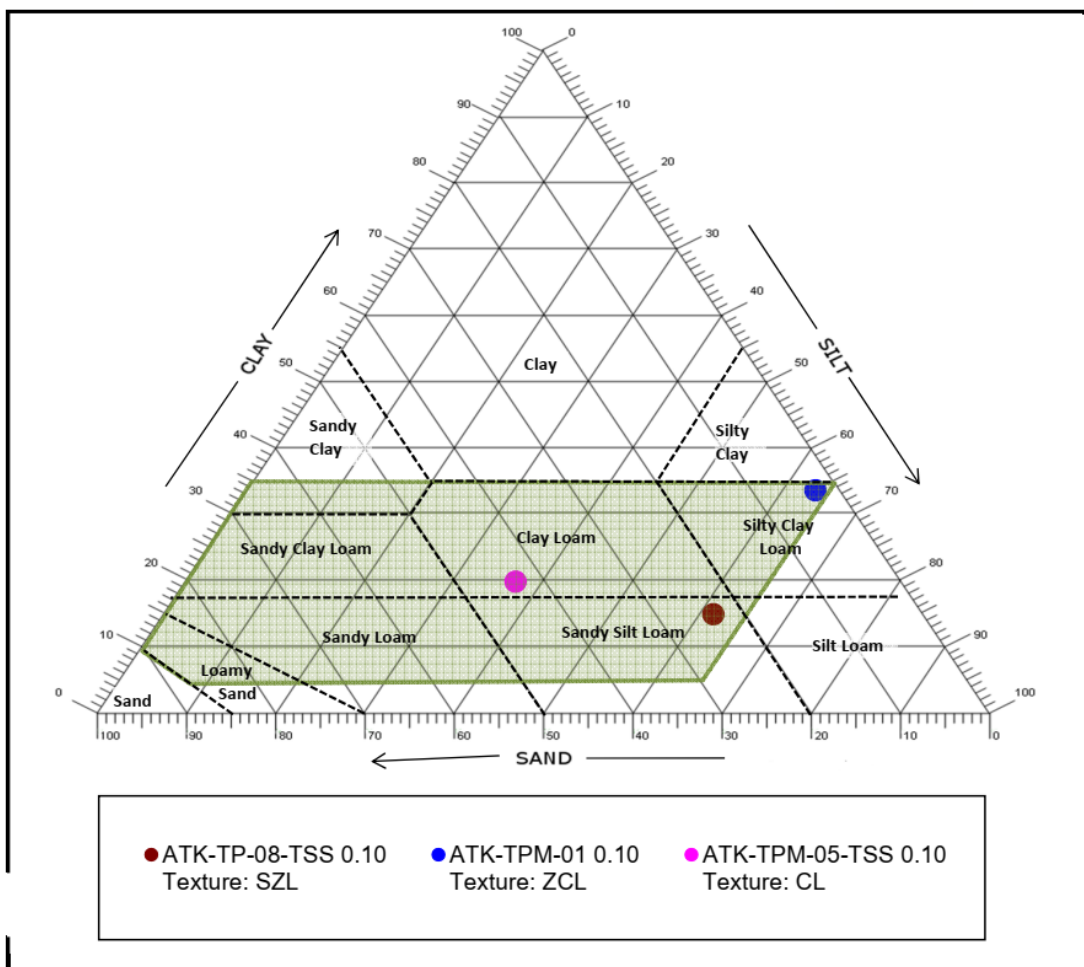
ne not evaluated

UK Soil Texture Classification

C	Clay	ZC	Silty Clay
SC	Sandy Clay	ZCL	Silty Clay Loam
CL	Clay Loam	SZL	Sandy Silt Loam
SL	Sandy Loam	ZL	Silt Loam
SCL	Sandy Clay Loam	S	Sand
LS	Loamy Sand		

SOCOTEC UK, Environmental Chemistry, Bretby Business Park, Ashby Rd, Burton on Trent, Staffs. DE15 0YZ. Tel: 01283 554400

Top soil - Certificate of Analysis v1.001



S204820

Consignment No S91035
Date Logged 16-Jan-2020
In-House Report Due 30-Jan-2020

[illegible]

	Analysis Required
	Analysis dependant upon trigger result - Note: due date may be affected if triggered
	No analysis scheduled
A	Analysis Subcontracted - Note: due date may vary

Report Number: EFS/204820

Method Descriptions

Matrix	MethodID	Analysis Basis	Method Description
Soil	ANC	Oven Dried @ < 35°C	Quantitative digestion with Hydrochloric Acid back titration with 1M Sodium Hydroxide to pH 7
Soil	CNRCALC	Oven Dried @ < 35°C	Calculated from Total Nitrogen%, and Total Carbon% in accordance with BS3882
Soil	ICPEXCH	Oven Dried @ < 35°C	Determination of Exchangeable Metals in soil samples by ICPOES detection
Soil	ICPTSNIT	Oven Dried @ < 35°C	Determination of Metals in soil samples by Nitric Acid digestion followed by ICPOES detection in accordance with BS3882
Soil	LOI(%MM)	Oven Dried @ < 35°C	Determination of loss on ignition for soil samples at specified temperature by gravimetry
Soil	PHSOIL51	Oven Dried @ < 35°C	Determination of pH of 5:1 deionised water to soil extracts using pH probe.
Soil	SubCon*	*	Contact Laboratory for details of the methodology used by the sub-contractor.
Soil	TCCALC	Oven Dried @ < 35°C	Calculated from LOI @ 440C in accordance with BS3882
Soil	TSCON	Oven Dried @ < 35°C	Determination of conductivity in soil samples by Calcium Sulphate extraction in accordance with BS3882
Soil	WSLM60	Oven Dried @ < 35°C	Determination by extraction from soil samples using Sodium Hydrogen carbonate followed by colorimetric detection

Where individual results are flagged see report notes for status.

Report Notes

Generic Notes

Soil/Solid Analysis

Unless stated otherwise,

- Results expressed as mg/kg have been calculated on the basis indicated in the Method Description table.
- All results on MCERTS reports are reported on a 105°C dry weight basis with the exception of pH and conductivity.
- Sulphate analysis not conducted in accordance with BS1377
- Water Soluble Sulphate is on a 2:1 water:soil extract

Waters Analysis

Unless stated otherwise results are expressed as mg/l

Nil: Where "Nil" has been entered against Total Alkalinity or Total Acidity this indicates that a measurement was not required due to the inherent pH of the sample.

Oil analysis specific

Unless stated otherwise,

- Results are expressed as mg/kg
- SG is expressed as g/cm³ @ 15°C

Gas (Tedlar bag) Analysis

Unless stated otherwise, results are expressed as ug/l

Asbestos Analysis

CH Denotes Chrysotile **TR** Denotes Tremolite
CR Denotes Crocidolite **AC** Denotes Actinolite
AM Denotes Amosite **AN** Denotes Anthophyllite
NAIIS No Asbestos Identified in Sample
NADIS No Asbestos Detected In Sample

Symbol Reference

- ^ Sub-contracted analysis.
- \$\$ Unable to analyse due to the nature of the sample
- ¶ Samples submitted for this analyte were not preserved on site in accordance with laboratory protocols.
This may have resulted in deterioration of the sample(s) during transit to the laboratory.
Consequently the reported data may not represent the concentration of the target analyte present in the sample at the time of sampling
- ¥ Results for guidance only due to possible interference
- & Blank corrected result
- I.S Insufficient sample to complete requested analysis
- I.S(g) Insufficient sample to re-analyse, results for guidance only
- Intf Unable to analyse due to interferences
- N.D Not determined **N.Det** Not detected
- N.F No Flow
- NS Information Not Supplied
- Req Analysis requested, see attached sheets for results
- p Raised detection limit due to nature of the sample
- * All accreditation has been removed by the laboratory for this result
- ‡ MCERTS accreditation has been removed for this result
- § accreditation has been removed for this result as it is a non-accredited matrix

Note: The Laboratory may only claim that data is accredited when all of the requirements of our Quality System have been met. Where these requirements have not been met the laboratory may elect to include the data in its final report and remove the accreditation from individual data items if it believes that the validity of the data has not been affected. If further details are required of the circumstances which have led to the removal of accreditation then please do not hesitate to contact the laboratory.

Client : SOCOTEC UK Doncaster
Site : A9031-19 Havant Thicket Winter Storage
Report Number : S20_4820

[illegible]

Appendix E. Soil profile data 2022

Project Number	Project Name				Parcel
C854	Havant Thicket Reservoir - Framework Soil Management Plan Phase 1				North Access
Date of Survey	Survey Type	Surveyor(s)	Company		
15/03/2022	Reconnaissance	RWA	Askew Land and Soil		
Weather		Relief	Land use and vegetation		
Cool, cloudy, showers					
Grid Reference		Postcode	Altitude	Area	
SU715101		PO9 5HD	40		
MAFF prov		MAFF detailed	Flooding		
AAR	ATO	MDw	MDp	FCD	Climate grade
835	1505	107	100	180	1
Bedrock		Superficial deposits			
London Clay Formation		None Recorded			
Soil association(s) 1:250,000			Detailed soil information		
Wickham			None		
Revision Number		Date Revised			
2		19/05/2022			

C854 Havant Thicket Reservoir - Framework Soil Management Plan Phase 1 Revision 2 Revision Date 19/05/2022



Soil Survey				Surveyor	RWA
Easting (X)	471500	Northing (Y)	109956	Alt (m)	51
Land Use	DCW	Reference	1 (Pit 1)	Slope °	1°
Bedrock	London Clay Formation	Superficial	None Recorded	Aspect	S
				Grid Reference	SU 71500 09956
				Date	15/03/2022

Layer	Topsoil	2	3	4	5	6	7
Lower Depth (cm)	5	15	25	40			
Texture	PL - Peaty loams	MZCL - Silty clay loam (me	C - Clay	C - Clay			
Matrix Colour	10YR2/2	10YR5/4	10YR5/3	10YR6/3			
Gley (Y/N)	No	No	No	Yes			
Ochreous Mottles	Form			CD - Common Distinct			
	Munsell Colour			10YR5/8			
Grey Mottles	Form						
	Munsell Colour						
Manganese (Y/N)	No	No	No	Yes			
% Stones (type 1)	0	2	2	2			
Stones > 2cm							
Stones > 6cm							
Stone Type	HR - All hard roc	HR - All hard rocks or stone	HR - All hard roc	HR - All hard rocks or stones (i.e. those which cannot be scratch			
% Stones (type 2)							
Stones > 2cm							
Stones > 6cm							
Stone Type							
CaCO3	NON - Non-calca	NON - Non-calcareous (<0.	NON - Non-calca	NON - Non-calcareous (<0.5% CaCO3)			
Shape of Peds.							
Size of Peds.							
Subsoil Structure	Not Applicable	Moderate	Moderate	Poor			
Soil or Ped. Strength							
Degree of Ped. Development							
Slowly Permeable Layer (Y/N)	No	No	No	Yes			

MDw	MDp	FCD
107	100	180

Wetness	Class (WC)	WC IV
	Grade (WE)	

Notes	Pit 1 The Avenue
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Soil Survey				Surveyor	RWA
Easting (X)	471721	Northing (Y)	109658	Alt (m)	51
Land Use	DCW	Reference	2 (Pit 2)	Slope °	1°
Bedrock	London Clay Formation	Superficial	None Recorded	Aspect	S
				Grid Reference	SU 71721 09658
				Date	15/03/2022

Layer	Topsoil	2	3	4	5	6	7
Lower Depth (cm)	5	12	24	40			
Texture	PL - Peaty loams	MZCL - Silty clay loam (me	C - Clay	C - Clay			
Matrix Colour	10YR2/2	10YR5/4	10YR5/3	10YR6/3			
Gley (Y/N)	No	No	No	Yes			
Ochreous Mottles	Form			MD - Many Distinct			
	Munsell Colour			10YR5/8			
Grey Mottles	Form						
	Munsell Colour						
Manganese (Y/N)	No	No	No	Yes			
% Stones (type 1)	0	2	0	0			
Stones > 2cm							
Stones > 6cm							
Stone Type	HR - All hard rock	HR - All hard rocks or stones	HR - All hard rock	HR - All hard rocks or stones (i.e. those which cannot be scratch			
% Stones (type 2)							
Stones > 2cm							
Stones > 6cm							
Stone Type							
CaCO3	NON - Non-calca	NON - Non-calcareous (<0	NON - Non-calca	NON - Non-calcareous (<0.5% CaCO3)			
Shape of Peds.							
Size of Peds.							
Subsoil Structure	Not Applicable	Moderate	Moderate	Poor			
Soil or Ped. Strength							
Degree of Ped. Development							
Slowly Permeable Layer (Y/N)	No	No	No	Yes			

MDw	MDp	FCD
107	100	180

Wetness	Class (WC)	WC IV
	Grade (WE)	

Notes	Pit 2 The Avenue
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Soil Survey				Surveyor	RWA
Easting (X)	471019	Northing (Y)	110965	Alt (m)	51
Land Use	RGR	Reference	3 (Pit 3)	Slope °	1°
Bedrock	London Clay Formation	Superficial	None Recorded	Aspect	S
				Grid Reference	SU 71019 10965
				Date	15/03/2022

Layer	Topsoil	2	3	4	5	6	7
Lower Depth (cm)	5	10					
Texture	MZCL - Silty clay	MZCL - Silty clay loam (medium)					
Matrix Colour	10YR3/1	10YR6/4					
Gley (Y/N)	No	No					
Ochreous Mottles	Form						
	Munsell Colour						
Grey Mottles	Form						
	Munsell Colour						
Manganese (Y/N)	No	No					
% Stones (type 1)	6	6					
Stones > 2cm	2						
Stones > 6cm	0						
Stone Type	HR - All hard rock	HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)					
% Stones (type 2)							
Stones > 2cm							
Stones > 6cm							
Stone Type							
CaCO ₃	NON - Non-calcareous	NON - Non-calcareous (<0.5% CaCO ₃)					
Shape of Peds.							
Size of Peds.							
Subsoil Structure	Moderate	Moderate					
Soil or Ped. Strength							
Degree of Ped. Development							
Slowly Permeable Layer (Y/N)	No	No					

MDw	MDp	FCD
107	100	180

Wetness	Class (WC)	WC IV
	Grade (WE)	

Notes	Pit 3 Grassland on Verge of Existing Northern Access Track. Impemeable at approximtely 10cm bgl. MADE GROUND
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Soil Survey				Surveyor	RWA
Easting (X)	471439	Northing (Y)	111362	Alt (m)	51
Land Use	DCW	Reference	4 (Pit 4)	Slope °	1°
Bedrock	London Clay Formation	Superficial	None Recorded	Aspect	S
				Grid Reference	SU 71439 11362
				Date	15/03/2022

Layer	Topsoil	2	3	4	5	6	7
Lower Depth (cm)	5	15	22	40			
Texture	PL - Peaty loams	MZCL - Silty clay loam (me	C - Clay	C - Clay			
Matrix Colour	10YR3/1	10YR5/4	10YR5/3	10YR6/3			
Gley (Y/N)	No	No	No	Yes			
Ochreous Mottles	Form			CD - Common Distinct			
	Munsell Colour			10YR5/8			
Grey Mottles	Form						
	Munsell Colour						
Manganese (Y/N)	No	No	No	Yes			
% Stones (type 1)	0	0	0	0			
Stones > 2cm							
Stones > 6cm							
Stone Type	HR - All hard rock	HR - All hard rocks or stones	HR - All hard rock	HR - All hard rocks or stones (i.e. those which cannot be scratch			
% Stones (type 2)							
Stones > 2cm							
Stones > 6cm							
Stone Type							
CaCO3	NON - Non-calca	NON - Non-calcareous (<0	NON - Non-calca	NON - Non-calcareous (<0.5% CaCO3)			
Shape of Peds.							
Size of Peds.							
Subsoil Structure	Not Applicable	Moderate	Moderate	Poor			
Soil or Ped. Strength							
Degree of Ped. Development							
Slowly Permeable Layer (Y/N)	No	No	No	Yes			

MDw	MDp	FCD
107	100	180

Wetness	Class (WC)	WC IV
	Grade (WE)	

Notes	Pit 4 Blendworth Fragment
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Soil Survey				Surveyor	RWA
Easting (X)	470906	Northing (Y)	109809	Alt (m)	51
Land Use	PGR	Reference	5 (Pit 5)	Slope °	1°
Bedrock	London Clay Formation	Superficial	None Recorded	Aspect	E
				Grid Reference	SU 70906 09809
				Date	15/03/2022

Layer		Topsoil	2	3	4	5	6	7
Lower Depth (cm)		20	40	50				
Texture		HZCL - Silty clay	C - Clay	C - Clay				
Matrix Colour		10YR4/2	10YR5/2	2.5Y6/8				
Gley (Y/N)		Yes	Yes	Yes				
Ochreous Mottles	Form	FD - Few Distinct	CD - Common Distinct	MD - Many Distinct				
	Munsell Colour	10YR5/8	10YR5/6	10YR5/8				
Grey Mottles	Form							
	Munsell Colour							
Manganese (Y/N)		No	No	Yes				
% Stones (type 1)		2	0	0				
Stones > 2cm		0						
Stones > 6cm		0						
Stone Type		HR - All hard rocks	HR - All hard rocks or stones	HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger)				
% Stones (type 2)								
Stones > 2cm								
Stones > 6cm								
Stone Type								
CaCO ₃		NON - Non-calcareous	NON - Non-calcareous (<0.5% CaCO ₃)	NON - Non-calcareous (<0.5% CaCO ₃)				
Shape of Peds.								
Size of Peds.								
Subsoil Structure		Not Applicable	Moderate	Poor				
Soil or Ped. Strength								
Degree of Ped. Development								
Slowly Permeable Layer (Y/N)		No	No	Yes				

MDw	MDp	PCD
107	100	180

Wetness	Class (WC)	WC IV
	Grade (WE)	

Notes	Pit 5 Grassland on the Deerslaugh Plain
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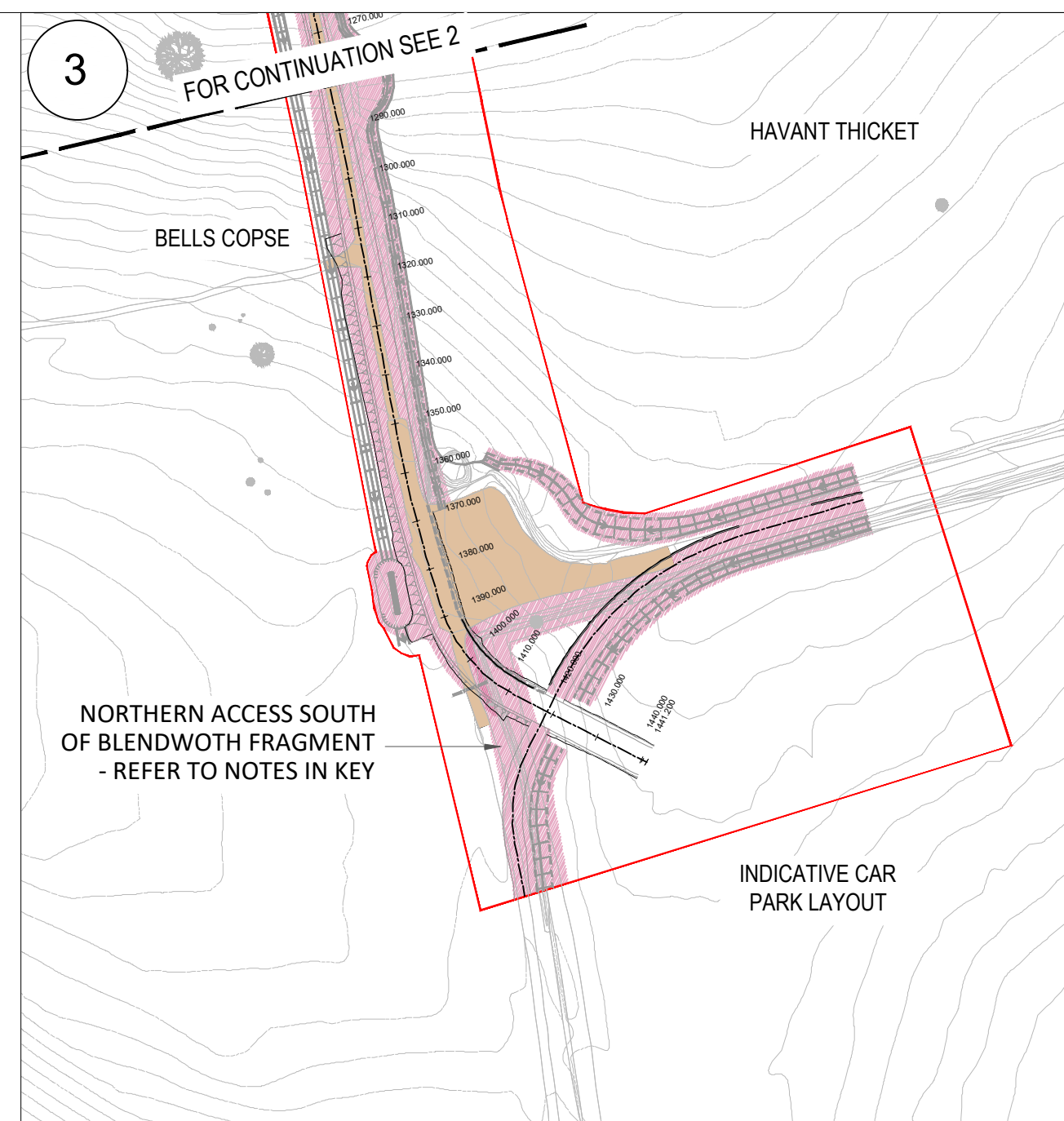
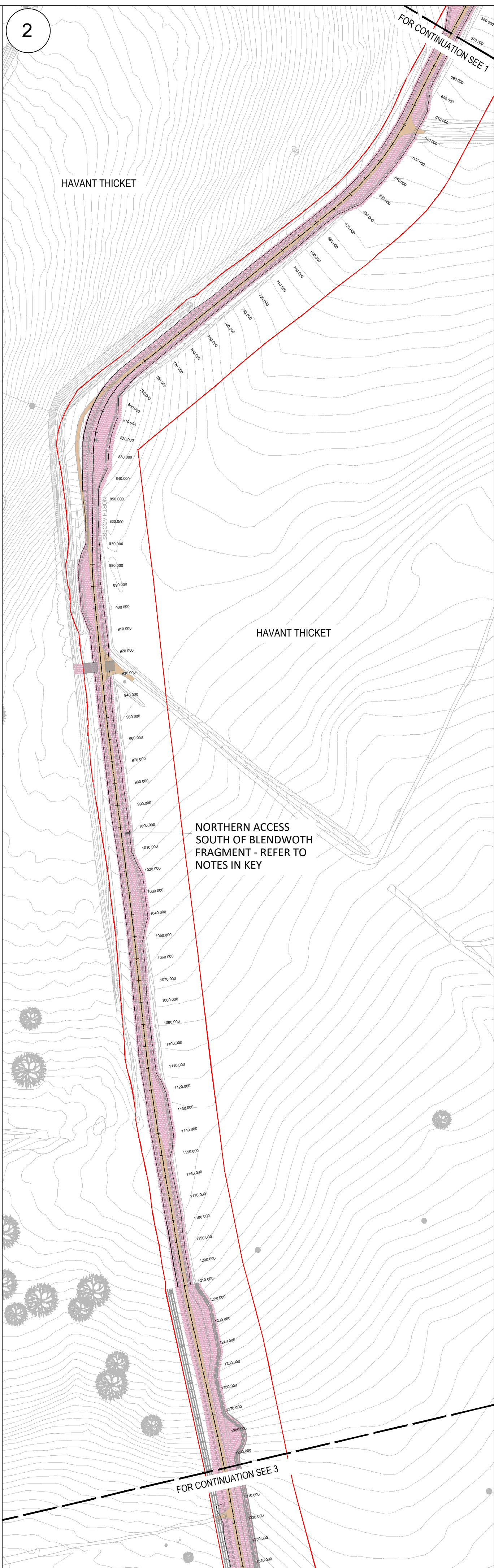
Gley
None
Gley
N/A

Appendix F. Laboratory Certificates of Analysis



ANALYTICAL REPORT											
Report Number	12905-22	N717		ROB ASKEW		Client C854					
Date Received	14-APR-2022										
Date Reported	19-MAY-2022										
Project	SOIL										
Reference	ROB ASKEW										
Order Number											
Laboratory Reference		SOIL558622	SOIL558623	SOIL558624	SOIL558625	SOIL558626	SOIL558627	SOIL558628	SOIL558629	SOIL558630	SOIL558631
Sample Reference		C854 TP1 5-20CM	C854 TP1 20-40CM	C854 TP2 10-20CM	C854 TP2 20-40CM	C854 TP3 0-5CM	C854 TP3 5-20CM	C854 TP4 5-10CM	C854 TP4 10-25CM	C854 TP5 0-22CM	C854 TP5 22-40CM
Determinand	Unit	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
pH water [1:2.5]		5.5	5.1	4.6	4.6	6.0	5.8	4.0	4.3	6.2	5.9
Available Phosphorus (Index)	mg/l	3.4 (0)	<2.5 (0)	4.2 (0)	<2.5 (0)	<2.5 (0)	<2.5 (0)	12.6 (1)	<2.5 (0)	<2.5 (0)	3.2 (0)
Available Potassium (Index)	mg/l	130 (2-)	33.0 (0)	72.9 (1)	70.1 (1)	120 (1)	23.4 (0)	86.6 (1)	45.1 (0)	116 (1)	138 (2-)
Available Magnesium (Index)	mg/l	186 (4)	89.7 (2)	64.6 (2)	48.5 (1)	167 (3)	51.1 (2)	94.7 (2)	29.8 (1)	615 (7)	427 (6)
Organic Matter LOI	% w/w	4.3	3.1	6.1	3.8	8.3	2.3	22.7	3.7	6.2	9.6
Total Nitrogen	% w/w	0.133	0.069	0.193	0.095	0.282	0.047	0.723	0.085	0.162	0.348
Notes											
Analysis Notes											
The sample submitted was of adequate size to complete all analysis requested.											
The results as reported relate only to the item(s) submitted for testing.											
The results are presented on a dry matter basis unless otherwise stipulated.											
Document Control											
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Reported by											
Myles Nicholson											
Natural Resource Management, a trading division of Cawood Scientific Ltd.											
Coopers Bridge, Braziers Lane, Bracknell, Berkshire, RG42 6NS											
Tel: 01344 886338											
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Appendix G. Northern Access – Indicative Soil Stripping and Reinstatement Layout Plan



— PHASE 1 RED LINE BOUNDARY

NORTHERN ACCESS JUNCTION/B2149 WITHIN BLENDWORTH FRAGMENT- DIG CONSTRUCTION
SITE WON TOPSOIL TO BE USED IN SITU ALONG B2149 VERGES. STRIP 150MM OF TOPSOIL (INCLUDES APPROX 50MM LEAF LITTER) AND REINSTATE.

 **NORTHERN ACCESS WITHIN BLENDWORTH FRAGMENT**

BLENDWORTH FRAGMENT - DIG CONSTRUCTION CHAINAGE 20 - 160
SITE WON TOPSOIL TO BE USED IN SITU. STRIP 150MM OF TOPSOIL (INCLUDES APPROX. 50MM LEAF LITTER). ALONG THE NORTHERN ACCESS SECTION WITHIN BLENDWORTH FRAGMENT AND REINSTATE TOPSOIL ALONG VERGES AND EMBANKMENTS ALONG THIS SAME SECTION. SURPLUS TOPSOIL TO BE TRANSLOCATED TO DONOR AREAS AGREED WITH PORTSMOUTH WATER ALONG NORTHERN ACCESS SOUTH OF BLENDWORTH FRAGMENT 190 - 1430.

BLENDWORTH FRAGMENT - NO-DIG CONSTRUCTION CHAINAGE 160-190
TOPSOIL TO BE RETAINED IN SITU AND NO SOIL TO BE STRIPPED TO AVOID
IMPACTING THE ROOT PROTECTION AREAS (RPA) OF EXISTING RETAINED TREES AS
SHOWN ON THE LANDSCAPE PLANS HTR-ATK-RZ-RE-DR-L-0027 -0030.

NORTHERN ACCESS SOUTH OF BLENDWORTH FRAGMENT CHAINAGE 190 - 1430

NORTHERN ACCESS SOUTH OF BLENDWORTH FRAGMENT - NO DIG - CONSTRUCTION CHAINAGE 190 - 1210
TOPSOIL TO BE RETAINED IN SITU AND NO SOIL TO BE STRIPPED TO AVOID IMPACTING THE ROOT PROTECTION AREAS (RPA) OF EXISTING RETAINED TREES AS SHOWN ON THE LANDSCAPE PLANS HTR-ATK-RZ-RE-DR-00127 - 0030. BEYOND THE RPAS, THE THIN OPPOSITE CORNERING (APPROXIMATELY 10' WIDE) BE STRIPPED TO ALLOW THE EXISTING TRACK WITHIN THE CONSTRUCTION FOOTPRINT AND REINSTATED ALONG THE VERGES AND EMBANKMENTS OF THE NORTHERN ACCESS IN THIS SECTION. THE CONTRACTOR SHALL AEGE THE EXTENT OF SOIL STRIPPING AND STORAGE LOCATION WITH PORTSMOUTH WATER.

NORTHERN ACCESS SOUTH OF BLENDWORTH FRAGMENT - DIG - CONSTRUCTION CHAINAGE 1210 - 1430
SITE WON TOPSOIL TO BE USED IN SITU. THE THIN TOPOSOIL COVERING (APPROX 50MM) SHALL BE STRIPPED ALONGSIDE THE EXISTING TRACK WITHIN THE CONSTRUCTION FOOTPRINT AND REINSTATED ALONG THE VERGES AND EMBANKMENTS OF THE NORTHERN ACCESS IN THIS SECTION. THE CONTRACTOR SHALL AGREE THE EXTENT OF SOIL STRIPPING AND STORAGE LOCATION WITH PORTSMOUTH WATER.

NORTHERN ACCESS SOUTH OF BLENDWORTH FRAGMENT - CONSTRUCTION OF RETENTION BASIN/DRY POND IN BELLS COPSE

SITE WORN TOPSOIL TO BE USED IN SITE: 150MM OF TOPSOIL (INCLUDING APPROX 50MM OF LEAF LITTER) SHALL BE STRIPPED WITHIN THE CONSTRUCTION FOOTPRINT AND STORED IN A SUITABLE LOCATION. ON COMPLETION THE TOPSOIL SHALL BE RESPREAD WITHIN THE RETENTION BASIN/DRY POND AND ALONG THE VERGES AND EMBANKMENTS OF THE NORTHERN ACCESS IN THIS SECTION.

TURNING CIRCLE ON JUNCTION OF NORTHERN ACCESS / FORESTRY ENGLAND CATEGORY A HAULAGE ROUTE EXISTING TRACK: SITE WON TOPSOIL TO BE USED IN SITU. THE THIN TOPSOIL COVERING (APPROX 50MM) SHALL BE STRIPPED ALONGSIDE THE EXISTING TRACK WITHIN THE CONSTRUCTION FOOTPRINT AND REINSTATED ALONG THE VERGES AND EMBANKMENTS OF THE NORTHERN ACCESS IN THIS SECTION. THE CONTRACTOR SHALL AGREE THE EXTENT OF SOIL STRIPPING AND THE STORAGE LOCATION WITH PORTSMOUTH WATER.

TURNING CIRCLE: SITE WON TOPSOIL TO BE USED IN SITU. WITHIN THE CONSTRUCTION FOOTPRINT:

- 150MM OF TOPSOIL (INCLUDING 50MM OF LEAF LITTER) SHALL BE STRIPPED WITHIN ANCIENT WOODLAND AREA AND STORED SEPARATELY IN A SUITABLE LOCATION.
 - 150MM OF TOPSOIL IN MEADOW AREA SHALL BE STRIPPED SOUTH OF HAULAGE ROUTE
- ON COMPLETION:
- AT LEAST 50MM OF ANCIENT WOODLAND TOPSOIL SHALL BE RESPALED ALONG THE VERGES AND EMBANKMENTS IN THIS SECTION.
 - AT LEAST 150MM OF LOWLAND WOODLAND TOPSOIL SHALL BE SPREAD IN THE PROPOSED LANDSCAPE AREA
 - WITHIN TURNING CIRCLE.
 - TO THE SOUTH OF THE HAULAGE ROUTE AT LEAST 50MM OF LOWLAND MEADOW TOPSOIL SHALL BE
- RESPALED ALONG THE VERGES AND EMBANKMENTS INCLUDING DITCHES.

 **EXCAVATED MATERIAL MAKING UP THE EXISTING TRACK**
IS NOT TO BE USED AS TOPSOIL DUE TO HEAVY COMPACTION LEVELS

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1. ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE STATED.
2. TO BE READ IN CONJUNCTION WITH THE FRAMEWORK SOIL MANAGEMENT PLAN HTR - ATK - ZZ- ZZ-RP-0166
3. BEFORE WORKS COMMENCE ON THE NORTHERN ACCESS, A PRE-CONSTRUCTION BOTANICAL SURVEY SHOULD BE UNDERTAKEN ALONG THE EXISTING FORESTRY ACCESS TRACK TO MAP THE LOCATIONS OF NOTABLE AND NOTEWORTHY SPECIES TO ENSURE THEIR PROTECTION IN SITU WHERE POSSIBLE OR IF NOT SALVAGED AND RELATED SPECIES SHOULD BE UNDERTAKEN BY A COMPETENT BOTANIST WHO HAS PRIOR KNOWLEDGE OF THE SITE (PREFERABLY BY JOHN NORTON OF ECOSA WHO UNDERTOOK THE PREVIOUS SURVEY).
4. FOLLOWING THE VEGETATION SURVEY (NOTE 3), TOPSOIL SHOULD NOT BE REINSTATED IN AREAS HIGHLIGHTED BY THE ECOLOGIST IN THE VEGETATION SURVEY.

In addition to the hazards/ risks normally associated with the types of work detailed on this drawing, all significant residual risks (moderate to very high) are indicated on the drawing with warning triangles. The risk register, in its entirety, is available on drawings HTR-ATK-ZZ-ZZ-DR-HS-0001 to 0007. The reference numbers shown against each triangle will correlate to risks shown on these schedules.

Environmental Risks are not shown on the drawings and reference should be made to the following Document –
HTR-ATK-XX-XX-RP-Z-0069 Outline Environmental Management Plan

P01 D2	BJ	BJ	BJ	---	First Issue		30/06/22
C01 A1	RV	LJB	BJ	BJ	For Check		30/06/22
Rev. Status	Dm By	Ckd By	Rev By	Auth By	Description		Date

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Drawing Suitability						Status: A1	
Initial non-contractual code							
Contractors Drawing Number:							
HTR		-ATK-ZZ-ZZ-DR-L				0049	
Project		Originator	Volume	Location	Type	Role	Number
Telephone: Havant (023) 9249 9888 Fax: Havant (023) 9245 3632 Website: www.portsmouthwater.co.uk Registered Office: PO Box 8 West Street Havant Hampshire PO9 1LG REGISTERED IN ENGLAND No. 2536455							
Project Ref. No:		Sheet:		Scale:		Sheet Size:	
HTR		1 of 1		1:1250		A1	
Project Title:							
HAVANT THICKET RESERVOIR							
Drawing Title:							
NORTHERN ACCESS INDICATIVE SOIL STRIPPING AND REINSTATEMENT LAYOUT PLAN							
Portsmouth Drawing Number:						Rev: C01	



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