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NORTH HYKEHAM RELIEF ROAD
SOIL MANGEMENT PLAN

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SOIL MANGEMENT PLAN

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APPENDICES

1. INTRODUCTION

1.1 Project Background

The North Hykeham Relief Road (NHRR), previously known as the Lincoln Southern Bypass (LSB), will link the recently constructed Lincoln Eastern Bypass (LEB) with the Lincoln Western Relief Road (LWRR) and the A46 on the Strategic Road Network (SRN). The NHRR is the last major highway scheme contained within the Lincoln Integrated Transport Strategy (LITS). The NHRR is also the last element of a complete ring road around the greater Lincoln urban area comprising both Lincoln and North Hykeham. The completed ring road will comprise of four sections of carriageway: the Lincoln Western Relief Road (LWRR), the Lincoln Northern Relief Road (LNRR), the Lincoln Eastern Bypass (LEB), and the NHRR. The NHRR will also form part of the Lincolnshire Coastal Highway.

1.2 Project Overview

The NHRR, comprises a Dual All-purpose 2-lane Carriageway with a combined foot and cycleway running to the north of the east-bound carriageway. It links the A46 to the Lincoln Eastern Bypass (LEB).

From Station Road to Grantham Road, the combined foot and cycleway will run to the south of the westbound carriageway before returning to the north of the east-bound carriageway between Grantham Road and the A15 Sleaford Road where it will connect to the LEB combined footway and cycleway. The NHRR is an off-line scheme, crossing land that is predominantly given over to agricultural use, with some areas of residential land, existing roads, rivers and some areas of non-agricultural land. Permanent land take will be required for the construction and permanent footprint of the proposed scheme, along with temporary land requirements for access, temporary haul roads, construction compounds, material processing and stockpile areas and storage areas.

1.3 Proposed Scheme

The proposed scheme will require extensive areas of earthworks in places to achieve an acceptable geometrical horizontal and vertical alignment and to cross existing infrastructure and watercourses including the River Witham. As noted above, the earthworks in places will be permanent and in other places will be temporary for the duration of the construction period. Most of these areas will involve land currently covered by soil. In the Environment Agency's 2019 report "The State of the Environment: Soils" it was recorded that the UK's soils currently store about 10 billion tonnes of carbon, roughly equal to 80 years of current annual greenhouse gas emissions.

1.4 NHRR Feature Requirements

NHRR feature requirements include:

- River Witham Crossing
- Station Road Crossing
- Wath Lane NMU Crossing
- Bat Bridge and Culvert
- Viking Way NMU Crossing
- Additional arm to A46 Roundabout
- New (A607) Grantham Road Roundabout
- New Brant Road Roundabout
- South Hykeham Road Roundabout
- Additional arm to LEB Roundabout
- Green Lane Drain Crossing
- South Hykeham Drain Crossing
- Waddington Dyke Drain Crossing

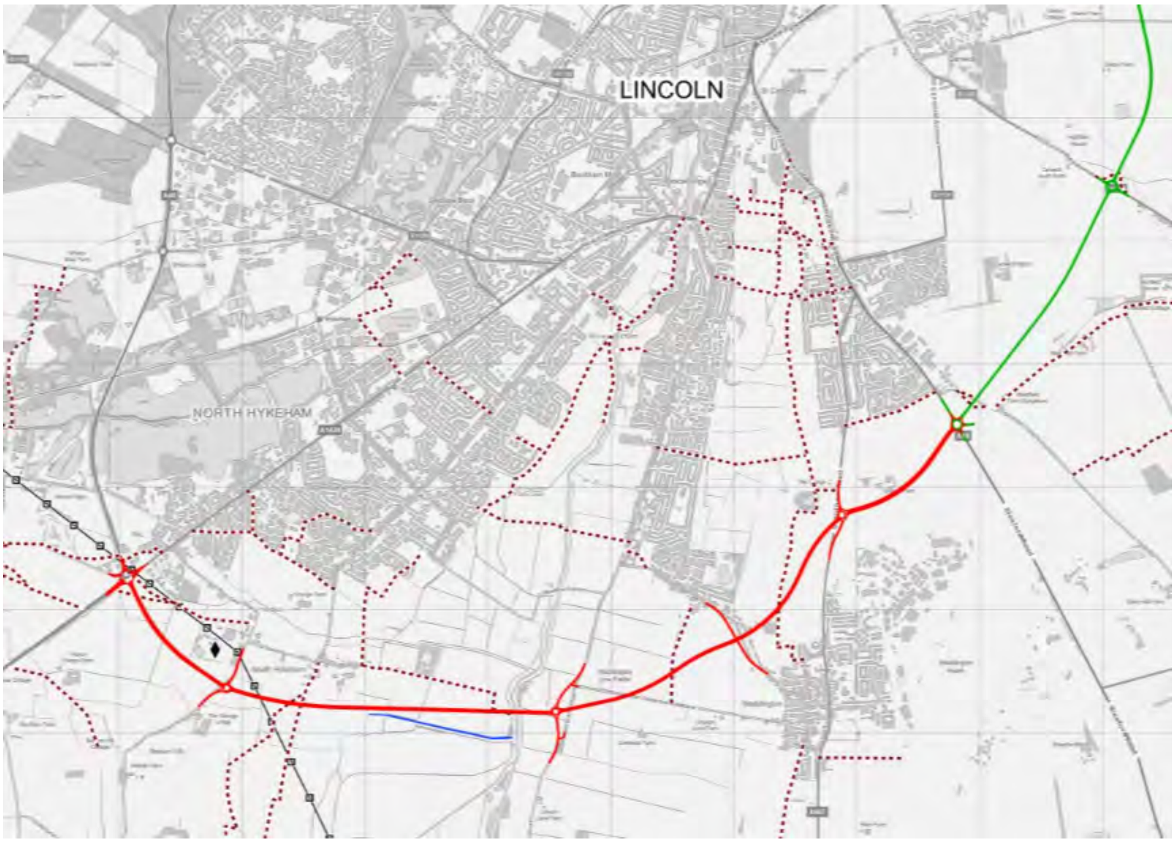


Figure 1: Location Plan, NHRR (Red), LEB (Green), EA Flood Bund (Blue)

2. PURPOSE AND OBJECTIVE

The purpose of this Soil Management Plan (SMP) is to set out best practice and specific mechanisms to minimise the effects of the construction on the soils, and to maximise the potential for soil to be retained ensuring adverse impacts on soils, including Best and Most Versatile Agricultural land, are avoided or minimised. This SMP sets out the soil types, characteristics and sensitivities that will be encountered with respect to the management and reinstatement of agricultural soils during and post NHRR construction, sets out the principles for handling and reinstating soils and provide best practice advice in relation to topsoil stripping, handling of sub-soils, storage, reinstatement, aftercare and working periods, seasonality and potential programme constraints. This document will provide valuable resource to the project team in the development of the project programme, Materials Management Plan (MMP) and the Construction Environmental Management Plan (CEMP).

This report:

- Describes the main proposals in Section 2;
- Sets out the soil types, characteristics and sensitivities in Section 3;
- Sets out the general, and important, principle for handling and reinstating soils in Section 4;
- Considers topsoil stripping in Section 5;
- Considers subsoil handling in Section 6;
- Considers soil storage for construction roads and site compounds in Sections 7 and 8;
- Considers soil reinstatement in Section 9;
- Considers soil aftercare management in Section 10; and
- Sets-out responsibilities in Section 11.

In all instances, the stripping, movement, storage, management, placing and reinstatement of soils (topsoils and subsoils) will be managed and directed by suitably experienced earthworks personnel in accordance with the advice and guidance provided with this document, the documents contained or referenced herein and in line with best practice. Judgement will be applied in assessing the suitability of soils for the works proposed, particularly with regards to weather conditions and moisture content of the soils.

3. SOIL TYPES AND CHARACTERISTICS

3.1 Principal Soil Types and Distribution

The national soils map identifies three soil associations.

The majority of the land to the west on the lower ground is shown to be Wickham 2 Association, described as slowly permeable seasonally waterlogged fine loamy over clayey, fine silty over clayey and clayey soils. Wickham 2 Association is made up of 4 component Series being Wickham, Denchworth, Oxpasture, and Evesham.

The land either side of the River Witham is identified as Fladbury 2 Association, described as Stoneless clayey soils variably affected by groundwater some with sandy subsoils. Fladbury 2 Association is made up of 3 component Series being Fladbury, Stixwould and Trent.

The land on the higher ground to the east is described as Elmton 1 Association, described as shallow well drained brashy calcareous fine loamy soils over limestone. Elmton 1 Association is made up of 4 component Series being Elmton, Aberford, Moreton and Shippon.

The soils identified on the mapping as Wickham 2 Association and Fladbury Association are largely as expected with slowly permeable subsoils identified at almost all locations and topsoil ranging from medium sandy loam to clay. There was an area either side of the River Witham up to 200m east of the river and 800m west of the river and 700m east of the south Hykeham road where sandy soils were identified that were not expected based on the soil type mapping although they are relatively similar to the Blackwood Association that is identified to the north.

The soils found on the higher ground identified on the soil type mapping are exactly as expected being shallow sandy loam or sandy clay loam over limestone limited by draughtiness.

3.2 Wickham 2 Association (7llf)

Wickham 2 Association soils are slowly permeable, seasonally waterlogged fine loamy over clayey soils, or in places fine silty over clayey, or clayey soils. The detailed description of these soils from the Soil Survey of England and Wales Soil Bulletin “Soils in Eastern England” is set out in Appendix 1.

These soils are the dominant soil from the A46 roundabout eastwards to the brashy top of the scarp at Waddington, with the exception of the area immediately adjacent to the River Witham. They are susceptible to damage in winter, as clayey soils have fine particles and stick together. Images 1 and 2 show examples of Wickham 2 Association soils. The impact from trafficking when conditions are not suitable can be seen.

Image 1: Wickham 2 Association Soils profiles

Image 2: Wickham Association Soils

Typically, these soils have a topsoil depth of 25 cm to 30 cm.

The upper and lower subsoils are brown clayey subsoils going greyer with depths below 60 cm. Photographs from the CJ Associates “Ground Investigation Factual Report” (October 2023) show, purely as an illustration, Wickham 2 Association soils as illustrated below.

Image 3 and 4: Wickham 2 Association Soils

The LandIS information on Wickham 2 Association soils is set out in Appendix 2.

3.3 Flasbury 2 Association (813c)

Fladbury 2 Association soils cover only a short length of the Proposed Scheme, extending a few hundred metres either side of the River Witham. These soils are still clayey and stoneless, but have a darker colour.

Image 5: Fladbury 2 Association Soils

Image 6: Fladbury 2 Association Soils – Close-up

Image 7: Fladbury 2 Association Soils – Close-up

Typically, these soils have a topsoil depth of 25 cm to 30 cm.

The upper and lower subsoils are greyish brown clayey to approximately 50 cm, with grey clay below. Further detail in terms of soil descriptions and depths can be found in the schemes Ground Investigation Report (GIR) upon completion of the ground investigation activities.

The LandIS information on Fladbury 2 Association soils is set out in Appendix 2.

The narrow strip of Fladbury 1 Association soils are shown in deeper trenches below.

Images 8 and 9: Fladbury 1 Association Soils

3.4 Similar to Blackwood Association

As noted earlier, either side of the River Witham the survey identified sandier soils, which had not been expected.

3.5 Elmton 1 Association Soils (343a)

The Elmton 1 Association soils are markedly different. They are brashy soils, with a high stone content. The soils are drier and less prone to smearing and damage when wet, as they have a lesser clay content.

Image 10: Elmton 1 Association Soils

Image 11: Elmton 1 Association Soils – Close-up

These soils cover the area from near to the top of the scarp to the Lincoln Eastern Bypass roundabout at the A15.

Topsoil depth is typically approximately 25 cm, these being shallow soils.

The subsoils are clayey where present, with the soil often going to limestone at shallow depths. Generally, subsoils will not be discernible. Further detail in terms of soil descriptions and depths can be found in the schemes Ground Investigation Report (GIR).

The LandIS information on Elmton 1Association soils is set out in Appendix 2.

The shallow, stoney soils are illustrated below.

Images 12 and 13: Elmton 1 Association Soils – Close-up

3.6 Soil Profiles

The soil profiles of these three soils are shown in Figures 2, 3 & 4 below. The depths are shown in cm.

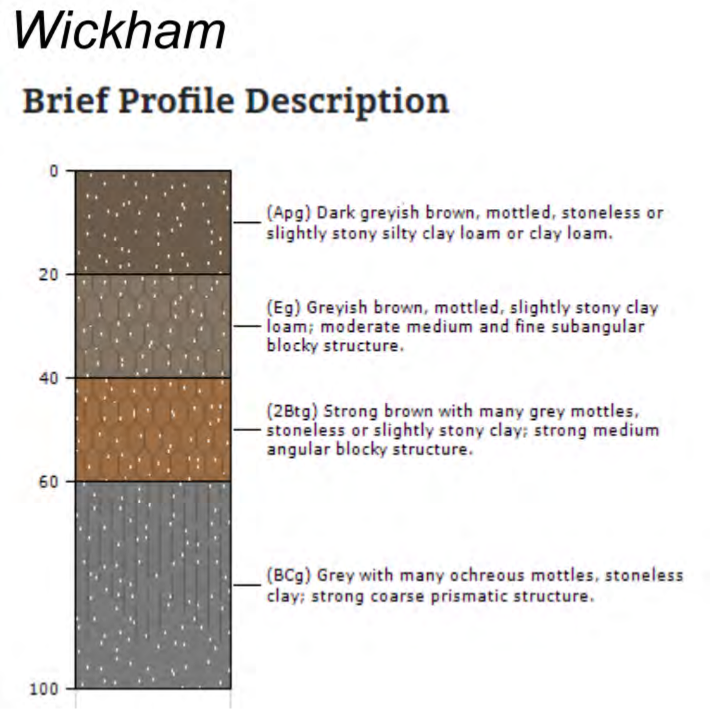


Figure 2: Wickham Soil Profile Description (courtesy of LandIS)

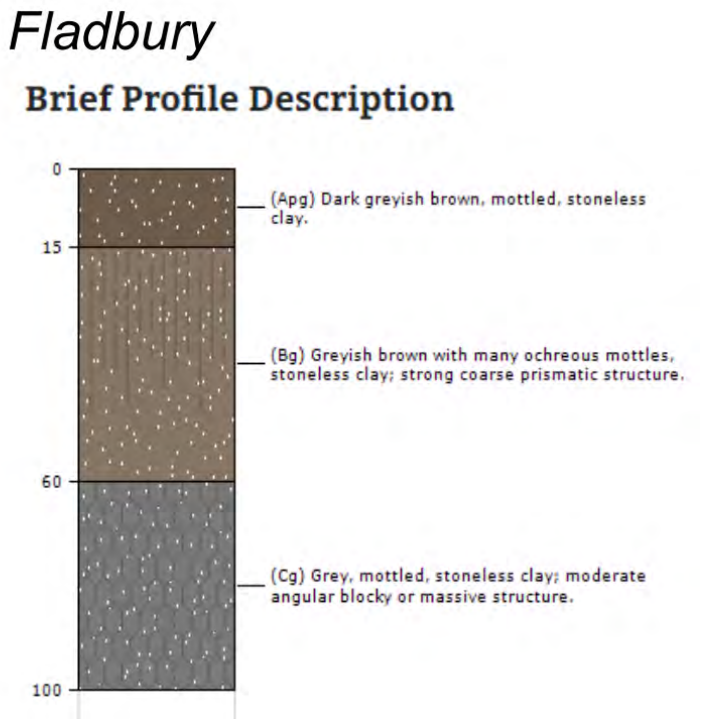


Figure 3: Fladbury Soil Profile Description (courtesy of LandIS)

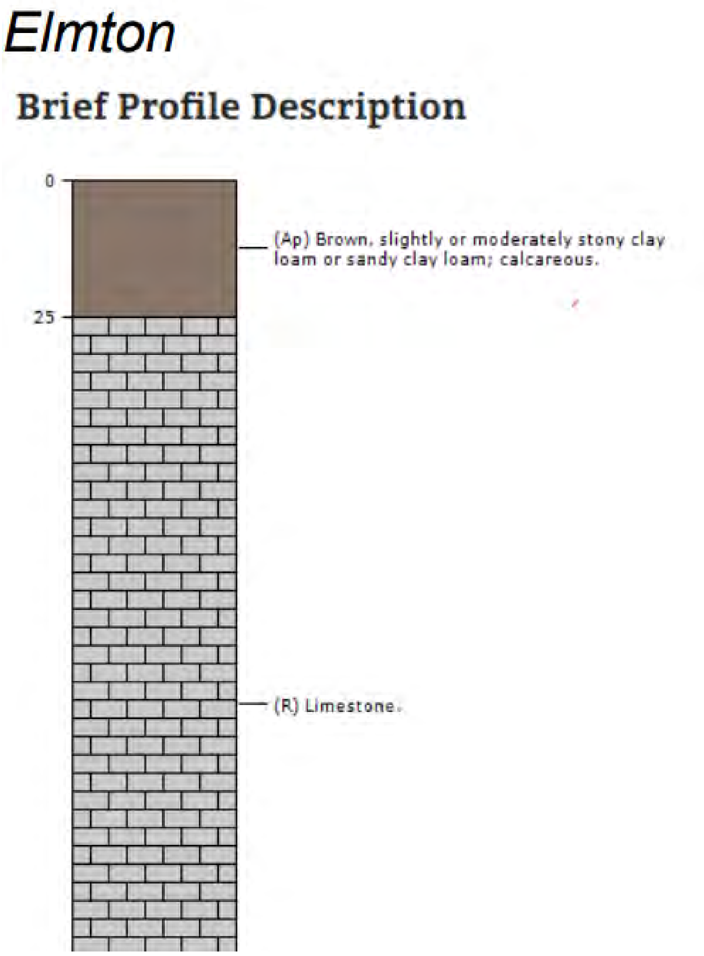


Figure 4: Elmton Soil Profile Description (courtesy of LandIS)

4. SOIL MANAGEMENT PLAN PRINCIPLES

4.1 Why Protect Soils?

Soil is an important natural capital resource. In the Environment Agency's "The State of the Environment: Soils" report (2019) they recorded that UK soils currently store about 10 billion tonnes of carbon, roughly equal to 80 years of current annual greenhouse gas emissions. It is important to retain the resource so far as possible.

Soil health has been declining, especially soils in long-term arable cropping. Most arable soils have lost 40% to 60% of their organic carbon.

Therefore, soils as a resource, play an important role in our carbon reserves, due to their ability to absorb carbon dioxide from the atmosphere and store it away as carbon.

4.2 Principles of Topsoil Soil Protection

Soils are generally resilient to being handled. However, they are a living ecosystem, and they benefit from being handled properly and carefully.

The key principle in any activity involving handling soils is to move them when they are in a suitable state, and this usually means that they are adequately dry.

Clay soils are particularly susceptible to being damaged by being handled when they are wet. Clay particles are very small and bind together. Clay soils therefore have small spaces for water to pass through, which makes them drain poorly.

When worked in a wet state, the small spaces tend to pack together and the whole becomes impermeable. In the days when canals were built, sheep were used to puddle clay to create impermeable linings to the canal because they pressed the material together. The basic principle in handling clayey soils in development sites is to achieve the opposite – a well-structured soil that can be worked.

Details are set out in Section 5, but in simple terms, if a clayey soil can be rolled into a sausage in the hand, it is too wet to move. This can be seen in Image 9 below. Trafficking of soil in such a condition will result in rutting and deterioration of the soil, damage to the soil structure, and a significant prospect of plant/machinery becoming stuck.

Image 14: Soil When too Wet for Handling

If tramlines across arable fields can be seen to be holding standing water, or boots get very sticky and become heavy with extra soil when you walk across a field, it is a good indication that soils are not suitable for being moved.

The soils therefore need to be stripped and moved into storage areas when they are suitably dry.

Topsoils and subsoils need to be removed separately and stored separately.

Soil is full of micro-organisms. It needs aerobic conditions to sustain life. Therefore, another key principle in storage is not to make the piles so large that conditions in the centre turn anaerobic. Soils that are stockpiled when wet tend to remain wet and become anaerobic, and the weight of the wet soil compresses soil lower down the stockpile.

4.3 Principles of Subsoil Protection

There are two very different soil profiles on the route of the Proposed Scheme.

The eastern end, westwards as far as the scarp, are shallow topsoils over limestone. The subsoils are often very stoney and will be worked as rock. If there are distinct areas of separate subsoil these will be preserved, but generally the subsoils from 25 cm to 50 cm will need to be separately stored for reuse but will be very stoney.

Most of the route crosses deep, generally stoneless clay soils. Moving clay, eg subsoil, when it is wet is difficult and the same principles as for topsoil will be important. The upper subsoils, from about 25 cm to 30cm depth (i.e. below topsoil) down to 50 cm generally, will be brownish clay going grey with depth. The browner clay subsoils will be stripped when conditions are as dry as possible, generally in the April to October period, and will be stored separately to the grey soils.

4.4 Principles of Storage and Reinstatement

The following advice applies to all soil types expected to be encountered on the NHRR scheme.

Soil can be stored long-term, but it needs to be placed in storage in the right, generally dry, condition, and the bunds will need to be managed throughout the life of the storage.

If soil going for storage is wet, it will be stored initially in shallow bunds to give it time to dry out. It can then be stored in larger bunds, if this is desirable.

Soil removed from an area will, so far as possible, be replaced in the same area. This will minimise the potential for soil variability, which can affect the way fields (especially arable fields) are farmed.

As a general principle, therefore, and so far as is practicable, soil storage will be near to where it was removed, but if that is not possible then storage areas need to be carefully labelled and recorded. This is particularly important for licenced areas which will be returned to the landowner.

Reinstatement will also be carried out when soils are suitably dry. If reinstatement results in soils spreading out in a dry manner, whereby they can easily be worked down to a fine tilth, then conditions are good.

As a general pointer for timing, look at what arable farmers are doing locally. If there is tractor activity in the fields, and soils are being worked without problem, then soil activities on site are probably possible without damage.

If, however, farmers are not active with machinery on land in the area, that is a good indication that the soils are not suitable for being worked.

4.5 Delays

Soils that are in storage in managed storage areas will not significantly deteriorate if there are unexpected project delays. Hence if for unforeseen reasons the timetable slips, this will not result in problems for soil management provided that the subsequent movement and restoration is re-programmed to a suitably dry time of the year. In other words, a project delay resulting in winter work with soils is not acceptable. Soils need to be moved and restored according to the season.

5. SOIL MANAGEMENT PLAN – TOPSOIL STRIPPING

5.1 Responsibilities and Roles

Soil management will be considered an important part of the construction process. Responsibility for the management of soils will rest with the site manager, who may delegate the role.

The role, and the contact number(s), will be defined and allocated within the CEMP.

5.2 Soil Resource Map

The soils across the site are affected by soil wetness.

The distribution of the wetter and drier soils correlates with the soil type map. The Wickham 2 and Fladbury 2 soils are clayey and wet, the Elmton 1 soils are brashy and much drier.

Refer to Section 3.1 for soil types and distribution.

5.3 Timing of Works

The weather patterns in recent years have been very variable, and winter rainfall has not followed normal patterns. This makes it very difficult to be specific about dates.

In general terms, and subject to the assessment methodology below, planning for major soil stripping activities should be within the following dates.

Table 1: Dates for Planned Soil Management

Soil Type	Key Dates
1 drier soils (Elmton)	Mid-March to mid-December
2 wetter soils (Fladbury and Wickham)	Mid-April to mid-November

These dates are for forward planning. Therefore, the initial site stripping will be timed to commence from mid-March in the east and mid-April for most of the route, and phased soil stripping timed to be complete by mid-November for most of the route.

Prior to moving topsoils, the “sausage” method will be used. If soil will not form a cohesive sausage or ball when rolled or squeezed, the soils will be suitable to be stripped using method 1 below. If, however, the soil forms a cohesive sausage or ball, and soil movement cannot be delayed, Method 2 will be followed. The area being moved will be minimised, so far as possible.

5.4 Topsoil Stripping and Stockpiling: Method 1 For Dry Soils

This is the method for soils that are suitably dry for handling.

The method for stripping topsoil will follow the principles set out in Defra’s Construction Code of Practice, an extract for which is shown in Figure 5.

Method

Remove surface vegetation by blading off, by scarification and raking, or kill off by application of a suitable non-residual herbicide applied not less than two weeks before stripping commences.

The method illustrated below is the preferred method for minimising damage to topsoil. It shows the transport vehicle running on the basal layer under subsoil as subsoil is also to be stripped. If only topsoil is to be stripped, the vehicle would run on the subsoil layer.

Stripping should be undertaken by the excavator standing on the surface of the topsoil, digging the topsoil to its maximum depth and loading into site or off-site transport vehicles.

Alternative stripping methods that can be shown to afford the same degree of soil protection are acceptable.

An archaeological watching brief might have to be accommodated during topsoil stripping.

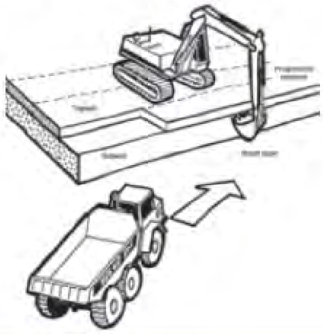


Figure 5: Soil Stripping Methodology

The soils on the site are generally clayey. If sustained heavy rainfall (>10 mm in 24 hours) is experienced, and ground conditions are therefore unsuitable, stripping activities will cease for at least 24 hours to allow soils to dry sufficiently. Topsoils moved when dry, can then be stockpiled in bunds up to 3 m to 4 m in height.

Topsoil storage will take place in a designated area. This will need to be identified at the detailed design and layout stage. It will be an area where soils can be left undisturbed for the duration of the construction period until they are required.

Soil stockpiling

Soil should be stored in an area of the site where it can be left undisturbed and will not interfere with site operations. Ground to be used for storing the topsoil should be cleared of vegetation and any waste arising from the development (e.g. building rubble and fill materials). Topsoil should first be stripped from any land to be used for storing subsoil.

Method 1 – Dry non-plastic soils

The soil is loose-tipped in heaps from a dump truck (a), starting at the furthest point in the storage area and working back toward the access point. When the entire storage area has been filled with heaps, a tracked machine (excavator or dozer) levels them (b) and firms the surface in order for a second layer of heaps to be tipped. This sequence is repeated (c & d) until the stockpile reaches its planned height. To help shed rainwater and prevent ponding and infiltration a tracked machine compacts and re-grades the sides and top of the stockpile (e) to form a smooth gradient.

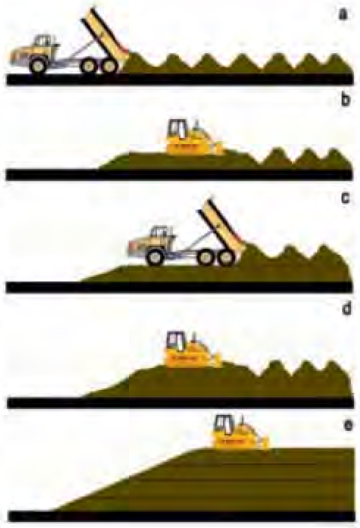


Figure 6: Soil Storing Methodology

Storage of dry soils will follow the methodology set out in the Construction Code of Practice, as reproduced in Figure 6.

5.5 Soil Stripping and Stockpiling – Method 2 for Wet Soils

This methodology should be avoided if possible, and soils will be stripped only when dry. If, however, this cannot be avoided then Method 2 will be followed.

Topsoil stripping will be carried out in the same way as shown in Figure 5.

Soil will then be tipped in shallow bunds, ideally not exceeding 1 m in height, but can be up to 2 m. An example is shown in Image 15 below.

Image 15: Example of Low Bund

These low bunds allow the soils to dry out. Deeper stockpiling can then take place when the soils have dried, typically three to four weeks later, as per the Construction Code of Practice guidance provided in Figure 7 below.

Method 2 – Wet plastic soils

The soil is tipped in a line of heaps to form a 'windrow', starting at the furthest point in the storage area and working back toward the access point (a). Any additional windrows are spaced sufficiently apart to allow tracked plant to gain access between them so that the soil can be heaped up to a maximum height of 2m (b).
To avoid compaction, no machinery, even tracked plant, traverses the windrow.

Once the soil has dried out and is non-plastic in consistency (this usually requires several weeks of dry and windy or warm weather), the windrows are combined to form larger stockpiles, using a tracked excavator (d). The surface of the stockpile is then regraded and compacted (e) by a tracked machine (dozer or excavator) to reduce rainwater infiltration.

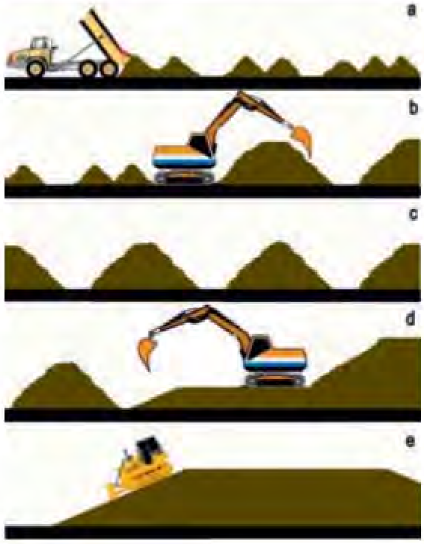


Figure 7: Stockpiling Wet Soils

6. SOIL MANAGEMENT PLAN – SUBSOIL

The subsoils present across the site will need to be handled similarly to the topsoils.

6.1 Clay Subsoils (Wickham 2 and Fladbury 2) – Class 4 Landscape Fill/Class 2 General Fill*

The subsoils are a brown, clayey subsoil going grey with depth. The depth of brown subsoil will vary but will be in the range of 30 cm to 40 cm, so from a depth of 25 cm to 55 cm– 60cm in the soil profile.

The browner subsoils will be removed, where excavations require, when dry. This will normally be in the May to October period. They will be stored separately to the topsoils, but following the principles set out for topsoils above.

If the subsoils go grey within the typical strip depth, the machinery operators will endeavour so far as possible to remove the browner subsoils separately to the greyer subsoils. There will be a clear visual distinction between the two.

The subsoils will be stockpiled as for the topsoils.

* Site won Class 2 General Fill material will conform to the requirements of Class 4 Landscape Fill. This will be detailed in the Series 600 and 3000 Specification Appendices in the detailed design, developed with LCC and Balfour Beatty.

6.2 Brashy Subsoils – Class 2C General Fill

The land covered by Elmton 1 soils is brashy limestone. The top 25 cm to 30 cm of subsoil below the topsoil will be removed so far as practicable and stored separately to the topsoils.

These soils will generally be suitable for handling between mid-March and mid-December

6.3 Stockpiling

Large stockpiles of subsoil are unlikely to be required. However, depending upon space availability subsoils can generally be stored to a greater depth without deterioration than can topsoils. A maximum design height of 5m for subsoil storage will be aimed for.

7. SOIL MANAGEMENT – CONSTRUCTION ROADS

7.1 Construction Methodology

The access tracks are created by stripping off some or all of the topsoil (to a depth of 200 mm) and then adding an aggregate-based surface. Usually, the aggregate will be placed onto a permeable membrane (use of which will be a temporary works decision and will need to consider material reclamation and reinstatement and particularly that challenges of ensuring that the geotextile is appropriately removed upon reinstatement with particular attention paid to licenced areas), which allows water penetration but which prevents the aggregate from mixing with the topsoils or upper subsoils.

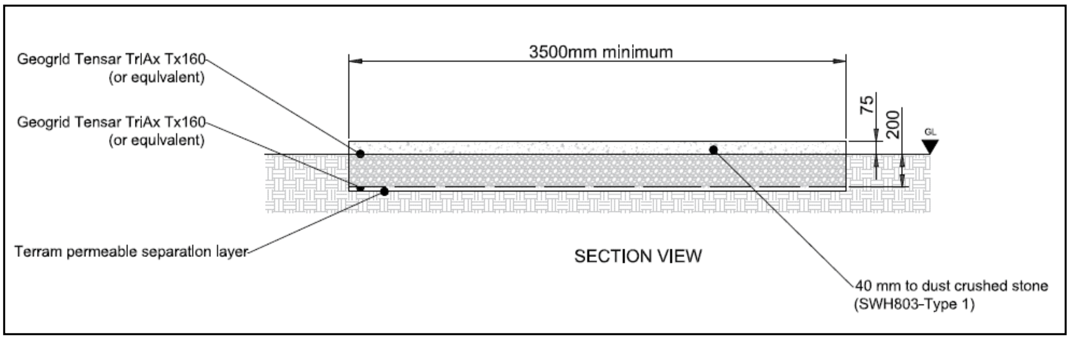


Figure 8: Typical Cross-section of Temporary Road

The construction process is normally carried out as follows:

1. Topsoil to approximately 10 cm to 15 cm is removed. This will be stored in a bund no more than 3 m high at an agreed location, for use in future restoration, ideally alongside the track;
2. A matting layer is added;
3. The base of stone is then added.

7.2 Soil Management

Soil should ideally be stripped when the soil is sufficiently dry and does not smear. This is a judgement that is easily made. If the soils can be rolled into a sausage shape in the hand which is not crumbly, or if rubbing a thumb across the surface causes a smudged smooth surface (a smear), the soil is generally too wet to strip or move without risk of structural damage. Topsoil depths vary but a stripping depth of 20-30cm will be a suitable maximum depth for topsoil in most cases, although rarely will it need to be stripped to such a depth.

Soil stripping will be carried out in accordance with Defra “Construction Code of Practice for the Sustainable Use of Soils on Construction Sites” (Defra, 2009). This document can be found at [Code of practice for the sustainable use of soils on construction sites - GOV.UK (www.gov.uk)]

The removed soil will be stored in bunds in accordance with the Construction Code of Practice, as set out in Appendix 3. Stockpiles will be constructed with tapered edges and seeded with grass if the intention is for them to be left for more than 2-3 months.

7.3 Bunds and Storage

The tracks involve the movement of soils. Therefore, the soils are more susceptible to damage from mechanical moving. The topsoil will, however, be stored for the duration of the operational period. Accordingly, if for operational reasons it is necessary to commence the construction of tracks when soils are not in optimal condition, the soil to be stored will be stored initially in bunds of maximum 1 m high.

This will allow the soils to dry. Shallow bunds can then be moved again once they are dry into larger bunds for long-term storage, if necessary.

Soil can vary over short distances, and restoration is best if the soil that has been removed is replaced as close as possible to the position it was removed from. Consequently for haul routes the best way to store the soil is adjacent to the construction track. This means it can be moved from the haul route to storage without transportation and will be the same soil when restoration takes place. This is illustrated in Image 16 below.

Image 16: Example of Soil Stores Next to Temporary Haul Route

Any bunds expected to be in place more than six months will be sown with a grass mix. This will be managed at least once per year to prevent the development of woody growth.

As a general rule, soil will not be moved during or within 24 hours of heavy rain.

Further information can be obtained as follows:

- MAFF “Good Practice Guide for Handling Soils”, 2000;
- Institute of Quarrying “Good Practice Guide for Handling Soils in Mineral Workings”, 2021; and
- BRE “Agricultural Good Practice For Solar Farms”, 2014.

7.4 Soil Storage Areas

The General Arrangement Plans show intended principal storage areas.

These are temporary storage areas, and land quality will not be adversely affected.

The following extract from the plans shows where it may be possible to store topsoil from the haul road, where it will be readily available for restoration in a similar place to its original location.

The topsoil in temporary storage would be stored to a depth of 2 m to 3 m (subject to any applied planning constraints), typically beside the haul road. Subsoil would be placed in larger bunds as suits the construction traffic flow, refer Figure 9 below.

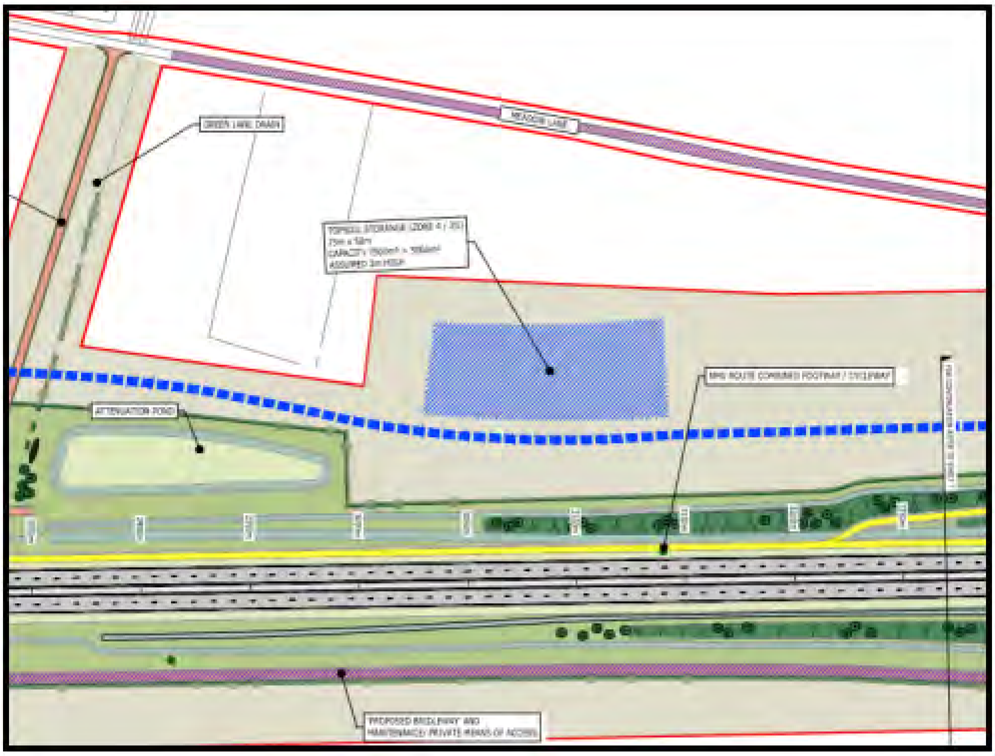


Figure 9: Example Construction Road Storage Locations

It will be particularly important for the Fladbury 1 soils near the river to store them separately from the Wickham 1 soils. A suggested (illustrative) storage location is shown in Figure 10.

The soils in this area vary over short distances, so retaining the soils as close as possible to their original location will be important and makes working operations easier.

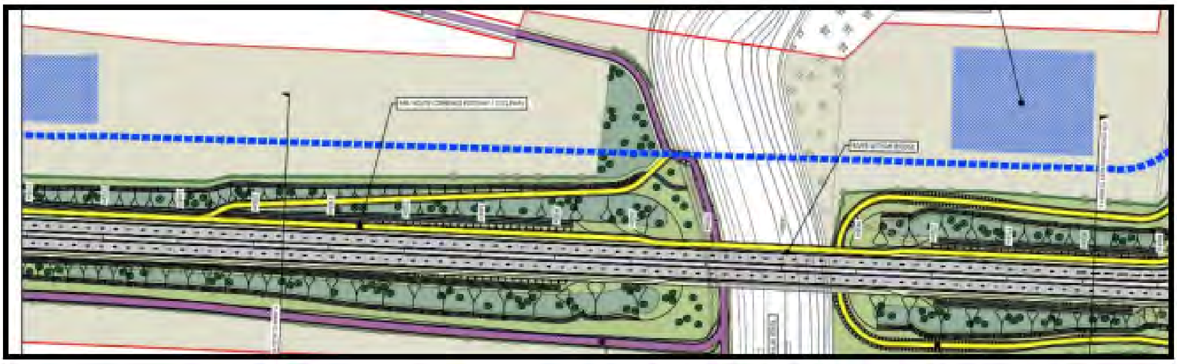


Figure 10: Example Construction Road Storage of Fladbury Soils

8. SOIL MANAGEMENT – SITE COMPOUNDS

8.1 The Areas

Temporary construction areas are shown on the general arrangement plans.

8.2 Construction Methodology

The methodology is generally similar to the construction of haul routes, but over a larger area.

Topsoil will be stripped to a depth of 25 cm and stored at the side of the compound area in a bund no more than 3 m to 4 m in height, following the guidance in Section 5 of this SMP.

An example of a construction compound that had recently been constructed is shown below. Construction compounds are built by stripping topsoil and storing that in a bund on the edge of the site. A matting is then laid down, and stone imported and levelled, as shown below.

Image 17: Newly laid construction compound (Elsham Lincoln Pipeline)

Image 18: Example of Matting Membrane

8.3 Bund Storage and Management

Bunds will be sown with grass seed, which will help prevent run-off and erosion, and the grass roots will help the soil.

At least annually the vegetation will be managed to prevent the growth of woody vegetation such as brambles.

If the bunds become infested with arable weeds then a more frequent mowing/strimming regime will be followed.

8.4 Bund Storage Locations

Construction compound areas will be restored at the end of the construction period. It is important to establish a storage location and methodology that enables soils to be stripped, stored and restored to the same profile and as close as reasonably possible to the same location as they were in before construction commenced. As an example, it could be within site compound area, see fig 11 below.

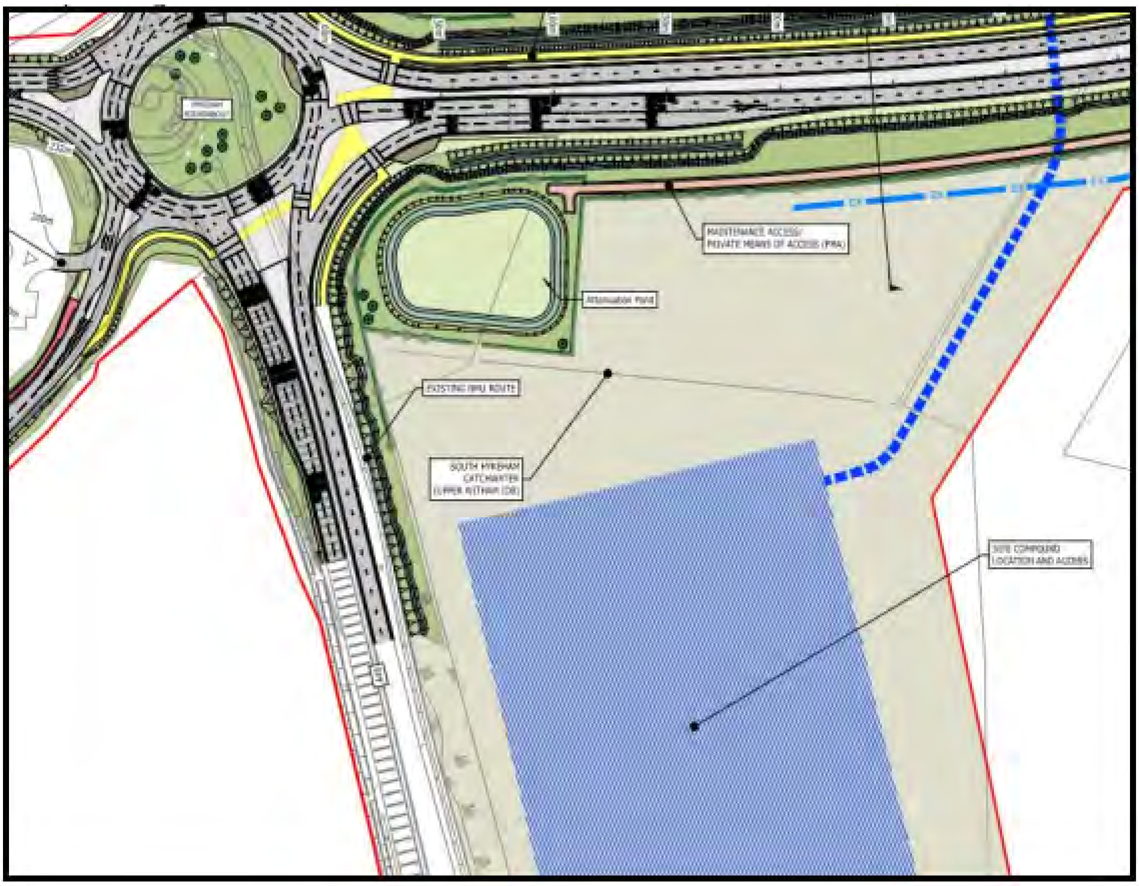


Figure 11: Example of Temporary Storage Area

There can be a great deal of flexibility over storage areas and indeed shapes. The following aerial image (Image 19) from the Lincoln Eastern Bypass (LEB) shows the interface between haul routes, construction areas storage areas during the construction phase. Large bunds of topsoil can be seen as the green areas, with the haul route weaving between two sections of bund.

Image 19: Aerial Image 2018 (north is to the left)

Provided that soil storage is recorded the location is not position critical.

9. REINSTATEMENT

9.1 Points of Principle

Reinstatement will follow the same key principles to the soil stripping stages. These are:

- Handle and move soils when the soils are suitably dry;
- Move soils as little as possible;
- Replace soils to the same location, restoring the soils in as close a replication of the original soil profile as is possible; and
- Ensure that any compaction or other effects are identified and rectified as part of the reinstatement process.

One of the most important aspects of the restoration process is therefore related to timing. Soils will have been stored in bunds of different sizes. A suitably qualified soil surveyor will be engaged prior to the restoration commencing to sample the bunds and confirm that the soils are sufficiently dry for moving.

9.2 Replacement Methodology

Suitably dried soils will be restored following the loose-tipping method set out in the Construction Code of Practice.

9.3 Placement of Soils

The placement of upper subsoils and topsoils for use within the proposed development will generally follow the stripping process but in reverse. It is again very important to move soils when they are suitable for being moved, and planned works will follow the timing set out earlier.

Prior to topsoil placement, however, the subsoils under the construction routes or compounds should be prepared. The subsoil that was not moved will likely have been compacted and trafficked, and this needs to be loosened. Loosening the subsoil not only allows root penetration, it also prevents a compaction pan which impedes downward drainage and can lead to surface flooding or topsoil sitting in wet conditions not suited to plant growth.

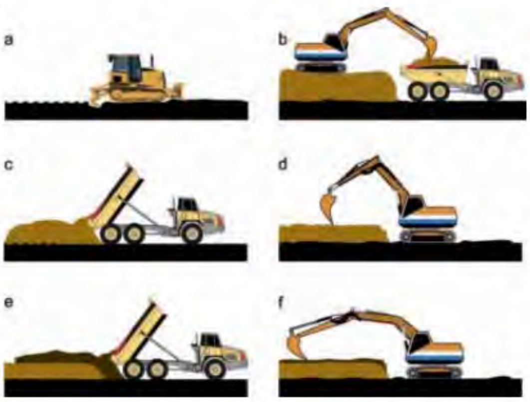
Prior to decompaction activities, a soil surveyor or experienced site engineer will inspect the soils and will advise on the depth to which compaction needs to be alleviated. This will determine the machinery required, and methodology needed.

Typically tines/subsoilers can be used, such as the examples given in Figure 12 (from the Construction Code of Practice)

Top (from left to right): *Ripping by tractor-drawn tines, Large winged-tine ripper, Topsoil rake used on a 3 tonne excavator*
Bottom: *Single ripper tooth used for relieving compaction to a depth of 600 mm*

Figure 12: Examples of Soil Loosening Equipment

The placement method is shown below, from the Construction Code of Practice.



a) *loosening the substrate of the receiving ground*
b) *loading of subsoil from stockpile*
c) *backtipping subsoil onto loosened substrate*
d) *levelling subsoil*
e) *backtipping topsoil*
f) *spreading topsoil over subsoil using excavator working on substrate*

Figure 13: Loose-tipping Method (Topsoil and Subsoil Spreading)

The topsoil will be returned to the same, and no less, thickness than it was before soil stripping. If additional topsoils are spread, provided that they are the same type of topsoil, this will not matter. Hence topsoil depths of a minimum of 250 mm, and generally a minimum of 300 mm, will be achieved.

Once replaced the topsoils will be worked with normal agricultural machinery to create a seed bed. As stored topsoil is often anaerobic, at least partially, a deep tine cultivation process will be used to loosen and mix soil as part of the seed bed preparation process.

10. SOIL AFTERCARE MANAGEMENT

Soil restoration, however well planned and executed, is affected by weather which is beyond the project's control.

Waterlogging and anaerobism are the two most common reasons for plant failure on restored sites (Construction Code, Section 6.4).

There is often a pressure to hand land back as soon as possible after restoration, but the soil health will first be assessed by a suitably experienced person and any remedial works completed prior to hand-back.

11. RESPONSIBILITIES

The project will dedicate a suitably experienced person to be in charge of soil management, storage and restoration.

The services of a suitably qualified and experienced soil consultant will be engaged who can provide periodic and targeted advice on soil suitability and working at key stages of the project.

APPENDIX 1
EXTRACTS SOILS AND THEIR USE IN EASTERN ENGLAND, SOIL SURVEY OF ENGLAND AND WALES

§ 54. ELMTON 1 ASSOCIATION
343a

This association is extensive (1351 km^2) from Dorset to Yorkshire on Jurassic limestone beds including the Middle Lias, Lincolnshire Limestone, Great Oolite and Corallian beds. It is usually on gently undulating plateaux or dipslopes dissected by dry valleys containing Head or colluvial deposits. Although there is wide variation in the component soils because of the range of parent materials, the association consists mainly of shallow brown rendzinas of the Elmton series, with small areas of deeper brown calcareous earths of the Aberford and Moreton series and argillic brown earths of the Shippon series. These fine loamy or clayey, variably stony soils are permeable and rarely waterlogged. Depth to limestone in Aberford soils is variable but in the general range 40–80 cm. The numerous minor component soils are given in the key below. Brief profile descriptions of the main soils follow, except Moreton series which is described in § 120.

Elmton series
(Full description Hartnup 1977, p.41)

0-25 cm — Ap
Brown, slightly or moderately stony clay loam or sandy clay loam; calcareous.

At 25 cm — R
Limestone.

Aberford series
(Full description Hartnup 1975, p.35)

0-25 cm — Ap
Dark brown, slightly or moderately stony clay loam; calcareous.

25-55 cm — Bw
Brown, slightly or moderately stony clay loam; weak coarse subangular blocky structure; calcareous.

At 55 cm — R
Limestone.

Shippon series
(Full description Jarvis, M.G. 1973 p.108)

0-20 cm — Ap
Dark brown, slightly stony clay loam.

20-40 cm — Eb
Yellowish brown, slightly stony clay; moderate medium subangular blocky structure.

40-60 cm — Bt
Dark brown, slightly stony clay; moderate fine angular blocky structure.

At 60 cm — R
Limestone.

The association is mainly on the wide, gently undulating dipslope of the Inferior Oolite Limestone between 30 and 90 m O.D. (Fig.41). In much of Lincolnshire, Elmton and Aberford series comprise most of the association, but in north Lincolnshire some dry valleys contain Dullingham (§ 8) rather than Aberford series and, near the scarp crest, Wick soils (§ 31) have been included on outcrops of Lower Estuarine Beds. In central Lincolnshire, where there are remnants of high-level gravels, Marcham and Cranwell series (both § 88) are locally important and small patches of Maxted (§ 20) soils occur. In parts of south Lincolnshire and Northamptonshire, the association occurs also on Great Oolite Limestone and Sherborne soils (§ 120) are common, locally occupying almost half the land. In Northamptonshire the proportion of Moreton soils is larger, and the valleys are floored with Dullingham or Millington soils (p.431).

Key to component soil series

	Shallow soils, limestone within 30 cm	1
	Deeper soils	2
1.	Fine loamy	ELMTON
	Coarse loamy	Marcham
	Clayey	Sherborne
2.	Subsoil calcareous above 40 cm	3
	Subsoil non-calcareous above 40 cm	5
3.	Limestone within 80 cm	4
	Deeper soils, fine loamy	Dullingham
4.	Fine loamy	ABERFORD
	Clayey	MORETON
	Coarse loamy	Cranwell
5.	Clayey; limestone within 80 cm	SHIPPON
	Coarse loamy; no limestone within 80 cm	Maxted

Soil water regime

Elmton and Aberford soils are permeable and overlie well-fissured limestone and are thus well drained (Wetness Class I). The soils readily absorb winter rain and there is little surface run-off. Wetter land occurs locally where Haselor (§ 17) and Evesham soils (§ 61) are included.

Elmton and Moreton soils are moderately droughty for most arable crops and very droughty for grassland; Aberford soils are generally less droughty.

Cultivation and cropping

Figure 40 illustrates the effects of soil and climate on landwork. The soils are easily worked, though local stoniness interferes with cultivation and may inhibit germination. There are adequate working periods in the autumn and spring. Cereals, sugar beet, potatoes, peas and grass for drying are grown. Direct drilling of winter and spring cereals on these soils gives similar yields to conventional techniques. The droughtiness of Elmton series restrict grass growth to spring and early summer, but there is negligible poaching risk.

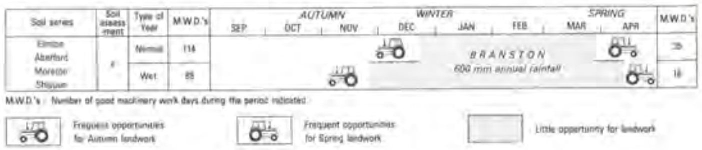


Figure 40. The effects of soil and climate on landwork, Elmton 1 association

Soil water regime

Fladbury and Thames subsoils are usually slowly or moderately permeable but the main cause of waterlogging is groundwater which fluctuates seasonally with changes in river level. The duration of waterlogging is often related to microrelief. In winter months, the water-table is at shallow depth for long periods in many Thames and Fladbury soils (Wetness Class IV) and locally they suffer prolonged waterlogging (Wetness Class V). Thin peaty topsoils occur in some low-lying areas. Wyre soils on raised areas of the floodplain are commonly more permeable and are less frequently waterlogged (Wetness Class II and III). Flooding is a perennial problem, its frequency and distribution depending on rainfall, catchment configuration and flood control measures. Many areas are flooded two or three times annually although, except in backswamps, duration is short.

Cultivation and cropping

In the west, these soils are predominantly under permanent grassland or long leys and rushes infest the wettest sites. Because of a large retained water capacity, there is a serious risk of poaching. Flooding further curtails late autumn and spring grazing, although flood control measures in recent years have considerably reduced the risk. Nevertheless, the soils support good summer fattening pasture and mowing grass, and growth is maintained during all but the driest periods.

There is some arable land in Northamptonshire but it is more common in the drier areas of Cambridgeshire and Essex where there is more opportunity for tillage and where summer grass yields are reduced by drought. Cereals are the main crop, spring sowing being preferred where there is risk of winter flooding. Frost-weathering of winter cultivations on this heavy land provides a good seed bed for spring sowings. Cereal crops are little affected by drought. Thames soils are naturally calcareous but Fladbury and Wyre soils are neutral or slightly acid in reaction. All three soils contain good reserves of potassium but are inherently poor in phosphorus, its level depending on recent fertilizer use. Manganese deficiencies are common in grass herbage and cereals.

§ 64. FLADBURY 2 ASSOCIATION

813c

This association, developed in greyish and brownish river alluvium, consists of mottled clayey soils, Fladbury and Stixwould series, and subsidiary loamy soils, Trent series. It occurs on the flat floodplains of the River Trent and its tributaries and along several smaller rivers and streams in Lincolnshire. Fladbury series belongs to the pelo-alluvial gley soils and has a mottled, slowly permeable, clayey subsoil. Stixwould soils are similar but pass into coarse loamy or sandy glaciofluvial material within 80 cm depth. Trent series (gleyic brown alluvial soils) is fine loamy, relatively permeable and has no grey mottling in the upper 40 cm. It is found on slightly raised parts of the Trent floodplain. Brief profile descriptions of Fladbury, Stixwould and Trent soils are given below.

Fladbury series
(Full description p.423)

0–15 cm — Apg
Dark greyish brown, mottled, stoneless clay.

15–60 cm — Bg
Greyish brown with many ochreous mottles, stoneless clay; strong coarse prismatic structure.

60–100 cm — Cg
Grey, mottled, stoneless clay; moderate angular blocky or massive structure.

Stixwould series
(Full description Reeve and Thomasson 1981, p.108)

0–20 cm — Ap
Very dark greyish brown, stoneless clay.

20–50 cm — Bg
Grey with many ochreous mottles, stoneless clay; weak coarse angular blocky or prismatic structure.

50–100 cm — 2Bg
Brown, mottled, stoneless sandy loam or loamy sand; weak coarse angular blocky or single grain structure.

Trent series
(Full description Kilgour 1979, p.53)

0–25 cm — Ap
Dark brown, stoneless clay loam.

25–50 cm — Bw
Brown, stoneless clay loam; moderate coarse subangular blocky structure.

50–100 cm — Bg
Brown, mottled, stoneless clay loam or sandy loam; weak medium angular blocky structure.

In Lincolnshire the association consists almost entirely of Fladbury and Stixwould series and covers 117 km^2. Fladbury soils dominate the Trent floodplain between Dunham Bridge and Gainsborough and the Witham alluvium from Grantham to Lincoln. Near Claypole, many Fladbury soils contain buried topsoils and there are local inclusions of Midelney (§ 93) and Thames series (§ 128). Along the small streams draining into the River Witham, east of Lincoln, Stixwould series is dominant. The association is found in the Till valley north-west of Lincoln, the Bain valley and along the middle and upper reaches of the Great Eau and Steeping River. Where the Bain valley narrows upstream, Conway (Thompson 1982) and Kettlebottom (Clayden and Hollis 1984) soils are common.

Key to component soil series

	Subsoils faintly mottled above 60 cm or distinctly mottled between 40 and 80 cm; fine loamy	TRENT
	Soils prominently mottled or greyish within 40 cm; clayey	1
1.	Over coarse loamy or sandy	STIXWOULD
	Clayey throughout	2
2.	Greyish or brownish	FLADBURY
	Reddish	Compton

Soil water regime

Most soils of the Fladbury series have slowly permeable subsoils and Stixwould soils have slowly permeable upper horizons, but in both cases the primary source of waterlogging is groundwater. Both soils are waterlogged for long periods of the winter (Wetness Class IV) and waterlogging can occur during the growing season (Wetness Class V) in low-lying sites. Because of the permeable substratum, however, groundwater-levels in Stixwould series respond more rapidly to changes in river level than those in Fladbury soils. Stixwould soils also respond better to drainage, but in both soils underdrainage is only effective where satisfactory outfalls can be achieved above river level or where pumping, as into the embanked River Witham, is provided. Flooding is infrequent but parts of the Trent floodplain are designated as flood storage areas, as at Lea Marshes near Gainsborough.

Cultivation and cropping

The association is primarily under arable use although there is still some permanent grassland mainly in the Trent and Witham valleys. Winter cereals with break crops of oilseed rape and, more rarely, potatoes or sugar beet are grown where the flood risk is reduced by arterial improvements, and underdrainage is made more effective by improvement of outfalls and the installation of pumps. Cultivations must be carefully timed, and in normal years there are few fieldwork days available in spring. Fladbury, Stixwould and Trent soils are naturally acid and require occasional dressings of lime. They have good reserves of potassium but phosphorus levels depend on recent fertilizer use. Manganese deficiencies in herbage are common on Fladbury and Stixwould soils.

§ 65. FLADBURY 3 ASSOCIATION
813d

Clayey alluvial soils on river floodplains dominate this association which occurs mainly in the South East and Northern England, but only locally in Eastern England. The association is fully described by Jarvis, M.G. *et al.* 1984. Fladbury series (§ 63), grey clayey pelo-alluvial gley soils, usually cover two-thirds of the ground and subsidiary silty or loamy soils the remainder, often where tributaries join the main valley. Thus, the fine silty Conway series (Thompson 1982), which belongs to the typical alluvial gley soils, is a frequent associate, and similar but fine loamy Enborne soils (Palmer 1982) occur in places. In the Mar Dyke catchment of south Essex, there are few soils other than Fladbury series, and in the Colne valley near Colchester, fine silty gleyic brown alluvial soils belonging to the Clwyd series (Thompson 1982) are included. Near the Grand Union Canal, south of Rickmansworth, where the alluvium rests on gravel, clayey soils with gravelly subsurface layers are locally common.

The principal soils are affected by high groundwater and are waterlogged for long periods in winter (Wetness Class IV). Fladbury soils are often slowly permeable, even within 40 cm depth, whereas Conway and Enborne soils are moderately permeable. Winter flooding is common, but when protected by embankments and improved by field drainage measures the soils are only seasonally waterlogged (Wetness Class III) in the dry south-east of the region. The soils have large reserves of available water.

Winter cereals and oilseed rape are grown where adequate standards of arterial and

Soil water regime

Wick, Sheringham and Newport series have permeable surface and subsurface layers and are unaffected by groundwater so they are naturally well-drained (Wetness Class I). Though rainfall is normally readily absorbed, heavy rainfall can cause gully erosion on bare sloping ground where the surface soil has been compacted. Sheringham and Wick soils are slightly droughty for cereals as, marginally, are the more water-retentive Sheringham soils. All three soils are non-droughty for sugar beet, moderately droughty for potatoes, which require irrigation for optimum yields, and very droughty for grass. Newport soils are moderately and very droughty for arable crops and grass respectively.

Cultivation and cropping

The soils are easily worked and there is adequate time for cultivations in both autumn and spring (Fig.73). Direct drilling is not advisable because of the low organic matter content and coarse loamy or sandy textures of the soils. There is likely to be a loss of yield especially in spring sown crops. The main crops are barley, both autumn and spring sown, and sugar beet. Much less wheat is grown than barley and field vegetables, mainly peas and main crop potatoes, are common. Sheringham and Wick series are valuable and flexible soils, but overall yields are reduced where Newport soils form droughtier spots within fields.

§ 140. WICKHAM 2 ASSOCIATION
711f

This association is extensive where thin loamy drift covers Jurassic and Cretaceous clay shales. It consists mainly of fine loamy over clayey typical stagnogley soils of the Wickham series but, where drift is absent, clayey soils of the Denchworth series are common. The better-drained stagnogleyic argillic brown earths of the Oxpasture series and calcareous clayey soils of the Evesham series are sporadically distributed. The association is found mostly in lowland vale country. There are many small inclusions of other soils which are described below and are listed in the key. Brief profile descriptions of the major component series are given elsewhere in the text: Wickham series in § 107, Denchworth series in § 61, Oxpasture series in § 107 and Evesham series in § 61.

This association covers 545 km^2 in Eastern England mainly in Lincolnshire and Northamptonshire but also in west Norfolk. In Lincolnshire it is mainly in the Lias Clay vale (Fig.41, Plate 2) between Lincoln and Newark where the Trent river terrace deposits are a source for the superficial loamy drift. Patches of sand and gravel give small inclusions of Quorndon soils (§ 29), and some coarse loamy over clayey soils of the Kings Newton series (§ 34) occur on the edge of the river terraces. Oxpasture soils become increasingly common towards the limestone scarp of Lincoln Edge, and small patches of Beccles (§ 24) soils are included where the association abuts chalky till. Evesham soils are

Table 40
Profile Available Water (A.P. mm), Crop-adjusted Mean Moisture Deficit (M.D. mm) and Droughtiness Class for extensive crops–Wickham 2 Association

	Wickham and Oxpasture series	Denchworth series
Location	Leadenham	Leadenham
Grid Ref.	SK950520	SK950520
Grass		
A.P.	130	140
M.D.	185	185
Droughtiness	very droughty	moderately droughty
Winter wheat		
A.P.	130	135
M.D.	121	121
Droughtiness	slightly droughty	slightly droughty
Spring barley		
A.P.	130	135
M.D.	114	114
Droughtiness	slightly droughty	slightly droughty
Potatoes		
A.P.	105	115
M.D.	117	117
Droughtiness	moderately droughty	moderately droughty
Sugar beet		
A.P.	165	170
M.D.	117	117
Droughtiness	slightly droughty	non-droughty
Oilseed rape		
A.P.	130	135
M.D.	111	111
Droughtiness	slightly droughty	slightly droughty

uncommon in the Lias vale and are found mainly in south-west Lincolnshire. However, Oxpasture and Evesham soils are more common on Upper Jurassic and Cretaceous rocks bordering the Fens. The association also occurs in the Ancholme valley north of Lincoln; north-east and east of Lincoln on slopes of narrow valleys cut into chalky till; on the western edge of the Wolds (Fig.21); and in the deeply dissected valleys of the southern Wolds. In Northamptonshire the association occurs both in narrow valleys cut into the clay shales and on the plateaux formed by Upper Jurassic rocks. Here in the valleys, Evesham soils are less frequent than elsewhere and in general the soils on the hilltops are siltier than those in the vales, and Oxpasture soils are common. Quorndon soils are a

common inclusion in west Norfolk on flat or gently sloping land at the foot of the chalk scarp. Here Oxpasture soils are not found.

Key to component soil series

	Soils calcareous above 40 cm; clayey	EVESHAM
	Soils non-calcareous above 40 cm	1
1.	Subsoil faintly mottled above 60 cm or distinctly mottled between 40 and 80 cm; fine loamy over clayey	OXPASTURE
	Prominently mottled or greyish above 40 cm	2
2.	Clayey throughout	DENCHWORTH
	With coarse or fine loamy horizons	3
3.	Fine loamy over clayey	WICKHAM
	Coarse loamy over clayey	Kings Newton
	Coarse loamy	Quorndon

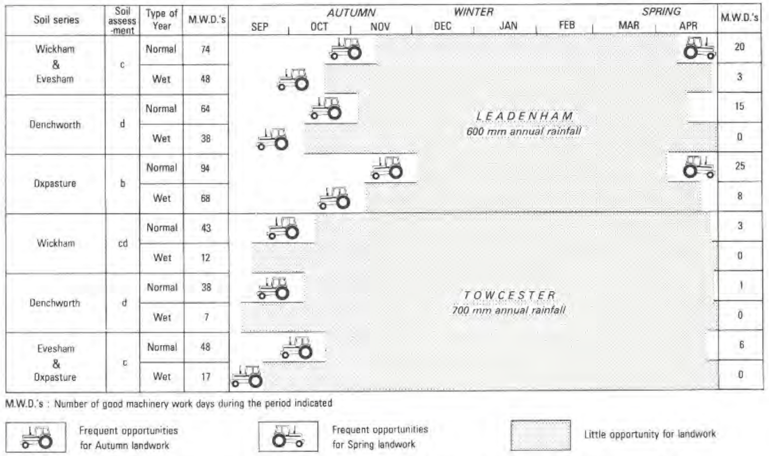


Figure 74. The effects of soil and climate on landwork, Wickham 2 association

Soil water regime

Occurring mainly on level or slightly sloping land these soils which have slowly permeable subsoils are seasonally waterlogged (Wetness Class III). Wickham, Oxpasture and

Denchworth series respond well to drainage treatment but because of their low hydraulic conductivity, Denchworth soils are more difficult to drain effectively. The land absorbs excess winter rainfall very slowly and much runs off laterally. The soils are slightly droughty for cereals but moderately to very droughty for grass (Table 40).

Cultivation and cropping

Most of the association is under arable cropping with a little short-term grassland. There is little opportunity for spring cultivations especially in the wetter areas (Fig.74) and autumn sown cereals, mainly wheat, are mostly grown. Oilseed rape and field beans are widely grown as break crops. Careful timing of cultivations is essential to avoid structural damage and the formation of compacted layers. Where grass is grown the yield potential is reduced because of droughtiness and early-spring and late autumn grazing is curtailed because of the serious risk of poaching. Wickham and Denchworth soils are mostly slightly acid in reaction, but Evesham soils are alkaline. Phosphorus levels are naturally low, but potassium is adequate for most plant needs.

§ 141. WICKHAM 4 ASSOCIATION
711h

This association consists of seasonally waterlogged soils with clayey slowly permeable subsurface horizons. It occurs mainly in southern England, and is extensive on gently undulating land in clay vales where the underlying Tertiary clay is thinly covered by loamy drift. The dominant soils are Wickham series (§ 107), typical stagnogley soils, fine loamy or fine silty over clayey and with grey and ochreous mottles throughout. The associated Windsor (§ 144) and Denchworth series (§ 61), are pelo-stagnogley soils, clayey to the surface and are found where the Head is very thin or absent. Both soils have grey and ochreous mottles, but Windsor soils become brownish at depth. Wickham soils are most common on gently sloping valley sides and footslopes. Windsor and Denchworth soils occur on moderate slopes. The association which is fully described by Jarvis, M.G. *et al.* (1984) occurs in Hertfordshire in small areas between Bishops Stortford and Ware on Reading Beds and London Clay, and also near Rickmansworth. Wickham and Windsor series are the main soils.

Most component soils are waterlogged for long periods (Wetness Class IV) where undrained. The slowly permeable clayey subsoils and moisture retentive surface horizons lead to poor water infiltration and rapid run-off. Underdrainage in these soils improves the rate of removal of excess water in winter (Trafford and Walpole 1975) and reduces waterlogging (Wetness Class III). The soils remain difficult to cultivate however, and there is little opportunity for work on the land in spring, so autumn cultivations are essential and winter cereals are the main arable crops.

Wickham and Windsor soils are naturally acid, but the acidity of arable soils depends on past liming history. Nevertheless base saturation is generally moderate or high, and there are no systematic nutrient or trace element deficiences.

APPENDIX 2
LANDIS INFORMATION ON SOILS

0711f WICKHAM 2

« 0711e WICKHAM 1 | Soil Associations | Soil Guide Home | 0711g WICKHAM 3 »

Soil and site characteristics

Slowly permeable seasonally waterlogged fine loamy over clayey, fine silty over clayey and clayey soils. Small areas of slowly permeable calcareous soils on steeper slopes.

Geology

Drift over Jurassic and Cretaceous clay or mudstone

Cropping and Land Use

Winter cereals and grassland in the Midlands; cereals in the Eastern Region dairying in the South West.

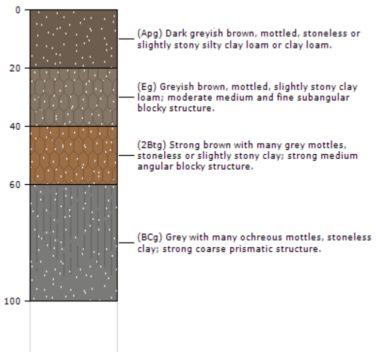
7.11 WICKHAM (Wh) (2227)

« WICK | WICKMERE »

Definition

Major soil group:	07 surface-water gley soils	Seasonally waterlogged slowly permeable soils, formed above 3 m 0.D. and prominently mottled above 40 cm depth. They have no relatively permeable material starting within and extending below 1 m of the surface.
Soil Group:	1 stagnogley soils	With a distinct topsoil. They are found mainly in lowland Britain.
Soil Subgroup:	1 typical stagnogley soils	(with ordinary clay enriched subsoil)
Soil Series:		medium loamy or medium silty drift over clayey material passing to clay or soft mudstone

Brief Profile Description



0813c FLADBURY 2

« 0813b FLADBURY 1 | Soil Associations | Soil Guide Home | 0813d FLADBURY 3 »

Soil and site characteristics

Stoneless clayey soils variably affected by groundwater some with sandy subsoils. Some similar fine loamy soils. Flat land. Risk of flooding.

Geology

River alluvium

Cropping and Land Use

Stock rearing on permanent grassland; cereals where flood risk low.

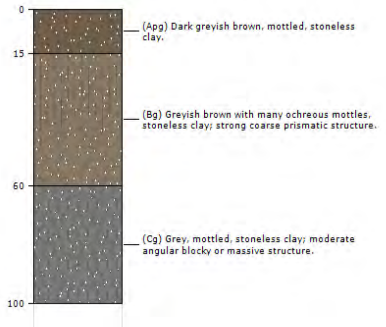
8.13 FLADBURY (Fa) (505)

« FFOREST | FLINT »

Definition

Major soil group:	08 ground-water gley soils	Seasonally waterlogged soils affected by a shallow fluctuating groundwater-table. They are developed mainly within or over permeable material and have prominently mottled or greyish coloured horizons within 40 cm depth Most occupy low-lying or depressional sites.
Soil Group:	1 alluvial gley soils	With distinct topsoil, in loamy or clayey recent alluvium more than 30 cm thick.
Soil Subgroup:	3 pelo-alluvial gley soils	(clayey with non-calcareous subsoil)
Soil Series:		clayey river alluvium

Brief Profile Description



0343a ELMTON 1

« 0342d WANTAGE 2 | Soil Associations | Soil Guide Home | 0343b ELMTON 2 »

Soil and site characteristics

Shallow well drained brashy calcareous fine loamy soils over limestone. Some similar deeper soils and some non-calcareous and calcareous clayey soils.

Geology

Jurassic Limestone

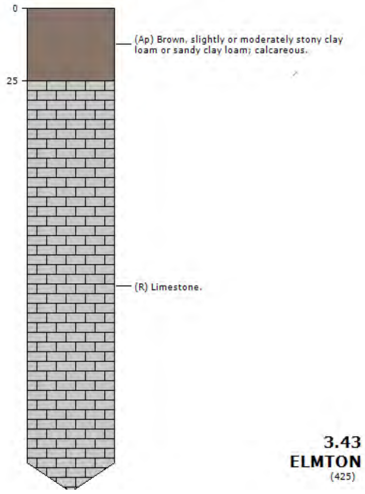
Cropping and Land Use

Cereals, sugar beet and potatoes; winter cereals and dairying in the South West.

Definition

Major soil group:	03 lithomorphic soils	Shallow, with a distinct, humose or peaty topsoil, but no subsurface horizons more than 5 cm thick (other than a bleached horizon). Normally over bedrock, very stony rock rubble or little altered soft unconsolidated deposits within 30 cm depth.
Soil Group:	4 rendzinas	Calcareous, over chalk, or extremely calcareous rock rubble or soft unconsolidated deposits.
Soil Subgroup:	3 brown rendzinas	(with brownish distinct topsoil that is not extremely calcareous)
Soil Series:		medium loamy lithoskeletal limestone

Brief Profile Description



APPENDIX 3
EXTRACTS CONSTRUCTION CODE OF PRACTICE

www.defra.gov.uk

Construction Code of Practice for the Sustainable Use of Soils on Construction Sites

BIS Department for Business Innovation & Skills

wrap Material change for a better environment

defra Department for Environment Food and Rural Affairs

5.4 Soil stockpiling

Why?

1. Soil often has to be stripped or excavated during the construction process. In order to enable its reuse on site at a later stage, soil needs to be stored in temporary stockpiles to minimise the surface area occupied, and to prevent damage from the weather and other construction activities.

How?

2. The main aim when temporarily storing soil in stockpiles is to maintain soil quality and minimise damage to the soil's physical (structural) condition so that it can be easily reinstated once respread. In addition, stockpiling soil should not cause soil erosion, pollution to watercourses or increase flooding risk to the surrounding area.

3. When soil is stored for longer than a few weeks, the soil in the core of the stockpile becomes anaerobic and certain temporary chemical and biological changes take place. These changes are usually reversed when the soil is respread to normal depths. However, the time it takes for these changes to occur very much depends on the physical condition of the soil.

4. Handling soil to create stockpiles invariably damages the physical condition of the soil to a greater or lesser extent. If stockpiling is done incorrectly the physical condition of the soil can be damaged irreversibly, resulting in a loss of a valuable resource and potentially significant costs to the project. The Soil Resource Survey and Soil Resource Plan should set out any limitations that the soil may possess, with respect to handling, stripping and stockpiling.

5. The size and height of the stockpile will depend on several factors, including the amount of space available, the nature and composition of the soil, the prevailing weather conditions at the time of stripping and any planning conditions associated with the development. Stockpile heights of 3-4m are commonly used for topsoil that can be stripped and stockpiled in a dry state but heights may need to be greater where storage space is limited.

6. Soil moisture and soil consistency (plastic or non-plastic) are major factors when deciding on the size and height of the stockpile, and the method of formation. As a general rule, if the soil is dry (e.g. drier than the plastic limit) when it goes into the stockpile, the vast majority of it should remain dry during storage, and thereby enable dry soil to be excavated and respread at the end of the storage period. Soil in a dry and non-plastic state is less prone to compaction, tends to retain a proportion of its structure, will respread easily and break down into a suitable tilth for landscaping. Any anaerobic soil also usually becomes re-aerated in a matter of days.

7. Soil stockpiled wet or when plastic in consistency is easily compacted by the weight of soil above it and from the machinery handling it. In a compacted state, soil in the core of the stockpile remains wet and anaerobic for the duration of the storage period, is difficult to handle and respread and does not usually break down into a suitable tilth. A period of further drying and cultivation is then required before the soil becomes re-aerated and acceptable for landscaping.

Soil management during construction

Stockpiling methods

8. There are two principal methods for forming soil stockpiles, based on their soil moisture and consistency.

9. Method 1 should be applied to soil that is in a dry and non-plastic state. The aim is to create a large core of dry soil, and to restrict the amount of water that can get into the stockpile during the storage period. Dry soil that is stored in this manner can remain so for a period of years and it is reuseable within days of respreading.

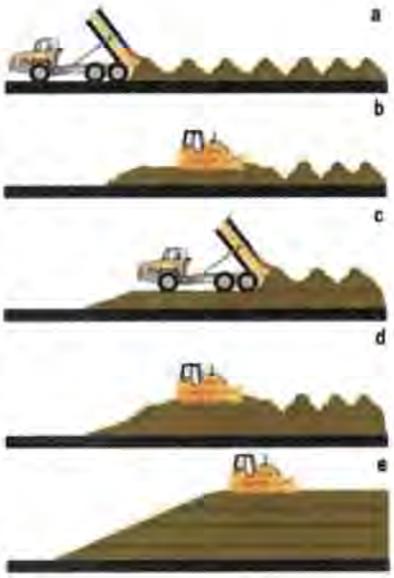
10. Method 2 should be applied if the construction programme or prevailing weather conditions result in soil having to be stockpiled when wet and/or plastic in consistency. This method minimises the amount of compaction, while at the same time maximising the surface area of the stockpile to enable the soil to dry out further. It also allows the soil to be heaped up into a 'Method 1' type stockpile, once it has dried out.

Soil stockpiling

Soil should be stored in an area of the site where it can be left undisturbed and will not interfere with site operations. Ground to be used for storing the topsoil should be cleared of vegetation and any waste arising from the development (e.g. building rubble and fill materials). Topsoil should first be stripped from any land to be used for storing subsoil.

Method 1 – Dry non-plastic soils

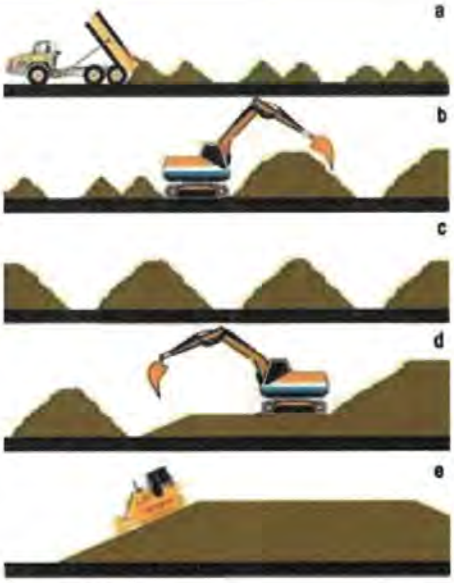
The soil is loose-tipped in heaps from a dump truck (a), starting at the furthest point in the storage area and working back toward the access point. When the entire storage area has been filled with heaps, a tracked machine (excavator or dozer) levels them (b) and firms the surface in order for a second layer of heaps to be tipped. This sequence is repeated (c & d) until the stockpile reaches its planned height. To help shed rainwater and prevent ponding and infiltration a tracked machine compacts and re-grades the sides and top of the stockpile (e) to form a smooth gradient.



Method 2 – Wet plastic soils

The soil is tipped in a line of heaps to form a 'windrow', starting at the furthest point in the storage area and working back toward the access point (a). Any additional windrows are spaced sufficiently apart to allow tracked plant to gain access between them so that the soil can be heaped up to a maximum height of 2m (b). To avoid compaction, no machinery, even tracked plant, traverses the windrow.

Once the soil has dried out and is non-plastic in consistency (this usually requires several weeks of dry and windy or warm weather), the windrows are combined to form larger stockpiles, using a tracked excavator (d). The surface of the stockpile is then regraded and compacted (e) by a tracked machine (dozer or excavator) to reduce rainwater infiltration.



Stockpile location and stability

11. Stockpiles should not be positioned within the root or crown spread of trees, or adjacent to ditches, watercourses or existing or future excavations. Soil will have a natural angle of repose of up to 40° depending on texture and moisture content but, if stable stockpiles are to be formed, slope angles will normally need to be less than that. For stockpiles that are to be grass seeded and maintained, a maximum side slope of 1 in 2 (25°) is appropriate.

Stockpile protection and maintenance

12. Once the stockpile has been completed the area should be cordoned off with secure fencing to prevent any disturbance or contamination by other construction activities. If the soil is to be stockpiled for more than six months, the surface of the stockpiles should be seeded with a grass/clover mix to minimise soil erosion and to help reduce infestation by nuisance weeds that might spread seed onto adjacent land.

13. Management of weeds that do appear should be undertaken during the summer months, either by spraying to kill them or by mowing or strimming to prevent their seeds being shed.

Clearly defined stockpiling of different soil materials

Long term stockpile of stripped topsoil left with only weed vegetation