Cardiff Green Infrastructure SPG

Soils and Development

Technical Guidance Note (TGN)

Consultation Draft

June 2017

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SOILS AND DEVELOPMENT

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1.0 INTRODUCTION

This Technical Guidance Note (TGN) supplements policies in the adopted Cardiff Local Development Plan (LDP) relating to climate change, green infrastructure, biodiversity and trees, and is part of the Supplementary Planning Guidance (SPG) for Green Infrastructure. It is one of a series of Technical Guidance notes that provide detailed information about the retention and provision of green infrastructure elements in new developments as follows:-

- Ecology and Biodiversity TGN
- Open Space TGN
- Public Rights of Way and Development TGN
- River Corridors TGN
- Soils and Development TGN
- Trees and Development TGN

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Welsh Government supports the use of Supplementary Guidance (SPG) to set out detailed guidance on the way in which development plan policies will be applied in particular circumstances or areas. SPG must be consistent with development plan polices and national planning policy guidance. SPG helps to ensure certain policies and proposals are better understood and applied more effectively. They do not have the same status as the adopted development plan but are a material consideration in the determination of planning applications

This Note is likely to be of particular benefit to those considering development proposals which involve works to soils. It enables developers, landowners and potential objectors to understand how the Council considers development proposals and the standard of provision sought.

2.0 WHAT IS SOIL?

The top layer of the earth's crust formed by varying quantities of mineral particles, organic matter, living organisms, air and water.

Soil may take thousands of years to develop but be destroyed in seconds by development, so in human terms it is a **non-renewable resource**.

A typical **soil profile** consists of variably well-defined **topsoil** and **subsoil** layers of differing volumes over **parent material** which might be **bedrock** or **superficial deposits** of glacial or alluvial origin **(Fig. 1)**.

Where a new soil profile is constructed after earthworks operations such as **'cut and fill'**, topsoil and subsoil layers are usually placed over an engineered **formation layer (Fig. 1)**.

Topsoil

Landscaping topsoil should be suitably drained and aerated and provide a sufficient source of water, nutrients, organic matter, soil fauna and flora to enable healthy, sustained growth by plants.

The majority of fine, feeder roots and their associated mycorrhizal fungi that are important in providing water and nutrients, grow in topsoil, with a proportion of larger, structural roots providing anchorage and storing resources.

Topsoil usually contains a higher quantity of organic matter, microbes and nutrients (e.g. nitrogen & sulphur) than subsoil, and is therefore particularly important to plant nutrition.

Subsoil

Landscaping subsoil has a number of key functions important to healthy plant growth:

- Acts as a reservoir during dry periods.
- Absorbs surplus water percolating down from topsoil.
- Provides anchorage for roots of large shrubs and trees.
- Provides a reserve of plant nutrients (e.g. potassium, magnesium & calcium).
- Provides an 'environmental service' attenuating water during periods of high rainfall.

Figure 1. Typical soil profile

3.0 SOILS AND DEVELOPMENT

Development requires soils to be **stripped**, **shaped**, **compressed** and **sealed** to provide a base for construction. Unfortunately these processes can seriously damage the functionality of soils in other respects.

When soils are considered as part of design and precautions taken to protect them during development, the extent of their loss and damage is reduced and the quality and sustainability of development enhanced.

This **Technical Guidance Note (TGN)** provides guidance on the **assessment**, **protection**, **handling**, **placement** and **amelioration** of soils to enhance the quality and sustainability of development. It does not cover **agricultural land quality**, **geo-environmental** or **geotechnical** aspects of soils and development.

4.0 SOILS AND PLANNING POLICY IN WALES

European Union directives on **Environmental Impact Assessment (EIA) (Ref. 1)** and **Strategic Environmental Assessment (SEA) (Ref. 2)** establish the requirement for consideration of the impacts on soils where development needs an EIA or SEA.

Planning Policy Wales (Ref. 3) states that one of the Welsh Government's objectives for the conservation and improvement of natural heritage is to: -

'*….promote the functions and benefits of soils, and in particular their function as a carbon store'*.

Technical Advice Note 5 Nature Conservation (Ref. 4) advises that for non EIA development, applicants ***'may find it useful'*** to prepare and submit a soils report: -

'*….demonstrating how and when the soils that may be affected by the development proposals will be moved, stored, used and conserved.'*

An objective of the **Cardiff Local Development Plan (LDP) (Ref.5)** is to: -

'*….protect, manage and enhance Cardiff's natural environmental assets, including....the best soils'.*

The supporting paragraphs for LDP **Key policy 15 (Climate Change)** emphasise the role of soils in storing carbon and sustainable drainage: -

'….Trees and soils act as substantial reservoirs of carbon, sequestering atmospheric carbon, and contributing substantially to soils, which accrete carbon faster under tree cover than other forms of vegetation. This stored carbon will usually be emitted as a greenhouse gas if trees are removed or damaged, or soils removed, covered or disturbed (by compaction or contamination) during the construction process.'

'….As far as practicable, trees should be retained and protected, and land kept as functioning vegetated soil open to the fall of organic matter, with new trees and shrubs provided by developers wherever possible. Where trees and shrubs cannot be surrounded by open soil, hard surfaces should not be used unless there is an overriding need, and areas that are not needed for pedestrian or vehicle use should be retained for soft landscape. Cardiff's open spaces, trees and soils play a crucial role in mitigating the effects of climate change at the local level. Open vegetated soils absorb rainfall and runoff.

The Planning Obligations Supplementary Planning Guidance (SPG) sets out the Council's approach to planning obligations when considering applications for development in Cardiff. It also sets out the mechanisms for securing survey, assessment, mitigation, compensation and enhancement of Green Infrastructure interests, which include soils.

5.0 SOIL ASSESSMENT

Baseline information about soils on development sites should be provided by submitting a: -

- Soil Resource Survey (SRS) *and a*
- Soil Resource Plan (SRP).

The SRS and SRP should be prepared in accordance with the **DEFRA Construction Code of Practice for the Sustainable Use of Soils on Construction Sites (2009) (Ref. 6)**, or any updated version of this Code.

The SRS and SRP should be prepared before site clearance, preparation or development that may result in damage to in-situ soils through compaction, contamination, excavations and vegetation removal.

Planning conditions may be applied requiring submission of an SRS and SRP and examples are given as follows: -

1) No development shall take place until the following has been submitted to and approved in writing by the Local Planning Authority: -

A Soil Resource Survey (SRS) prepared by a qualified soil scientist in accordance with the 2009 DEFRA Construction Code of Practice for the Sustainable Use of Soils on Construction Sites that delineates, characterises and quantifies all re-usable topsoil and subsoil resources on the site.

Reason: To ensure that usable soil resources are fully utilised within the development and any surplus soil is identified for off-site use.

2) No development shall take place until the following has been submitted to and approved in writing by the Local Planning Authority: -

A Soil Resource Plan (SRP) prepared by a qualified soil scientist in accordance with the 2009 DEFRA Construction Code of Practice for the Sustainable Use of Soils on Construction Sites that has been informed by a Soil Resource Survey carried out in discharge of condition (*). The SRP shall set out the methods and equipment to be used for the protection, recovery, storage, re-use and disposal of all site topsoil and subsoil and shall include details of an auditable system of site monitoring by a qualified soil scientist to ensure correct implementation of the SRP.

Reason: To ensure that all usable soil resources are appropriately recovered and protected, and not lost, damaged or sterilised during the construction process.

Descriptions of soils within an SRS should conform to the criteria defined in the: -

- Soil Survey Field Handbook (Ref. 7) *or*
- BS EN ISO 25177:2011 (Ref. 8).

Soil testing as part of an SRS should accord with: -

- BS 3882:2015 - Table 1 (Ref. 9) *and*
- BS 8601:2013 - Table 1 (Ref. 10) *or* any updated versions of these Standards.

The SRS and SRP should be prepared by a **Soil Scientist**. The **British Society of Soil Science** **www.soils.org.uk** provides details of Soil Scientists.

So long as they conform to the Code and are prepared by a Soil Scientist, it is appropriate to include an SRS and SRP as part of a: -

- Geo-environmental assessment *and/or*

- Geotechnical assessment *and/or*
- Agricultural Land Classification Survey (ALCS).

Geo-environmental or geotechnical assessments may show irremediable levels of soil contamination, negating the requirement for an SRS and SRP, but should not replace an SRS and SRP.

An ALCS may provide useful information about soils, but this is focused on functionality in supporting agriculture, not re-use for landscaping as part of development, so an ALCS should not replace an SRS and SRP.

Information provided by **Soils and their Use in Wales (Ref. 11)**; the **Soilscapes** viewer at **http://www.landis.org.uk/soilscapes/** and the **Soils Site Reporter** at **http://www.landis.org.uk/services/sitereporter.cfm** should supplement, not replace assessment in accordance with the Code.

For small sites, or sites where existing garden or other soft landscaping soils are to be retained and protected in situ, and used for new planting, an SRS and SRP is unlikely to be required. However, a basic soil assessment by a Soil Scientist, Environmental Scientist, Arboriculturist, Horticulturist or Landscape Architect, based on the preparation of trial pits, is appropriate. Soil physical characteristics should be recorded, photographed and submitted as evidence of the suitability of the soil for its intended end use, and a strategy for soil handling, storage and placement prepared, that accords with the principles set out in BS 3882:2015, BS 8601:2013 and the DEFRA Code.

The **Soil Survey Field Handbook** and **BS EN ISO 25177:2011** give guidance on examining soils in the field and a photographic field guide to preparing soil pits and assessing the physical characteristics of soils is provided by the **Environment Agency Think Soils Manual (Ref. 12)**.

For small scale developments such as domestic extensions, where little disturbance to existing garden soils is proposed, a soil assessment is not likely to be required.

6.0 SOIL PROTECTION

Development should be designed to protect the largest possible volume of the best **in situ** soils – i.e. ***those that are likely to perform the greatest number of functions to enhance the quality and sustainability of development.***

Where in situ soils are to be retained, soil protection up to the point of completion of built development and implementation of landscaping should comprise a **physical barrier** and/or **ground protection** to prevent **compaction** and **contamination**.

Barriers and ground protection should accord with **BS 5837:2012 (Ref. 13)**, or any updated version of this Standard, and their positions be shown on a plan submitted as part of an SRS.

Soils to be protected may coincide with the **Root Protection Area** of retained trees or areas of proposed structural landscaping. In these cases there should be concordance between the SRS and the **Arboricultural Method Statement** and **Tree Protection Plan**, submitted in accordance with BS 5837:2012.

7.0 SOIL STRIPPING AND STORAGE

Where soil stripping and storage is unavoidable, strict adherence to an approved SRP should prevent irremediable loss of functionality due to compaction, contamination, loss of structure, loss of organic matter and loss of biodiversity.

Key considerations to ensure that soil stripping and storage do not cause an irremediable loss of functionality include: -

- Use of fit for purpose equipment that minimises compaction.
- Stripping to defined depths to avoid mixing topsoil and subsoil.
- Adherence to an approved stripping plan showing soil types to be stripped, haulage routes and phasing.
- Avoiding multiple handling and avoiding handling during or following wet weather.
- Stockpiling for the shortest possible period of time and to a depth and method appropriate to the characteristics of the soil, including its wetness.
- Stockpiling different soil types separately.
- Ensuring the angle of repose for stockpiles is less than 40 degrees, or 25 degrees where stockpiles are to be seeded and maintained.
- Ensuring that stockpiles to be stored for over 6 months are seeded with a grass or clover mix to minimise erosion, reduce weed development and maintain biological activity.

All stages of soil stripping and storage as part of development should be overseen by a Soil Scientist, to ensure compliance with the approved SRP. Auditable site monitoring reports should be prepared by the Soil Scientist and submitted to the Local Planning Authority upon satisfactory completion of each stage.

8.0 SOIL PLACEMENT

Only soils that have been handled in accordance with an approved SRP and/or where appropriate, tested, certified and found to be fit for purpose by a Soil Scientist in accordance with **BS 3882:2015** and **BS 8601:2013**, or updated versions of these Standards, should be emplaced as part of development.

Soil placement should only take place where the receiving substrate is fit for purpose and under the supervision of a Soil Scientist. For example, where large container or root-balled tree planting is proposed, topsoil should not be emplaced onto compacted, poorly drained sub-soil, or soil compacted to **bulk densities** that will impede root growth. To ensure root growth is not impeded, bulk densities should be provided that accord with those reported in Watson *et al.* **(Ref. 15)** as follows: -

- Sands & loamy sands: <1.60g cm^{-3} ideal. >1.80g cm^{-3} will restrict root growth.
- Sandy loams & loams: <1.40g cm^{-3} ideal. >1.80g cm^{-3} will restrict root growth.
- Sandy clay loams & clay loams: <1.40g cm^{-3} ideal. >1.75g cm^{-3} will restrict root growth.
- Silts & silt loams: <1.30g cm^{-3} ideal. >1.75g cm^{-3} will restrict root growth.
- Silt loams & silty clay loams: <1.10g cm^{-3} ideal. >1.65g cm^{-3} will restrict root growth.
- Sandy clays, silty clays, some clay loams (35-45% clay): <1.10g cm^{-3} ideal. >1.58g cm^{-3} will restrict root growth.
- Clays (>45% clay): <1.10g cm^{-3} ideal. >1.47g cm^{-3} will restrict root growth.

The method of placement should be described in the SRS, but the most appropriate method generally is **loose tipping** by machine as described in the **DEFRA Code**, during weather conditions that will not result in the soil becoming sticky, amorphous or **self-compacting**.

Some soils, such as well-structured sandy loams, are more 'tolerant' of handling than soils with high clay or silt content, and lose less of their functionality on placement. One of the important functions of an SRS therefore, is to identify soils with different 'tolerances' in relation to handling and placement.

As a rule of thumb, topsoil and subsoil depths for different planting types should be as follows: -

- Trees – 300mm topsoil over 600mm subsoil.
- Shrubs – 300mm topsoil over 300mm subsoil.
- Amenity grassland – 150mm topsoil over 150mm subsoil.

Over-specification of topsoil and **under-specification of subsoil** should be avoided. Topsoil functionality below 300mm is impeded and excessive depths can increase the risks of anaerobic soil conditions developing and resulting in planting failures.

9.0 SOIL AMELIORATION

Where soils are found to be degraded, every effort should be made to recycle constituents that can be used in the manufacture of soils to be re-used on site. Where soil manufacturing is proposed, full details of the process and end product specification should be provided by a Soil Scientist within an SRP.

Soil ameliorants such as **compost** and **fertiliser** should only be proposed if deficiencies of composition or structure are shown by the SRS or testing in accordance with BS 3882:2015 and BS 8601:2013, or updated versions of these Standards.

The type and extent of soil amelioration should be specified by a Soil Scientist within an SRP.

The use of machinery to break up subsoil and relieve compaction does not guarantee good aeration and drainage thereafter and may result in significant damage to soil biota.

Ripping and other forms of machine cultivation should only be used as a last resort, where other less invasive forms of amelioration are not available, or will not be effective. Ripping may not be effective for soils with high silt content, or soils with high clay content but that are poorly structured. In all cases, the method and equipment to be used should be specified by a Soil Scientist.

Where more sensitive planting types such as large trees are proposed, the importation of well-aerated, freely draining subsoil may be more appropriate than machine cultivation in ensuring good soil functionality.

The following documents provide useful guidance on soil amelioration in relation to landscaping: -

- DEFRA Construction Code of Practice for the Sustainable Use of Soils on Construction Sites.

- The Impact of Subsoil Compaction on Soil Functionality and Landscape (Ref. 16).

- Forest Research Best Practice Guidance for Land Regeneration Notes 3, 4, 5 and 19 (2014) (Refs. 17, 18, 19, 20).

- BS 4428:1989 Code of practice for general landscape operations (excluding hard surfaces) (Ref. 21).

- BS 7370: Part 4: 1993 Grounds Maintenance Part 4: Recommendations for maintenance of soft landscape (other than amenity turf) (Ref. 22).

- BS 3998:2010 Tree work – Recommendations (Ref. 23).

- BS 8601:2013 Specification for subsoil and requirements for use.

- BS 8545:2014 Trees: from nursery to independence in the landscape – Recommendations.

- BS 3882:2015 Specification for topsoil.

10.0 IMPORTED SOILS

Where existing soils or manufactured soils using local resources cannot be used and importation of topsoil and subsoil is proposed, a **soiling plan and specification** should be submitted giving details of proposed topsoil and sub-soil types, profiles and extents. This information should be supported by certification for all proposed soils in accordance with **BS 3882:2015** and **BS 8601:2013**, or updated versions of these Standards, and by an **interpretive report** prepared by a **Soil Scientist**, demonstrating that the proposed soils will be fit for purpose.

Different planting types such as root-balled and container tree planting, bare-root, transplant and whip planting, amenity grassland, sports pitches and wildflower grassland, have differing requirements of the soil. A **'one size fits all'** or **'multi-purpose BS 3882 soil'** soil is therefore unlikely to be appropriate in many cases, and particularly not for sensitive functions such as large tree planting, where optimal conditions of aeration and drainage to depth are critical to successful establishment; or sports pitches where regular, intensive footfall may result in damage to soil functionality.

Where large tree planting is proposed, soils meeting the **'sandy loam'** textural range in the British Standards should be used as a default, but meeting British Standards alone, will not guarantee good functionality in this regard, particularly for soils that are at the top end of the textural range limits in terms of silt and clay content. Wherever possible, specifications that exceed British Standards and are designed specifically for their intended end use should be used.

The use of specialist soils for landscaping, such as **Amsterdam tree sands**, **structural soils** and **'hybrid'** topsoil-subsoils should be supported by site specific product manufacturer's specifications that demonstrate fitness for purpose.

All imported soils should also be assessed in terms of potential contaminants, not only in terms of plant health, but also human health. As such, conditions are likely to

be attached to planning permissions requiring that any imported topsoil or subsoil, natural or manufactured, must be assessed for chemical or other potential contaminants in accordance with a scheme of investigation submitted to and approved in writing by the Local Planning Authority, in advance of its importation.

11.0 REFERENCES

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