

Drew Wetherell Bourne Amenity Ltd The Wharf Newenden Cranbrook Kent TN18 5QG

> 13th April 2023 Our Ref: TOHA/23/7891/3/SS

> > Your Ref: PO 114361

Dear Sirs

Topsoil Analysis Report: SO TS6 Topsoil

We have completed the analysis of the soil sample recently received, referenced SO TS6 Topsoil, and have pleasure reporting our findings.

The purpose of the analysis was to determine the suitability of the sample for general landscape purposes (trees, shrubs, amenity grass). In addition, this sample has been assessed to determine its compliance with the requirements of the British Standard for Topsoil (BS3882:2015 – Specification for Topsoil – Table 1, Multipurpose Topsoil).

This report presents the results of analysis for the sample received, and it should be considered 'indicative' of the topsoil source. The report and results should therefore not be used by third parties as a means of verification or validation testing, waste designation purposes or for any project-specific application, especially after the topsoil has left the Bourne Amenity site.

SAMPLE EXAMINATION

The sample was described as a very dark brown (Munsell Colour 10YR 3/3), slightly moist, friable, slightly calcareous LOAMY SAND with weakly developed, very fine to medium granular structure*. The sample was very slightly stony, comprising stones up to 8mm in size, and contained a moderate proportion of organic fines and occasional woody fragments. No unusual odours, deleterious materials, roots or rhizomes of pernicious weeds were observed.

*This appraisal of soil structure was made from examination of a disturbed sample(s). Structure is a key soil characteristic that may only be accurately assessed by examination in an in-situ state.



Plate 1 – SO TS6 Topsoil Sample

ANALYTICAL SCHEDULE

The sample was submitted to a UKAS and MCERTS accredited laboratory for a range of physical and chemical tests to confirm the composition and fertility of the soil, and the concentration of selected potential contaminants. The following parameters were determined:

- detailed particle size analysis (5 sands, silt, clay);
- stone content (2-20mm, 20-50mm, >50mm);
- pH and electrical conductivity values;
- calcium carbonate;
- exchangeable sodium percentage;
- major plant nutrients (N, P, K, Mg);
- organic matter content;
- C:N ratio;
- visible contaminants (>2mm);
- heavy metals (Sb, As, B, Ba, Be, Cd, Cr, Cu, Pb, Hg, Ni, Se, V, Zn);
- total cyanide and total (mono) phenols;
- elemental sulphur, acid volatile sulphur and water soluble sulphate;
- speciated PAHs (US EPA16 suite);
- aromatic and aliphatic TPH (C5-C35 banding);
- benzene, toluene, ethylbenzene, xylene (BTEX);
- asbestos screen.

The results are presented on the attached Certificate of Analysis and an interpretation of the results is given below.

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RESULTS OF ANALYSIS

Detailed Particle Size Analysis and Stone Content

The sample fell into the *loamy sand* texture class, which is usually considered suitable for general landscape applications provided the soil's physical condition is satisfactory.

Further detailed particle size analysis found the sample to have a reasonably narrow particle size distribution with a predominance of *medium sand* (0.25-0.50mm). This is usually ideal for topsoil in general landscape applications as reasonable porosity levels are generally maintained in a consolidated state and the risk of particle interpacking is reduced. The sample should therefore provide adequate drainage and aeration properties for general landscape applications.

The stone content of the sample was very low and as such, stones should not restrict the use of the soil for general landscape purposes.

pH and Electrical Conductivity Values

The sample was strongly alkaline in reaction (pH 8.1). This pH value would be considered suitable for general landscape purposes provided species with a wide pH tolerance or those known to prefer alkaline soils are selected for planting, turfing and seeding.

The electrical conductivity (salinity) value (water extract) was moderate, which indicates that soluble salts should not be present at levels that would be harmful to plants.

The electrical conductivity value by CaSO₄ extract (*BS3882* requirement) fell below the maximum specified value (3300 µS/cm) given in *BS3882:2015 – Table 1*.

Organic Matter and Fertility Status

The sample was adequately supplied with organic matter and all major plant nutrients.

The C:N ratio of the sample was acceptable for general landscape purposes.

Potential Contaminants

With reference to BS3882:2015 - Table 1: Notes 3 and 4, there is a requirement to confirm levels of potential contaminants in relation to the topsoil's proposed end use. This includes human health, environmental protection and metals considered toxic to plants. In the absence of site-specific assessment criteria, the concentrations that affect human health have been compared with the residential with homegrown produce land use in the Suitable For Use Levels (S4ULs) presented in The LQM/CIEH S4ULs for Human Health Risk Assessment (2015) and the DEFRA SP1010: Development of Category 4 Screening Levels (C4SLs) for Assessment of Land Affected by Contamination – Policy Companion Document (2014).

Of the potential contaminants determined, none was found at levels that exceeded their guideline values.

Phytotoxic Contaminants

Of the phytotoxic (toxic to plants) contaminants determined (copper, nickel, zinc), none was found at levels that exceeded the maximum permissible levels specified in BS3882:2015 – Table 1.

CONCLUSION

The purpose of the analysis was to determine the suitability of the topsoil sample for general landscape purposes. The analysis has also been undertaken to determine the sample's compliance with the requirements of the British Standard for Topsoil (BS3882:2015 – Specification for Topsoil – Table 1, Multipurpose Topsoil).

From the soil examination and subsequent laboratory analysis, the sample was described as a strongly alkaline, non-saline, slightly calcareous loamy sand with a weakly developed structure and very low stone content. The sample contained sufficient reserves of organic matter and plant nutrients. Of the potential contaminants determined, none exceeded their respective guideline values.

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To conclude, based on our findings, the topsoil represented by this sample would be considered suitable for general landscape purposes (trees, shrubs and amenity grass), provided species with a wide pH tolerance or those known to prefer alkaline soils are selected for planting, turfing and seeding the physical condition of the soil is satisfactory.

The topsoil was also fully compliant with the requirements of the British Standard for Topsoil (BS3882:2015 – Specification for Topsoil – Table 1, Multipurpose Topsoil).

Soil Handling Recommendations

It is important to maintain the physical condition of the soil and avoid structural damage during all phases of soil handling (e.g. stockpiling, respreading, cultivating, planting, seeding or turfing). As a consequence, soil handling operations should be carried out when soil is sufficiently dry to be non-plastic (friable) in consistency.

It is important to ensure that the soil is not unnecessarily compacted by trampling or trafficking by site machinery, and soil handling should be stopped during and after heavy rainfall and not continued until the soil is friable in consistency. If the soil is structurally damaged and compacted at any stage during the course of soiling or landscaping works, it should be cultivated appropriately to relieve the compaction and to restore the soil's structure prior to any planting, turfing or seeding.

Further details on soil handling are provided in Annex A of BS3882:2015.

We hope this report meets with your approval and provides the necessary information. Please do not hesitate to contact the undersigned if we can be of further assistance.

Yours faithfully

Harriet MacRae

BSc MSc

Graduate Soil Scientist

Matthew Heins

BSc (Hons) MISoilSci Senior Soil Scientist

For & on behalf of Tim O'Hare Associates LLP

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Client:	Bourne Amenity Ltd
Project:	SO TS6 Topsoil
Job:	Topsoil Analysis (BS3882:2015)
Date:	13/04/2023
Job Ref No:	TOHA/23/7891/3/SS



Sample Reference	SO TS6 Topsoil			
Clay (<0.002mm)	%	Accreditation UKAS	10	
Silt (0.002-0.05mm)	%	UKAS	7	
Very Fine Sand (0.05-0.15mm)	%	UKAS	10	
Fine Sand (0.15-0.25mm)	%	UKAS	18	
Medium Sand (0.25-0.50mm)	%	UKAS	43	
Coarse Sand (0.50-1.0mm)	%	UKAS	10	
Very Coarse Sand (1.0-2.0mm)	%	UKAS	2	
Total Sand (0.5 - 2.0mm) Texture Class (UK Classification)	%	UKAS UKAS	83 LS	
Stones (2-20mm)	% DW	GLP	1	
Stones (20-50mm)	% DW	GLP	0	
Stones (>50mm)	% DW	GLP	0	
Visible Conteminents: Pleatics - 2 00mm	%	UKAS	0	
Visible Contaminants: Plastics >2.00mm Visible Contaminants: Sharps >2.00mm	%	UKAS	0	
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pH Value (1:2.5 water extract)	units	UKAS	8.1	
Calcium Carbonate	%	UKAS	1.2	
Electrical Conductivity (1:2.5 water extract) Electrical Conductivity (1:2 CaSO ₄ extract)	uS/cm uS/cm	UKAS UKAS	1137 3018	
Exchangeable Sodium Percentage	%	UKAS	6.0	
Organic Matter (LOI)	%	UKAS	8.1	
Total Nitrogen (Dumas)	%	UKAS	0.36	
C : N Ratio	ratio	UKAS	13	
Extractable Phosphorus	mg/l	UKAS	56	
Extractable Potassium	mg/l	UKAS	1048	
Extractable Magnesium	mg/l	UKAS	119	
Total Antimony (Sb)	mg/kg	MCERTS	2	
Total Arsenic (As)	mg/kg	MCERTS	13	
Total Barium (Ba)	mg/kg	MCERTS	32	
Total Beryllium (Be)	mg/kg	MCERTS	0.43	
Total Cadmium (Cd)	mg/kg	MCERTS	< 0.2 17	
Total Chromium (Cr) Hexavalent Chromium (Cr VI)	mg/kg ma/ka	MCERTS MCERTS	< 1.8	
Total Copper (Cu)	mg/kg	MCERTS	14	
Total Lead (Pb)	mg/kg	MCERTS	18	
Total Mercury (Hg)	mg/kg	MCERTS	< 0.3	
Total Nickel (Ni)	mg/kg	MCERTS	13	
Total Selenium (Se)	mg/kg	MCERTS	< 1.0	
Total Vanadium (V)	mg/kg	MCERTS	34	
Total Zinc (Zn)	mg/kg	MCERTS	40	
Water Soluble Boron (B)	mg/kg	MCERTS	0.7	
Total Cyanide (CN)	mg/kg	MCERTS MCERTS	< 1.0 < 1.0	
Total (mono) Phenols Elemental Sulphur	mg/kg mg/kg	MCERTS	13	
Water Soluble Sulphate (SO ₄)	g/l	MCERTS	7	
Naphthalene	mg/kg	MCERTS	< 0.05	
Acenaphthylene	mg/kg	MCERTS	< 0.05	
Acenaphthene Fluorene	mg/kg mg/kg	MCERTS MCERTS	< 0.05 < 0.05	
Phenanthrene	mg/kg	MCERTS	< 0.05	
Anthracene	mg/kg	MCERTS	< 0.05	
Fluoranthene	mg/kg	MCERTS	< 0.05	
Pyrene	mg/kg	MCERTS	< 0.05	
Benzo(a)anthracene	mg/kg	MCERTS	< 0.05	
Chrysene Benzo(b)fluoranthene	mg/kg mg/kg	MCERTS MCERTS	< 0.05 < 0.05	
Benzo(k)fluoranthene	mg/kg	MCERTS	< 0.05	
Benzo(a)pyrene	mg/kg	MCERTS	< 0.05	
Indeno(1,2,3-cd)pyrene	mg/kg	MCERTS	< 0.05	
Dibenzo(a,h)anthracene	mg/kg	MCERTS	< 0.05	
Benzo(g,h,i)perylene	mg/kg	MCERTS MCERTS	< 0.05 < 0.80	
Total PAHs (sum USEPA16)	mg/kg	WICEKTS	₹ 0.60	
Aliphatic TPH >C5 - C6	mg/kg	MCERTS	< 0.001	
Aliphatic TPH >C6 - C8	mg/kg	MCERTS	< 0.001	
Aliphatic TPH >C8 - C10	mg/kg	MCERTS	< 0.001	
Aliphatic TPH > C10 - C12	mg/kg	MCERTS	< 1.0	
Aliphatic TPH >C12 - C16 Aliphatic TPH >C16 - C21	mg/kg	MCERTS MCERTS	< 2.0 < 8.0	
Aliphatic TPH >C16 - C21 Aliphatic TPH >C21 - C35	mg/kg mg/kg	MCERTS	< 8.0	
Aliphatic TPH (C5 - C35)	mg/kg	MCERTS	< 10	
Aromatic TPH >C5 - C7	mg/kg	MCERTS	< 0.001	
Aromatic TPH >C7 - C8	mg/kg	MCERTS	< 0.001	
Aromatic TPH >C8 - C10	mg/kg	MCERTS	< 0.001	
Aromatic TPH >C10 - C12	mg/kg	MCERTS	< 1.0	
Aromatic TPH > C12 - C16	mg/kg	MCERTS	< 2.0	
Aromatic TPH >C16 - C21 Aromatic TPH >C21 - C35	mg/kg mg/kg	MCERTS MCERTS	< 10 < 10	
Aromatic TPH (C5 - C35)	mg/kg	MCERTS	< 10	
	33			
Benzene	mg/kg	MCERTS	< 0.005	
Toluene	mg/kg	MCERTS	< 0.005	
Ethylbenzene	mg/kg	MCERTS MCERTS	< 0.005 < 0.005	
p & m-xylene o-xylene	mg/kg mg/kg	MCERTS MCERTS	< 0.005	
MTBE (Methyl Tertiary Butyl Ether)	mg/kg	MCERTS	< 0.005	
Asbestos Screen	ND/D	ISO 17025	Not-detected	

LS = LOAMY SAND

Visual Examination

The sample was described as a very dark brown (Munsell Colour 10YR 3/3), slightly moist, friable, slightly calcareous LOAMY SAND with a weakly developed, very fine to medium granular structure. The sample was very slightly stony, comprising stones up to 8mm in size, and contained a moderate proportion of organic fines and occasional woody fragments. No unusual odours, deleterious materials, roots or rhizomes of pernicious weeds were observed.

Results of analysis should be read in conjunction with the report they were issued with

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H.MacRae

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