TIM O'HARE ASSOCIATES
SOIL & LANDSCAPE CONSULTANCY

Mr Drew Wetherell
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1st June 2022
Our Ref: TOHA/22/7512/1/SS
Your Ref: PO 103539

Dear Sirs

Topsoil Analysis Report: Low Fertility

We have completed the analysis of the sample recently submitted, referenced *Low Fertility TS5 Topsoil,* and have pleasure reporting our findings.

The purpose of the analysis was to determine the suitability of the sample for use as a Low Fertility Topsoil. 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, Specific Purpose Low Fertility).*

This report presents the results of analysis for the sample submitted to our office, 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 or waste designation purposes, especially after the material has left the Bourne Amenity Ltd site.

SAMPLE EXAMINATION

The sample was described as a strong brown (Munsell Colour 7.5YR 4/6), slightly moist, friable, non-calcareous LOAMY SAND with a single grain structure*. The sample was virtually stone-free and contained a low proportion of organic fines. 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. Structure is a key soil characteristic that may only be accurately assessed by examination in an in-situ state.

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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.

RESULTS OF ANALYSIS

Particle Size Analysis and Stone Content

The sample fell into the *loamy sand* texture class. Further detailed particle size analysis found the sample to have a sufficiently narrow particle size distribution and a predominance of *medium sand* (0.25-0.50mm) followed by *coarse sand* (0.50-1.0mm).

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

pH and Electrical Conductivity Values

The sample was alkaline in reaction (pH 8.1). This pH value would be considered suitable for landscape purposes providing species with a wide pH tolerance or those known to prefer alkaline soils are selected.

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

The electrical conductivity value by $CaSO_4$ 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 contained adequate reserves of organic matter and major plant nutrients in relation to the requirements of *BS3882:2015 – Table 1: Specific Purpose Low Fertility*.

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

Potential Contaminants

With reference to *BS3882:2015 - Table 1*: Notes 3 and 4, there is a recommendation 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 sample for use as a Low Fertility Topsoil. 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, Specific Purpose Low Fertility).*

From the soil examination and subsequent laboratory analysis, the sample was described as an alkaline, non-saline, non-calcareous, loamy sand, with a single grain structure and low stone content. The sample contained adequate reserves of organic matter and major plant nutrients for the intended purpose. Of the potential contaminants determined, none exceeded their respective guideline values.

Based on our findings, the topsoil represented by this sample would be considered suitable for use as low fertility topsoil, provided its physical condition is maintained and species tolerant of alkaline soils are selected.

The sample was compliant with the requirements of the requirements of *BS3882:2015 – Specification for Topsoil – Table 1, Specific Purpose Low Fertility*.

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 reasonably dry and 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

C. Spears.

Ceri Spears
BSc MSc MISoilSci
Senior Associate

For & on behalf of Tim O'Hare Associates LLP

Client:	**Bourne Amenity Limited**
Project:	**Low Fertility Topsoil**
Job:	**Topsoil Analysis - BS3882:2015**
Date:	**01/06/2022**
Job Ref No:	**TOHA/22/7512/1/SS**

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Sample Reference			**Low Fertility TS5 Topsoil**
		Accreditation	
Clay (<0.002mm)	%	UKAS	10
Silt (0.002-0.05mm)	%	UKAS	1
Very Fine Sand (0.05-0.15mm)	%	UKAS	6
Fine Sand (0.15-0.25mm)	%	UKAS	13
Medium Sand (0.25-0.50mm)	%	UKAS	42
Coarse Sand (0.50-1.0mm)	%	UKAS	20
Very Coarse Sand (1.0-2.0mm)	%	UKAS	8
Total Sand (0.05-2.0mm)	%	UKAS	89
Texture Class (UK Classification)	--	UKAS	LS
Stones (2-20mm)	% DW	GLP	3
Stones (20-50mm)	% DW	GLP	0
Stones (>50mm)	% DW	GLP	0
Visible Contaminants: Plastics >2.00mm	%	UKAS	0
Visible Contaminants: Sharps >2.00mm	%	UKAS	0
pH Value (1:2.5 water extract)	units	UKAS	8.1
Calcium Carbonate	%	UKAS	1.0
Electrical Conductivity (1:2.5 water extract)	uS/cm	UKAS	362
Electrical Conductivity (1:2 $CaSO_4$ extract)	uS/cm	UKAS	2214
Exchangeable Sodium Percentage	%	UKAS	1.4
Organic Matter (LOI)	%	UKAS	3.3
Total Nitrogen (Dumas)	%	UKAS	0.14
C : N Ratio	ratio	UKAS	13
Extractable Phosphorus	mg/l	UKAS	18
Extractable Potassium	mg/l	UKAS	168
Extractable Magnesium	mg/l	UKAS	32
Total Antimony (Sb)	mg/kg	MCERTS	<1.0
Total Arsenic (As)	mg/kg	MCERTS	10
Total Barium (Ba)	mg/kg	MCERTS	13
Total Beryllium (Be)	mg/kg	MCERTS	0.37
Total Cadmium (Cd)	mg/kg	MCERTS	< 0.2
Total Chromium (Cr)	mg/kg	MCERTS	15
Hexavalent Chromium (Cr VI)	mg/kg	MCERTS	< 1.8
Total Copper (Cu)	mg/kg	MCERTS	10
Total Lead (Pb)	mg/kg	MCERTS	5
Total Mercury (Hg)	mg/kg	MCERTS	< 0.3
Total Nickel (Ni)	mg/kg	MCERTS	12
Total Selenium (Se)	mg/kg	MCERTS	< 1.0
Total Vanadium (V)	mg/kg	MCERTS	36
Total Zinc (Zn)	mg/kg	MCERTS	20
Water Soluble Boron (B)	mg/kg	MCERTS	0.8
Total Cyanide (CN)	mg/kg	MCERTS	< 1.0
Total (mono) Phenols	mg/kg	MCERTS	< 1.0
Elemental Sulphur	mg/kg	MCERTS	< 5.0
Acid Volatile Sulphide	mg/kg	MCERTS	8.4
Water Soluble Sulphate (SO_4)	g/l	MCERTS	
Naphthalene	mg/kg	MCERTS	< 0.05
Acenaphthylene	mg/kg	MCERTS	< 0.05
Acenaphthene	mg/kg	MCERTS	< 0.05
Fluorene	mg/kg	MCERTS	< 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	mg/kg	MCERTS	< 0.05
Benzo(b)fluoranthene	mg/kg	MCERTS	< 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	< 0.05
Total PAHs (sum USEPA16)	mg/kg	MCERTS	< 0.80
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	mg/kg	MCERTS	< 2.0
Aliphatic TPH >C16 - C21	mg/kg	MCERTS	< 8.0
Aliphatic TPH >C21 - C35	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	mg/kg	MCERTS	< 10
Aromatic TPH >C21 - C35	mg/kg	MCERTS	< 10
Aromatic TPH (C5 - C35)	mg/kg	MCERTS	< 10
Benzene	mg/kg	MCERTS	< 0.001
Toluene	mg/kg	MCERTS	< 0.001
Ethylbenzene	mg/kg	MCERTS	< 0.001
o-xylene	mg/kg	MCERTS	< 0.001
p & m-xylene	mg/kg	MCERTS	< 0.001
MTBE (Methyl Tertiary Butyl Ether)	mg/kg	MCERTS	< 0.001
Asbestos	ND/D	ISO 17025	Not-Detected

LS = LOAMY SAND

Visual Examination

The sample was described as a strong brown (Munsell Colour 7.5YR 4/6), slightly moist, friable, non-calcareous LOAMY SAND with a single grain structure. The sample was virtually stone-free and contained a low proportion of organic fines. No unusual odours, deleterious materials, roots or rhizomes of pernicious weeds were observed.

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