



TIM O'HARE ASSOCIATES  
SOIL & LANDSCAPE CONSULTANCY

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

25<sup>th</sup> July 2023  
Our Ref: TOHA/23/1018/5/SS  
Your Ref: PO 120618

Dear Sirs

**Soil Analysis Report: Lightweight Topsoil**

We have completed the analysis of the soil sample recently submitted, referenced *Lightweight Topsoil*, and have pleasure reporting our findings.

The purpose of the analysis was to determine the suitability of the material for use as an intensive lightweight substrate in a rooftop or podium garden environment.

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, waste designation purposes or for any project-specific application, especially after the soil has left the Bourne Amenity Ltd site.

**SAMPLE EXAMINATION**

The sample was described as a very dark brown (Munsell Colour 10YR 2/2), slightly moist, friable, very slightly calcareous, LOAMY SAND with a single grain structure. The sample was very slightly stony, with the exception of frequent lightweight expanded clay aggregate particles (leca). The sample contained a moderate proportion of organic fines and occasional woody fragments. No deleterious materials, unusual odours, roots or rhizomes of pernicious weeds were observed.

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Tim O'Hare Associates LLP  
Howbery Park Wallingford Oxfordshire OX10 8BA  
T:01491 822653 E:info@toha.co.uk  
www.toha.co.uk



*Plate 1: Lightweight 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);
- bulk density (oven dry, field capacity, saturated);
- saturated hydraulic conductivity;
- visible contaminants (>2mm);
- pH and electrical conductivity values;
- calcium carbonate;
- exchangeable sodium percentage;
- major plant nutrients (N, P, K, Mg);
- organic matter content;
- C:N ratio;
- heavy metals (Sb, As, B, Ba, Be, Cd, Cr, Cr VI, Cu, Pb, Hg, Ni, Se, V, Zn);
- soluble sulphate, elemental sulphur, acid volatile sulphide;
- total cyanide and total (mono) phenols;
- aromatic and aliphatic TPH (C5-C35 banding);
- speciated PAHs (US EPA16 suite);
- 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

### 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 predominance of *medium sand* (0.25-0.50mm) and smaller proportions of *coarse sand* (0.50-1.0mm). This is usually suitable for topsoil in rooftop or podium garden 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 these applications.

With the exception of 'leca' particles, the sample contained a very low proportion of 'stone' sized material (>2mm).

### Bulk Density and Saturated Hydraulic Conductivity

The sample displayed a bulk density at Field Capacity of 1.47 Mg/m<sup>3</sup>, which is reasonably low compared to that of standard topsoil. The suitability of the bulk density result should be confirmed by the project engineer for the recipient site.

The saturated hydraulic conductivity of the sample (18 mm/hour) indicates that the substrate is sufficiently permeable and should demonstrate adequate drainage performance for use in rooftop or podium garden environments. Soils used in these environments need to have satisfactory drainage performance to avoid stagnation (and therefore excess weight) and to enable efficient conveyance of water into the drainage system.

The suitability of the bulk density and the drainage properties should be confirmed by the project engineer.

### pH and Electrical Conductivity Values

The sample was strongly alkaline in reaction (pH 8.2). This pH value would be considered suitable for general landscape purposes providing 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 moderately high. Although the growth of many plant species (including amenity turf) are unlikely to be affected by this level of salinity, it is possible that salt sensitive species, including emergent seedlings, could show reduced growth potential.

The electrical conductivity value by CaSO<sub>4</sub> extract (3408 µS/cm) exceeded our maximum recommended value (3300 µS/cm).

### Organic Matter and Fertility Status

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

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

### Potential Contaminants

In the absence of site-specific criteria, the concentrations that affect human health have been assessed for *residential with homegrown produce* end-use against 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 for Assessment of Land Affected by Contamination – Policy Companion Document (2014).

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

### Phytotoxic Contaminants

Of the phytotoxic (toxic to plants) contaminants determined (copper, nickel, zinc), none was found at levels that exceeded their guideline values.

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## CONCLUSION

The purpose of the analysis was to determine the suitability of the material for use as an intensive lightweight substrate in a roof garden or podium landscape environment.

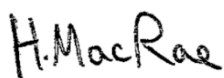
From the sample examination and laboratory analysis, the substrate was described as a strongly alkaline, saline, slightly calcareous loamy sand with a single grain structure. The sample was virtually stone-free with the exception of 'leca' particles. Moderate to high reserves of organic matter and major plant nutrients were recorded. Of the potential contaminants determined, none exceeded their respective guideline values.

The topsoil blend represented by this sample is a little rich, indicated by the elevated electrical conductivity result and borderline potassium content. The proportion of soluble salts should reduce in time once the material is wetted by rain or irrigation water. However, it is recommended that the quantity and quality of the compost component used in the blend is reviewed in this instance.

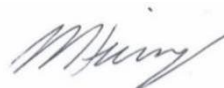
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We hope this report meets with your approval and provides the necessary information. Please do not hesitate to contact the undersigned if we can be of further assistance.

Yours faithfully



**Harriet MacRae**  
BSc MSc  
Graduate Soil Scientist



**Matthew Heins**  
BSc (Hons) MSc  
Senior Soil Scientist

For & on behalf of Tim O'Hare Associates LLP



Client:	Bourne Amenity Limited
Project:	Lightweight Topsoil
Job:	Physical and Horticultural Properties
Date:	25/07/2023
Job Ref No:	TOHA/23/1018/5/SS

Sample Reference		Accreditation
Clay (<0.002mm)	%	UKAS
Silt (0.002-0.063mm)	%	UKAS
Very Fine Sand (0.05-0.15mm)	%	UKAS
Fine Sand (0.15-0.25mm)	%	UKAS
Medium Sand (0.25-0.50mm)	%	UKAS
Coarse Sand (0.50-1.0mm)	%	UKAS
Very Coarse Sand (1.0-2.0mm)	%	UKAS
Total Sand (0.05-2.0mm)		UKAS
Texture Class (UK Classification)	--	UKAS
Stones (2-20mm)	% DW	UKAS
Stones (20-50mm)	% DW	UKAS
Stones (>50mm)	% DW	UKAS

Saturated Hydraulic Conductivity	mm/hr	A2LA
Bulk Density (when Oven Dried)	Mg/m <sup>3</sup>	UKAS
Bulk Density (at Field Capacity)	Mg/m <sup>3</sup>	UKAS
Bulk Density (at Saturation)	Mg/m <sup>3</sup>	UKAS

pH Value (1:2.5 water extract)	units	UKAS
Calcium Carbonate	%	UKAS
Electrical Conductivity (1:2.5 water extract)	uS/cm	UKAS
Electrical Conductivity (1:2 CaSO <sub>4</sub> extract)	uS/cm	UKAS
Exchangeable Sodium Percentage	%	UKAS
Organic Matter (LOI)	%	UKAS
Total Nitrogen (Dumas)	%	UKAS
C : N Ratio	ratio	UKAS
Extractable Phosphorus	mg/l	UKAS
Extractable Potassium	mg/l	UKAS
Extractable Magnesium	mg/l	UKAS

Visible Contaminants: Plastics >2.00mm	%	UKAS
Visible Contaminants: Sharps >2.00mm	%	UKAS

SL =SANDY LOAM

#### Visual Examination

The sample was described as a very dark brown (Munsell Colour 10YR 2/2), slightly moist, friable, very slightly calcareous, LOAMY SAND with a single grain structure. The sample was very slightly stony, with the exception of frequent lightweight expanded clay aggregate particles (leca). The sample contained a moderate proportion of organic fines and occasional woody fragments. No deleterious materials, unusual odours, 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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#### Lightweight Topsoil

10
2
2
8
40
29
9
88
LS
1
0
0

18
1.15
1.47
1.46

8.2
2
1698
3408
12.3
9.4
0.41
13
101
1436
153

0
0

H. MacRae

Harriet MacRae  
BSc MSc  
Graduate Soil Scientist



Client:	Bourne Amenity Limited
Project:	Lightweight Topsoil
Job:	Chemical Properties
Date:	25/07/2023
Job Ref No:	TOHA/23/1018/5/SS

Sample Reference		Accreditation
Total Antimony (Sb)	mg/kg	MCERTS
Total Arsenic (As)	mg/kg	MCERTS
Total Barium (Ba)	mg/kg	MCERTS
Total Beryllium (Be)	mg/kg	MCERTS
Total Cadmium (Cd)	mg/kg	MCERTS
Total Chromium (Cr)	mg/kg	MCERTS
Hexavalent Chromium (Cr VI)	mg/kg	MCERTS
Total Copper (Cu)	mg/kg	MCERTS
Total Lead (Pb)	mg/kg	MCERTS
Total Mercury (Hg)	mg/kg	MCERTS
Total Nickel (Ni)	mg/kg	MCERTS
Total Selenium (Se)	mg/kg	MCERTS
Total Vanadium (V)	mg/kg	MCERTS
Total Zinc (Zn)	mg/kg	MCERTS
Water Soluble Boron (B)	mg/kg	MCERTS
Total Cyanide (CN)	mg/kg	MCERTS
Total (mono) Phenols	mg/kg	MCERTS
Elemental Sulphur (S)	mg/kg	MCERTS

Lightweight Topsoil
< 1.0
18
35
0.39
< 0.2
17
< 1.8
22
23
< 0.3
19
< 1.0
30
96
2.5
< 1.0
< 1.0
240

Naphthalene	mg/kg	MCERTS
Acenaphthylene	mg/kg	MCERTS
Acenaphthene	mg/kg	MCERTS
Fluorene	mg/kg	MCERTS
Phenanthrene	mg/kg	MCERTS
Anthracene	mg/kg	MCERTS
Fluoranthene	mg/kg	MCERTS
Pyrene	mg/kg	MCERTS
Benzo(a)anthracene	mg/kg	MCERTS
Chrysene	mg/kg	MCERTS
Benzo(b)fluoranthene	mg/kg	MCERTS
Benzo(k)fluoranthene	mg/kg	MCERTS
Benzo(a)pyrene	mg/kg	MCERTS
Indeno(1,2,3-cd)pyrene	mg/kg	MCERTS
Dibenzo(a,h)anthracene	mg/kg	MCERTS
Benzo(g,h,i)perylene	mg/kg	MCERTS
Total PAHs (sum USEPA16)	mg/kg	MCERTS

< 0.05
< 0.05
< 0.05
< 0.05
0.11
< 0.05
0.76
0.57
0.17
0.2
0.17
0.08
0.11
0.06
< 0.05
0.09
2.3

Aliphatic TPH >C5 - C6	mg/kg	MCERTS
Aliphatic TPH >C6 - C8	mg/kg	MCERTS
Aliphatic TPH >C8 - C10	mg/kg	MCERTS
Aliphatic TPH >C10 - C12	mg/kg	MCERTS
Aliphatic TPH >C12 - C16	mg/kg	MCERTS
Aliphatic TPH >C16 - C21	mg/kg	MCERTS
Aliphatic TPH >C21 - C35	mg/kg	MCERTS
Aliphatic TPH (C5 - C35)	mg/kg	MCERTS
Aromatic TPH >C5 - C7	mg/kg	MCERTS
Aromatic TPH >C7 - C8	mg/kg	MCERTS
Aromatic TPH >C8 - C10	mg/kg	MCERTS
Aromatic TPH >C10 - C12	mg/kg	MCERTS
Aromatic TPH >C12 - C16	mg/kg	MCERTS
Aromatic TPH >C16 - C21	mg/kg	MCERTS
Aromatic TPH >C21 - C35	mg/kg	MCERTS
Aromatic TPH (C5 - C35)	mg/kg	MCERTS

< 0.001
< 0.001
< 0.001
< 1.0
< 2.0
< 8.0
10
10
< 0.001
< 0.001
< 0.001
< 1.0
< 2.0
< 10
< 10
< 10

Benzene	mg/kg	MCERTS
Toluene	mg/kg	MCERTS
Ethylbenzene	mg/kg	MCERTS
p & m-xylene	mg/kg	MCERTS
o-xylene	mg/kg	MCERTS
MTBE (Methyl Tertiary Butyl Ether)	mg/kg	MCERTS

< 0.005
< 0.005
< 0.005
< 0.005
< 0.005
< 0.005

Asbestos Screen	ND/D	ISO 17025
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Not-detected
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H. MacRae

Harriet MacRae  
BSc MSc  
Graduate Soil Scientist

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