



TIM O'HARE ASSOCIATES  
SOIL & LANDSCAPE CONSULTANCY

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Bury Hill Landscape Supplies Ltd  
The Estate Office  
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Surrey, RH4 3JU

1<sup>st</sup> September 2020  
Our Ref: TOHA/20/9603/4/SS  
Your Ref: see below

Dear Sirs

**Soil Analysis Report: Intensive Roof Garden Substrate – Ericaceous Lightweight**

We have completed the analysis of the soil sample recently submitted, referenced *Ericaceous Lightweight*, 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 garden environment for ericaceous planting.

This report presents the results of analysis for the sample submitted to our office, and it should be considered 'indicative' of the soil 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 soil has left the Bury Hill Landscape Supplies Ltd site.

**SAMPLE EXAMINATION**

The sample was described as a dark brown (Munsell Colour 10YR 3/3), slightly moist, friable, slightly calcareous SANDY LOAM with a weakly developed, fine granular structure. The sample contained frequent lightweight expanded clay aggregate particles (leca) and was virtually free of other stone sized material. A high proportion of organic fines was recorded, together with occasional woody fragments. No deleterious materials, unusual odours, roots or rhizomes of pernicious weeds were observed.

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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 & gravel, silt, clay);
- saturated hydraulic conductivity;
- bulk density;
- porosity;
- pH value;
- electrical conductivity values (CaSO<sub>4</sub> extract);
- organic matter content;
- plant available phosphate and potassium;
- total nitrogen;
- carbon : nitrogen ratio;
- heavy metals (As, Cd, Cr, Cu, Pb, Hg, Ni, Se, Zn, B);
- 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.

## **RESULTS OF ANALYSIS**

### **Particle Size Analysis**

The less than 2mm fraction fell into the *sandy loam* texture class. Further detailed particle size analysis revealed the sample to have a reasonably narrow particle size distribution and a predominance of *medium sand* (0.25-0.50mm), with smaller proportions of *fine sand* (0.25-0.15mm) and *silt* (0.002-0.05mm). This would be considered suitable for soil in landscape applications as reasonable porosity levels are generally maintained in a consolidated state. The sample should therefore provide adequate drainage and aeration properties for an intensive roof garden topsoil.

The 'stone' sized fraction (>2mm) of the sample was moderate (by mass), comprising frequent leca particles up to 20mm in size. The proportion of stone sized particles recorded would be considered acceptable for an intensive roof garden substrate.

### **Bulk Density, Permeability and Porosity**

The sample displayed a low saturated bulk density value (1.32 Mg/m<sup>3</sup>) compared to that of standard soils, indicating that the material has potential for use as a lightweight soil.

The permeability and porosity tests were designed to test the substrate's drainage, aeration and water-storage capacities.

The permeability rate of the sample was high (240 mm/hour), and indicates a suitable drainage rate for a lightweight growing medium.

The sample displayed a high total porosity value (55%) and satisfactory available porosity when at field capacity.

### **pH and Electrical Conductivity Values**

The sample was slightly acid in reaction (pH 6.2). This pH value would be considered suitable for landscape purposes, including ericaceous planting schemes where acidic conditions are required.

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

## **Organic Matter and Fertility Status**

The sample was adequately supplied with organic matter and all major plant nutrients. Longer term nutrient retention could be improved using a soil conditioner (e.g. TerraCottem).

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.

## **CONCLUSION**

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

From the soil examination and laboratory analysis, the substrate was described as a slightly acid, non-saline SANDY LOAM with a weakly developed structure and moderate stone content, comprising LECA particles. The sample possessed a high permeability rate and high total porosity value. The sample was adequately supplied with organic matter and all major plant nutrients. Of the potential contaminants determined, none exceeded their respective guideline values.

Based on our findings, the substrate represented by this sample would be suitable for use as a lightweight intensive substrate for landscaping purposes in a roof garden environment, including for ericaceous planting.

The substrate should be underlain by a suitably graded subsoil product to interface with underlying structures and / or drainage infrastructure, as appropriate.

## **RECOMMENDATIONS**

### **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. If the soil is compacted at any stage during the course of soiling or landscaping works, it should be cultivated appropriately to relieve the compaction prior to any planting, turfing or seeding.

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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



**Aaron Cross**  
BSc MSc  
Soil Scientist



**Ceri Spears**  
BSc MSc MISOilSci  
Senior Associate

For & on behalf of Tim O'Hare Associates LLP



Client:	<b>Bury Hill Landscape Supplies Ltd</b>
Project	<b>Intensive Roof Garden Substrate</b>
Job:	<b>Physical and Horticultural Properties</b>
Date:	<b>01/09/2020</b>
Job Ref No:	<b>TOHA/20/9603/3/SS</b>

Sample Reference		
		Accreditation
Clay (<0.002mm)	%	UKAS
Silt (0.002-0.05mm)	%	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
Fine Gravel (2.0-4.0mm)	%	UKAS
Coarse Gravel (4.0-8.0mm)	%	UKAS
Stones (>8mm)	% DW	UKAS

Bulk Density (at Field Capacity)	g/cm <sup>3</sup>	A2LA
Bulk Density (at Saturation)	g/cm <sup>3</sup>	A2LA
Bulk Density (when Oven Dried)	g/cm <sup>3</sup>	A2LA
Field Capacity	% v/v	A2LA
Particle Density	g/cm <sup>3</sup>	A2LA

Saturated Hydraulic Conductivity	mm/hr mm/min	A2LA
Total Porosity	%	A2LA
Porosity at Field Capacity		A2LA

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

**Ericaceous  
Lightweight**

7
17
7
13
18
8
2
4
15
9

1.19
1.32
0.77
42
1.7

240
4
55
13

6.2
2.3
2300
8.3
0.31
16
45
178

**Visual Examination**

The sample was described as a dark brown (Munsell Colour 10YR 3/3), slightly moist, friable, slightly calcareous SANDY LOAM with a weakly developed, fine granular structure. The sample contained frequent lightweight expanded clay aggregate particles (leca) and was virtually free of other stone sized material. A high proportion of organic fines was recorded, together with occasional woody fragments. No deleterious materials, unusual odours, roots or rhizomes of pernicious weeds were observed.

*Aaron Cross*

**Aaron Cross**  
BSc MSc  
Soil Scientist

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

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Client:	<b>Bury Hill Landscape Supplies Ltd</b>
Project	<b>Intensive Roof Garden Substrate</b>
Job:	<b>Chemical Properties</b>
Date:	<b>01/09/2020</b>
Job Ref No:	<b>TOHA/20/9603/3/SS</b>

Sample Reference		Accreditation
Total Arsenic (As)	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 Zinc (Zn)	mg/kg	MCERTS
Water Soluble Boron (B)	mg/kg	MCERTS
Total Cyanide (CN)	mg/kg	MCERTS
Total (mono) Phenols	mg/kg	MCERTS

**Ericaceous  
Lightweight**

7
0.2
13
< 4.0
19
40
< 0.3
14
< 1.0
52
0.7
< 1
< 1.0

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
< 0.05
< 0.05
< 0.05
< 0.05
< 0.05
< 0.05
< 0.05
< 0.05
< 0.05
< 0.05
< 0.05
< 0.05
< 0.05
< 0.05
< 0.80

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
< 8.0
< 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

< 0.001
< 0.001
< 0.001
< 0.001
< 0.001
< 0.001

*A. Cross*

**Aaron Cross**  
BSc MSc  
Soil Scientist

Asbestos Screen	ND/D	ISO 17025
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Not-detected
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