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SOIL & LANDSCAPE CONSULTANCY

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9th December 2022
Our Ref: TOHA/22/7685/9/SS
Your Ref: see below

Soil Analysis Report: Bury Hill Horsham Yard – Lawn Rootzone (E)

We have completed the analysis of the soil sample recently submitted, referenced *Lawn Rootzone (E)* and have pleasure reporting our findings.

The purpose of the analysis was to determine the suitability of the sample specifically for use as a lawn rootzone for high-performance amenity grass areas with good compaction resistance and a higher drainage rate are required, and where automatic irrigation and on-going maintenance are provisioned.

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 yellowish brown (Munsell Colour 10YR 3/4), slightly moist, friable, non-calcareous SAND with a single grain structure. The sample was very slightly stony and contained a low proportion of organic fines and occasional woody fragments. No unusual odours, deleterious materials, roots or rhizomes of pernicious weeds were observed.

Plate 1: Lawn Rootzone (E) 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, drainage rate and fertility of the rootzone, and the concentration of selected potential contaminants. The following parameters were determined:

- detailed particle size analysis (clay, silt, '5 sands');
- stone content (2-20mm, 20-50mm, >50mm);
- saturated hydraulic conductivity;
- 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 (As, Cd, Cr, Cu, Pb, Hg, Ni, Se, Zn, B);
- total cyanide and total (mono) phenols;
- 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 *sand* texture class. Further detailed particle sized distribution found the sample to have a predominance of *medium sand* (0.25-0.50mm), with a smaller proportion of *coarse sand* (0.50-1.0mm) and *very coarse sand* (1.0-2.0mm). This should be suitable for high-use grass areas as sufficient porosity levels are maintained in a consolidated state and the risk of particle interpacking and surface smearing is minimised.

High sand content soils typically have good aeration, drainage and compaction-resistance properties, but can possess reduced water and nutrient retention capacities. As such, it will be important that the lawn be suitably maintained (seasonal fertiliser applications, irrigation, decompaction etc.) as part of an ongoing maintenance regime.

The sample was virtually stone-free and as such, stones will not restrict the use of the soil.

Saturated Hydraulic Conductivity

The saturated hydraulic conductivity rate (53 mm/hr) recorded under a degree of consolidation was moderate and acceptable for many applications. However, it would not be considered 'fast-draining', where a rate of over 150 mm/hr is usually observed.

The combination of this drainage rate and the soil's particle size distribution should offer a good balance of water retention for plant uptake and drainage of surplus water over a period of time.

pH and Calcium Carbonate Values

The sample was strongly alkaline in reaction (pH 8.6) and non-calcareous ($CaCO_3$ <1%).

The main source of the 'alkalinity' is likely to be the potassium ions from the compost in the sample. As such, this pH value would be considered suitable for most grass cultivars.

Electrical Conductivity Values

The electrical conductivity (salinity) values (water and $CaSO_4$ extract) were low, which indicates that soluble salts were not present at levels that would be harmful to plants.

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 landscape applications.

Potential Contaminants

In the absence of site-specific assessment criteria, the concentrations of potential contaminants that affect human health have been compared with the *residential with home grown 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 our maximum permissible levels.

CONCLUSION

The purpose of the analysis was to determine the suitability of the sample for use as a rootzone for high-performance amenity grass / lawn areas.

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

To conclude, based on our findings, the soil represented by this sample would be considered suitable for high-use lawn areas that are supported by irrigation and provided the reduced drainage rate is acceptable for the project specific requirements.

A suitable maintenance regime should also be implemented to support the establishment and continued growth of the grass sward (e.g. decompaction, aeration, fertiliser applications, etc.).

Soil Handling Recommendations

It is important to maintain the physical condition of the soil and avoid compaction during all phases of soil handling (e.g. stockpiling, respreading, cultivating, seeding or turfing). As a consequence, soil handling operations should be carried out when soil and the underlying ground is sufficiently dry and stable.

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 ground has dried out. If the soil is compacted at any stage during the course of soiling or landscaping works, it should be decompacted appropriately.

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

H.MacRae

Harriet MacRae
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Graduate Soil Scientist

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For & on behalf of Tim O'Hare Associates LLP

TIM O'HARE ASSOCIATES
SOIL & LANDSCAPE CONSULTANCY

Client:	**Bury Hill Landscape Supplies Ltd**
Project:	**Bury Hill Horsham Yard - Lawn Rootzone (E)**
Job:	**Rootzone Analysis**
Date:	**09/12/2022**
Job Ref No:	**TOHA/22/7685/9/SS**

Sample Reference			**Lawn Rootzone (E)**
		Accreditation	
Clay (<0.002mm)	%	UKAS	3
Silt (0.002-0.05mm)	%	UKAS	0
Very Fine Sand (0.05-0.15mm)	%	UKAS	1
Fine Sand (0.15-0.25mm)	%	UKAS	7
Medium Sand (0.25-0.50mm)	%	UKAS	40
Coarse Sand (0.50-1.0mm)	%	UKAS	33
Very Coarse Sand (1.0-2.0mm)	%	UKAS	16
Total Sand (0.05-2.0mm)	%	UKAS	97
Texture Class (UK Classification)	--	UKAS	S
Stones (2-20mm)	% DW	GLP	1
Stones (20-50mm)	% DW	GLP	0
Stones (>50mm)	% DW	GLP	0
Saturated Hydraulic Conductivity	mm/hr	A2LA	53
pH Value (1:2.5 water extract)	units	UKAS	8.6
Calcium Carbonate	%	UKAS	< 1.0
Electrical Conductivity (1:2.5 water extract)	uS/cm	UKAS	527
Electrical Conductivity (1:2 $CaSO_4$ extract)	uS/cm	UKAS	2670
Exchangeable Sodium Percentage	%	UKAS	4.2
Organic Matter (LOI)	%	UKAS	3.9
Total Nitrogen (Dumas)	%	UKAS	0.18
C : N Ratio	ratio	UKAS	13
Extractable Phosphorus	mg/l	UKAS	31
Extractable Potassium	mg/l	UKAS	532
Extractable Magnesium	mg/l	UKAS	66
Total Arsenic (As)	mg/kg	MCERTS	4
Total Cadmium (Cd)	mg/kg	MCERTS	< 0.2
Total Chromium (Cr)	mg/kg	MCERTS	7.3
Hexavalent Chromium (Cr VI)	mg/kg	MCERTS	< 1.8
Total Copper (Cu)	mg/kg	MCERTS	11
Total Lead (Pb)	mg/kg	MCERTS	7
Total Mercury (Hg)	mg/kg	MCERTS	< 0.3
Total Nickel (Ni)	mg/kg	MCERTS	5
Total Selenium (Se)	mg/kg	MCERTS	< 1.0
Total Zinc (Zn)	mg/kg	MCERTS	20
Water Soluble Boron (B)	mg/kg	MCERTS	1.3
Total Cyanide (CN)	mg/kg	MCERTS	< 1.0
Total (mono) Phenols	mg/kg	MCERTS	< 1.0
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
p & m-xylene	mg/kg	MCERTS	< 0.001
o-xylene	mg/kg	MCERTS	< 0.001
MTBE (Methyl Tertiary Butyl Ether)	mg/kg	MCERTS	< 0.001
Asbestos	ND/D	ISO 17025	Not-detected

S = SAND

Visual Examination

The sample was described as a dark yellowish brown (Munsell Colour 10YR 3/4), slightly moist, friable, non-calcareous SAND with a single grain structure. The sample was very slightly stony and contained a low 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

H.MacRae

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