TIM O'HARE ASSOCIATES
SOIL & LANDSCAPE CONSULTANCY

Mr John Coles
Bury Hill Landscape Supplies Ltd
The Estate Office
Old Bury Hill
Westcott
Nr Dorking
Surrey, RH4 3JU

18th January 2024
Our Ref: TOHA/24/1206/7/SS
Your Ref: see below

Dear Sirs

Sand Analysis Report: Bury Hill Horsham Yard – Medium / Coarse Washed Silica Sand (E)

We have completed the analysis of the sand sample recently submitted, referenced *Medium / Coarse Washed Silica Sand (E),* and have pleasure reporting our findings.

The purpose of the analysis was to assess selected physical and chemical properties of the sand in order to determine its potential for use in a range of landscape applications. The ultimate suitability of the sand for any specific use or project should be reviewed and assessed in advance. However, this report offers some possible applications where the sand may be appropriate.

This report presents the results of analysis for the sample submitted to our office, and it should be considered 'indicative' of the sand source. The report and results should therefore not be relied upon by any third parties.

SAMPLE EXAMINATION

The sample can be described as a brownish yellow (Munsell Colour, 10YR 6/8), moist, friable, non-calcareous SAND with a single grain structure. The sample was stone free and no unusual odours, deleterious materials, roots or rhizomes of pernicious weeds were observed.

Plate 1: Medium / Coarse Washed Silica Sand (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 of the soil. The following parameters were determined:

- detailed particle size analysis (5 sands, silt, clay);
- stone content (2-20mm, 20-75mm, >75mm);
- saturated hydraulic conductivity;
- pH and electrical conductivity (1:2.5 water extract);
- exchangeable sodium percentage
- calcium carbonate.
- organic matter content;
- california bearing ratio (CBR);
- visible contaminants;
- heavy metals (Sb, As, B, Ba, Be, Cd, Cr, Cu, Pb, Hg, Ni, Se, V, Zn);
- 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 Saturated Hydraulic Conductivity

The sample had a total sand content of 98%. Further detailed particle size analysis revealed the sample to have a narrow particle size distribution, with a predominance of *medium sand* (0.25-0.50mm) and smaller proportion of *fine sand* (0.15-0.25mm) and *coarse sand* (0.50-1.0mm).

If used as a subsoil for landscaping applications, it could be described as 'very free-draining' which is confirmed by the high saturated hydraulic conductivity result (621mm/hr).

Stone Content

The sample was stone-free and, as such, stones should not restrict the use of the soil for use as subsoil in general landscape purposes.

pH and Electrical Conductivity Values

The sample was slightly alkaline in reaction (pH 7.4), with a low calcium carbonate (lime) content. This pH value should not restrict the use of the sand for most landscape purposes.

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

Organic Matter Content

The organic matter content was low (<0.5%).

California Bearing Ratio

A re-compacted California Bearing Ratio (CBR) was completed as part of the engineering testing undertaken on the sample. The sample was re-compacted using the 2.5kg rammer at the as received moisture content and the sample returned a minimum CBR of 10%. Assuming that the in-situ compaction method selected during installation provides similar levels of compaction to that of the laboratory test, the in-situ performance of the material should be able to achieve a similar result, provided it is compacted at the same moisture content (8%).

As the performance of the soil will be linked to the moisture content at time of compaction, further work may be required in order to correlate the change in engineering performance of the material over the range of moisture contents at which the soil is likely to be placed and compacted.

We recommend a more conservative approach with the performance of the material, and, as opposed to a CBR of 10%, we would quote "should achieve a CBR in excess of 5%..." The 5% CBR is important as this is the lower limit for the sub-grade for the minimum construction thickness.

Potential Contaminants

In the absence of site-specific assessment criteria, the concentrations of selected potential contaminants that affect human health have been assessed for the concentrations that affect human health have been assessed for *residential* 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 exceeded their respective guideline values.

Phytotoxic Contaminants

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

COMMENTS

The sand represented by this sample has the following properties:

- Narrow particle size distribution
- Low fines content
- High drainage rate
- Slightly alkaline pH value
- Low lime content
- Non-saline
- Inorganic

Based on these characteristics, the sand represented by this sample may have potential for use in a number of landscape application, examples of which could include:

1) A free-draining, compaction resistant subsoil for landscape environments where a higher level of permeability and porosity in the subsoil layer is required, e.g. when planting larger rootballed trees, for podium landscapes, or formal / high-use grass lawns;
2) For use as a filter medium for bioretention systems and rain gardens that may be included within Sustainable Drainage Systems (SuDS);
3) For use in sports pitch drainage where a free-draining sand may be required (e.g. sand grooves);
4) For blending with suitable ameliorants to produce high-permeability rootzones;

The suitability of this sand for any specific project or product should be carefully checked by further testing as necessary and should be approved by any project's designer / manager before use.

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

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Senior Soil Scientist

For & on behalf of Tim O'Hare Associates LLP

TIM O'HARE ASSOCIATES
SOIL & LANDSCAPE CONSULTANCY

Client:	**Bury Hill Landscape Supplies Ltd**
Project	**Bury Hil Horsham Yard**
Job:	**Sand Analysis**
Date:	**18/01/2024**
Job Ref No:	**TOHA/24/1206/7/SS**

Sample Reference	**Medium / Coarse Washed Silica Sand (E)**

		Accreditation	
Clay (<0.002mm)	%	UKAS	1
Silt (0.002-0.05mm)	%	UKAS	1
Very Fine Sand (0.05-0.15mm)	%	UKAS	5
Fine Sand (0.15-0.25mm)	%	UKAS	17
Medium Sand (0.25-0.50mm)	%	UKAS	56
Coarse Sand (0.50-1.0mm)	%	UKAS	15
Very Coarse Sand (1.0-2.0mm)	%	UKAS	5
Total Sand (0.05-2mm)	%	UKAS	98
Texture Class (UK Classification)	--	UKAS	S
Stones (2-20mm)	% DW	GLP	0
Stones (20-75mm)	% DW	GLP	0
Stones (>75mm)	% DW	GLP	0
Saturated Hydraulic Conductivity	mm/hr	A2LA	621
pH Value (1:2.5 water extract)	units	UKAS	7.4
Calcium Carbonate	%	UKAS	< 1.0
Electrical Conductivity (1:2.5 water extract)	uS/cm	UKAS	57
Electrical Conductivity (1:2 $CaSO_4$ extract)	uS/cm	UKAS	2191
Organic Matter (LOI)	%	UKAS	<0.5
Exchangeable Sodium Percentage	%	UKAS	1.9
Moisture Content (Initial)	%	UKAS	8
Moisture Content (Top)	%	UKAS	7
Moisture Content (Base)	%	UKAS	8
Moisture Content (Mean)	%	UKAS	8
Initial Bulk Density	Mg/m3	UKAS	1.82
Initial Dry Density	Mg/m3	UKAS	1.70
CBR Top	%	UKAS	10
CBR Base	%	UKAS	26
Visible Contaminants: Plastics >2.00mm	%	UKAS	0
Visible Contaminants: Sharps >2.00mm	%	UKAS	0
Total Antimony (Sb)	mg/kg	MCERTS	< 1.0
Total Arsenic (As)	mg/kg	MCERTS	2.6
Total Barium (Ba)	mg/kg	MCERTS	7.1
Total Beryllium (Be)	mg/kg	MCERTS	0.1
Total Cadmium (Cd)	mg/kg	MCERTS	< 0.2
Total Chromium (Cr)	mg/kg	MCERTS	6.1
Hexavalent Chromium (Cr VI)	mg/kg	MCERTS	< 1.8
Total Copper (Cu)	mg/kg	MCERTS	3.4
Total Lead (Pb)	mg/kg	MCERTS	< 1.0
Total Mercury (Hg)	mg/kg	MCERTS	< 0.3
Total Nickel (Ni)	mg/kg	MCERTS	4
Total Selenium (Se)	mg/kg	MCERTS	< 1.0
Total Vanadium (V)	mg/kg	MCERTS	12
Total Zinc (Zn)	mg/kg	MCERTS	4.6
Water Soluble Boron (B)	mg/kg	MCERTS	< 0.2
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
Benz(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	< 0.020
Aliphatic TPH >C6 - C8	mg/kg	MCERTS	< 0.020
Aliphatic TPH >C8 - C10	mg/kg	MCERTS	< 0.050
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	20
Aliphatic TPH (C5 - C35)	mg/kg	MCERTS	27
Aromatic TPH >C5 - C7	mg/kg	MCERTS	< 0.010
Aromatic TPH >C7 - C8	mg/kg	MCERTS	< 0.010
Aromatic TPH >C8 - C10	mg/kg	MCERTS	< 0.050
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	< 0.005
Toluene	mg/kg	MCERTS	< 0.005
Ethylbenzene	mg/kg	MCERTS	< 0.005
p & m-xylene	mg/kg	MCERTS	< 0.005
o-xylene	mg/kg	MCERTS	< 0.005
MTBE (Methyl Tertiary Butyl Ether)	mg/kg	MCERTS	< 0.005
Asbestos	D/ND	ISO 17025	Not-detected

S = SAND

Visual Examination

The sample can be described as a brownish yellow (Munsell Colour, 10YR 6/8), moist, friable, non-calcareous SAND with a single grain structure. The sample was stone free and no unusual odours, deleterious materials, roots or rhizomes of pernicious weeds were observed.

H.MacRae

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