



TIM O'HARE ASSOCIATES
SOIL & LANDSCAPE CONSULTANCY

Mr Andy Spetch
British Sugar plc Co-Products
Oundle Road
Peterborough
PE2 9QU

25th November 2022

Our Ref: TOHA/22/7740/SS
Your Ref: PO 60206549

Dear Sirs

Soil Carbon Report: Landscape 20 Topsoil - Newark

We have completed the soil carbon audit on the LANDSCAPE 20 TOPSOIL sample recently submitted, referenced *Nwk-L20-Nov*, and have pleasure reporting our findings.

INTRODUCTION

The focus on soil health and climate change has brought attention to the levels of carbon stored in soils, and the benefits from measuring soil carbon stocks to increase the understanding of carbon sequestration potential. This can be achieved by monitoring the soil organic carbon. The following analysis provides a complete audit of the carbon contained within this topsoil sample.

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 validating soil carbon levels on other sites after the topsoil has left the British Sugar factory.

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, very fine to medium granular and sub-angular blocky structure. The sample was stone-free and no unusual odours, observable deleterious materials, roots or rhizomes of pernicious weeds were recorded.

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

ANALYTICAL SCHEDULE

The sample was submitted to a UKAS accredited laboratory for a range of tests to profile the carbon levels within the topsoil and other relevant parameters.

- Organic Carbon Stock (by calculation)
- Bulk Density
- Total Carbon
- Soil Organic Carbon
- Soil Inorganic Carbon
- Active Carbon
- Organic Matter
- Total Nitrogen
- Carbon: Nitrogen Ratio

The results are presented on the attached Certificate of Analysis and a commentary on the parameters tested is given below.

COMMENTS

Organic Carbon Stock (tonnes/Ha)

Organic Carbon Stock provides a total organic carbon value in tonnes of carbon per hectare of land to the specified depth to which the topsoil is placed. This calculation factors in the measured soil organic carbon %, stone content, topsoil depth and bulk density. In this instance a topsoil depth of 300mm has been used, and a value of 94 t/ha was calculated.

Total Carbon

Total Carbon is the measure of all carbon forms within the soil which are primarily organic or inorganic. Total carbon is different to Total Organic Carbon, which refers specifically to the organic carbon fraction.

Soil Organic Carbon

Soil Organic Carbon (SOC) is the carbon component of soil organic matter. It is a diverse group of carbon-based compounds originating from the decomposition of plant material, animal residues, soil fauna and biota. The level of SOC is influenced by environmental factors and management practices, and it is a key measurement in monitoring changes in the levels of carbon stocks.

Soil Inorganic Carbon

Soil Inorganic Carbon (SIC) comprises carbonates and bicarbonates which are abundant in alkaline soils. The SIC forms a reservoir in the soil and the levels can be subject to change with biological and environmental factors that influence the precipitation of solid calcium carbonate (CaCO_3) or the emission of gaseous carbon dioxide (CO_2).

Active Carbon

Active Carbon is the proportion of carbon that readily breaks down and is accessible to soil microbes, and as such, is a useful *Soil Health Indicator*. Changes in soil management, such as cultivation methods, or the application of organic soil ameliorants, can be monitored with active carbon analysis. This is a precursor to long term build-up of soil organic matter and is therefore a guide to long term carbon stores.

Soil Organic Matter

Soil Organic Matter is a complex mixture of all organic material found in the soil including living components (plant roots, microorganisms) and dead components (leaf litter, humic substances). It increases the soil's water holding capacity and provides a slow-release source of energy for microorganisms, which in turn increases the cycling of nutrients within the soil.

Total Nitrogen

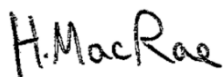
Nitrogen is the main nutrient of plant growth and is closely associated with soil organic matter. It is mobile in the environment and present in many different compounds, some of which are available for uptake by plants. *Total Nitrogen* is the measure of all forms of nitrogen (organic and inorganic) in the dried sample.

C:N Ratio

The proportion of organic carbon relative to nitrogen (C:N ratio) gives an indication of the right balance for soil microbes to aid the release of nutrients. The optimum C:N ratio for nitrogen release in soil is between 10 and 12, and the maximum recommended limit is 20.

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



Tim O'Hare
BSc MSc FSoilSci FBIAC CSci
Principal Consultant

For & on behalf of Tim O'Hare Associates LLP



TIM O'HARE ASSOCIATES
SOIL & LANDSCAPE CONSULTANCY

Client:	British Sugar plc Co-Products
Project:	Landscape 20 Topsoil - Newark
Job:	Soil Carbon Audit
Date:	25/11/2022
Job Ref No:	TOHA/22/7740/SS

Sample Reference		Accreditation
Organic Carbon Stock	tonnes / ha	UKAS
Bulk Density	kg/l	UKAS
Total Carbon	%	UKAS
Soil Organic Carbon (SOC)	%	UKAS
Soil Inorganic Carbon (SIC)	%	UKAS
Active Carbon	mg/kg	UKAS
Active Carbon % of SOC	% of SOC	UKAS
Organic Matter	%	UKAS
Total Nitrogen	%	UKAS
C : N Ratio	ratio	UKAS

Nwk-L20-Nov-22

94#
1.21
3.0
2.6
0.4
608
2.3
4.5
0.32
8

based on a topsoil depth of 300mm

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, very fine to medium granular and sub-angular blocky structure. The sample was stone-free and no unusual odours, observable deleterious materials, roots or rhizomes of pernicious weeds were recorded.

H. MacRae

Harriet MacRae
BSc MSc
Graduate Soil Scientist

Results of analysis should be read in conjunction with the report they were issued with
The contents of this certificate shall not be reproduced without the express written permission of Tim O'Hare Associates LLP