

REPORT 76942/G
IDENTIFICATION OF
POTENTIAL STONE SOURCE
READING

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IDENTIFICATION OF
POTENTIAL STONE SOURCE
READING

Capital Stone
Sewardstone Hall Farm
Sewardstone Road
Chingford
London
E4 7RH

This report comprises
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4 pages of text
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For the attention of Mr Mark Johnson

13 May 2024

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IDENTIFICATION OF

POTENTIAL STONE SOURCE

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Reference : Instructions from Mr Mark Johnson of Capital Stone.

1. **INTRODUCTION**

A stone sample (received broken into two pieces), advised to be from the above site, was received in our laboratory on 17 April 2024 and subjected to testing in accordance with your instructions.

We were instructed to undertake testing in order to identify the stone type and potential matching stone source/s of the submitted sample.

2. **SAMPLE RECEIVED**

Sandberg Ref.	Advised Location Details	Specimen weight, g
G54932	Reading	363

3. TEST METHODS AND RESULTS

3.1 Petrographic examination

The sample was subjected to petrographic examination in accordance with methods described in BS 5930:2015+A1:2020¹, ISRM² and BS EN 12407:2019³.

Record colour photographs of the sample received are presented in Table 1 of this report.

The sample was first subjected to macroscopical and low power stereoscopic microscope examination supported by simple physical and chemical tests.

A representative portion from the sample was used to prepare a large area thin section, which was examined under a Leica DM4500P high power petrological microscopes employing plane polarised and cross polarised light at magnifications up to x1000.

The detailed petrographic examination results are given in Table 1 of this report.

The macroscopical examination findings for the stone sample may be summarised as follows:

Specimen G54932

The stone was pale cream to off-white on broken surfaces, and grey on exposed and polluted surfaces, predominantly medium grained, oolitic bioclastic LIMESTONE. The stone was generally well to moderately compacted, moderately hard to moderately soft, moderately robust to moderately weak and appeared generally porous (subjective estimate). The sample's apparently exposed surfaces were generally weathered.

4. DISCUSSION

On the basis of the microscopic examination the stone sample was found to be an oolitic limestone similar in colour and general composition to potential source/s which are given in the Table below together with the degree of confidence in the match.

¹ BS 5930:2015+A1:2020. Code of Practice for Site Investigation, Clause 36, Description and Classification of Rocks for Engineering Purposes.

² Rock Characterisation Testing and Monitoring. International Society for Rock Mechanics (ISRM) Suggested methods. Petrographic Description of Rocks p.73, 1981 Edition.

³ BS EN 12407:2019. Natural Stone Test Methods - Petrographic Examination.

Sandberg Ref.	Potential Source Material	Estimated Degree of Confidence in Match
C23296	Bath stone - Monks Park Quarry Location : Monks Park, Corsham, Wiltshire	Probable
	Bath stone, Combe Down - Upper Lawns Quarry Quarry Location : Upper Lawns , Combe Down, Bath	Possible
	Guiting Stone - Cotswold Hill Quarry Quarry Location : Cotswold Hill, Ford, Nr Temple Guiting, Cheltenham, Gloucestershire	Possible
	Danglingworth Stone Quarry Location : Danglingworth, NW of Cirencester, Gloucestershire	Possible

The sample was compared against archived petrographic data and thin sections. It is therefore recommended that colour matching of the stone from the suggested potential sources with the material/s on site is carried out.

The above suggested stone source/s are generally similar in colour and appearance but not identical to the submitted stone.

It is therefore recommended that colour matching of the stone from the suggested sources with the material/s on site is carried out. This is important in respect of variation due to fresh and weathered stone both in the quarry and on the structure.

It should be borne in mind that, apart from the parameters discussed above, ultimately the matching of a potential source stone with that in a historic structure is also dependent upon a range of other additional factors. These include:

Weathering

The rate of weathering in the installation climate will affect how the new stone will appear during long-term exposure (i.e. the colour of fresh stone will alter over time and this needs to be considered in respect of the original stone appearance in the structure).

Furthermore, different stones will weather and react in different ways according to their composition and physical properties (i.e. will the new stone weather or degrade at the same rate as the original or not).

Permeability

A key parameter of any replacement stone is its permeability. A new (substitute) stone needs to have compatible porosity and inter-connectivity characteristics to those of the original stone, otherwise moisture migration can be inhibited and lead to accelerated deterioration.

Strength

If a stone is load-bearing in a structure, it is critical to establish that any new stone has adequate strength to meet the required factors of safety.

Workability

Any stone considered for replacement works must have characteristics that allow it to be worked into the necessary shape and form of the elements that comprise the structure.

We would strongly recommend that the suggested source quarries are visited by an experienced geologist and samples are examined in detail with respect to compatibility of physical characteristics, durability and comparative performance. We would welcome the opportunity to assist in this process.

5. REMARKS

The stone matching was based upon the sample submitted. Stone sources may be expected to exhibit considerable lateral and vertical variations in composition and character over short distances and single samples are unlikely to be reliably representative of whole source areas or specific locations within these areas during continuing exploitation.

In addition, the above suggested quarries may have stopped operating or the new stone extracted may differ considerably in colour, texture and overall composition with that originally produced.

These results and comments conclude the testing requested to date. Please do not hesitate to contact us if we can be of further assistance.

Capital Stone
Sewardstone Hall Farm
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London
E4 7RH

For the attention of Mr Mark Johnson

Geology/Laboratory

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for Sandberg LLP



Panos Sotiropoulos
Principal Geologist

13 May 2024

SAMPLE PHOTOGRAPHS



G54932. View of sample received exhibiting exposed and broken / sawn surfaces.



G54932. View of sample received exhibiting broken / sawn surfaces.

SAMPLE PHOTOGRAPHS



G54932. Close-up of an exposed surface of sample received.



G54932. Close-up of a broken surface of sample received.

PETROGRAPHICAL EXAMINATION OF ROCK

BS 5930:2015+A1:2020, BS EN ISO 14689:2018, ISRM Method, BS EN 12407:2019, ASTM C1721-22

Tested by / Date

PS/08-05-2024

SAMPLE DETAILS			
Sample Reference:	G54932	Client Reference/Site Mark:	-
Sample Type, Source and Sampling Location Details:	Reading		
Condition on Receipt:	Dry	Sample weight, g :	363 approximately
Methods of Preparation of Specimens and Examination Procedures:	The stone sample was first subjected to macroscopical and low power stereomicroscopical examination supported by simple physical and chemical tests. A representative specimen from the sample was used to prepare a large area thin section which was examined under a Leica DM4500P high power petrological microscope, employing plane, cross polarised and ultra violet light modes and magnifications up to x1000.		
Any Other Details:	The thin section specimen was taken across the pieces of the sample. Thin section dimension 45mm x 49mm approximately which was completed on 8 May 2024.		

MATERIAL DESCRIPTION:	The stone was pale cream to off-white on broken surfaces, and grey on exposed and polluted surfaces, predominantly medium grained, oolitic bioclastic LIMESTONE. The stone was generally well to moderately compacted, moderately hard to moderately soft, moderately robust to moderately weak and appeared generally porous (subjective estimate). The sample's apparently exposed surfaces were generally weathered.
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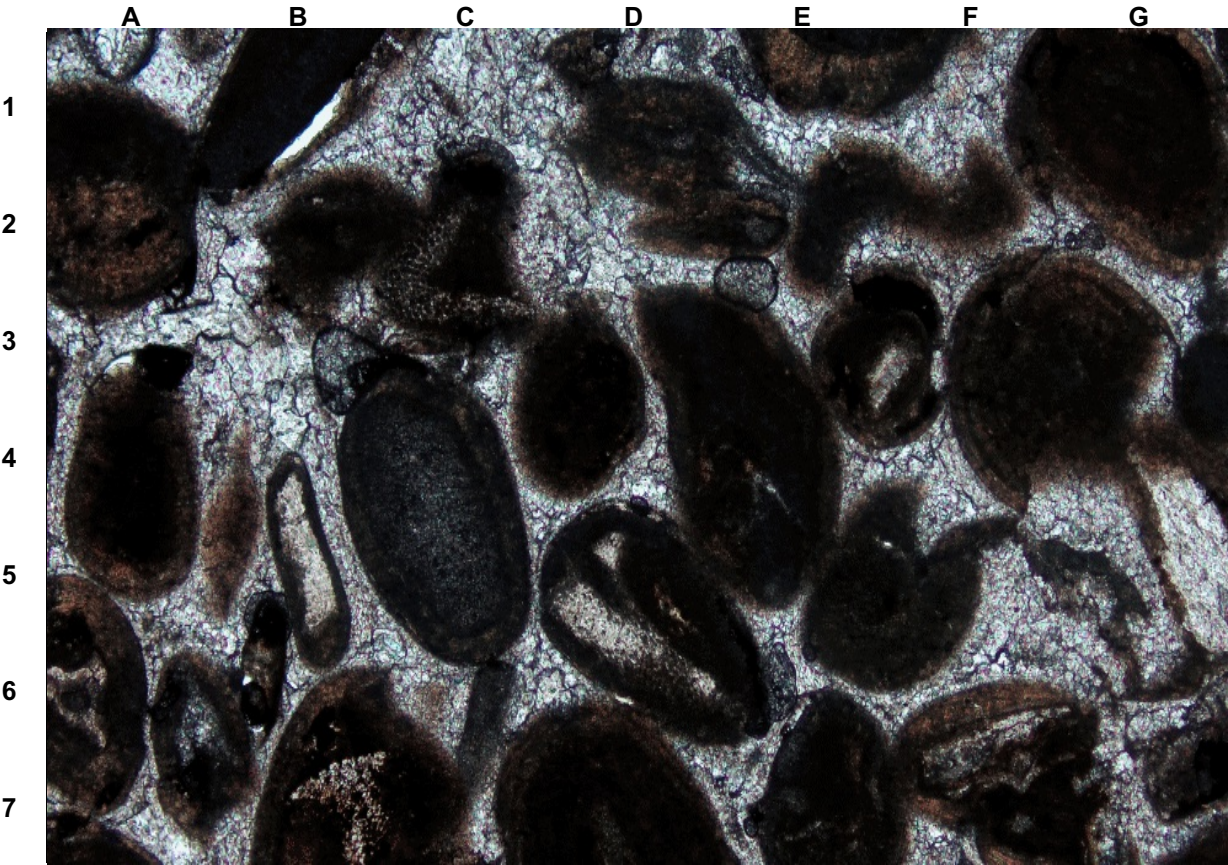
MATERIAL COMPOSITION:		PETROGRAPHICAL DETAILS ⁿ
COMPONENT	Volume % (estimated)	The stone was found to be a generally matrix supported oolitic bioclastic limestone (oobiosparite) consisting primarily of ooids and relict bioclasts and predominantly sparry calcite forming the matrix and/or intergranular material. Sporadic iron and/or manganese oxide imparted a brownish to pale orange colouration to parts of ooids and relict bioclasts. The ooids were typically rounded and occasionally elongate and sometimes subround (ranging in size from 50µm to 800µm and commonly 200µm to 500µm in diameter or across) and generally exhibited concentric structure. The ooids consisted mainly of micritic calcite and sporadically central parts exhibited partial crystallisation to microspar and/or sparry calcite. Relict bioclasts (up to 1.5mm long, 0.6mm across and commonly less than 0.5mm long and 300µm across) were unevenly distributed and consisted mainly of elongate to subround shell pieces, sporadically exhibiting an aragonitic texture with a micrite periphery and were sometimes partially replaced by micrite and/or sparry calcite. The matrix comprised mainly sparry calcite anhedral grains (up to 600µm and commonly less than 200µm across) forming a mosaic with generally tight contacts. Orange brown possibly iron and/or manganese oxide occasionally partially stained ooids or parts of ooids and relict bioclasts respectively. The stone was generally well to moderately compacted and porous. There were voids (up to 0.4mm and commonly 0.1-0.3mm across) which were generally associated with the ooids. Micrite, which was the main constituent of the ooids, was also microporous thus contributing to the overall porosity of the stone.
Ooids / Relict Bioclasts	70	
Matrix	30	
Iron and/or Manganese oxide	<1	
TOTAL:	100	

UE = Undulatory Extinction. ND = Not Determined. NA = Not Applicable. NS = Not Supplied.

ⁿ Details mainly relate to components or features of possible engineering significance.

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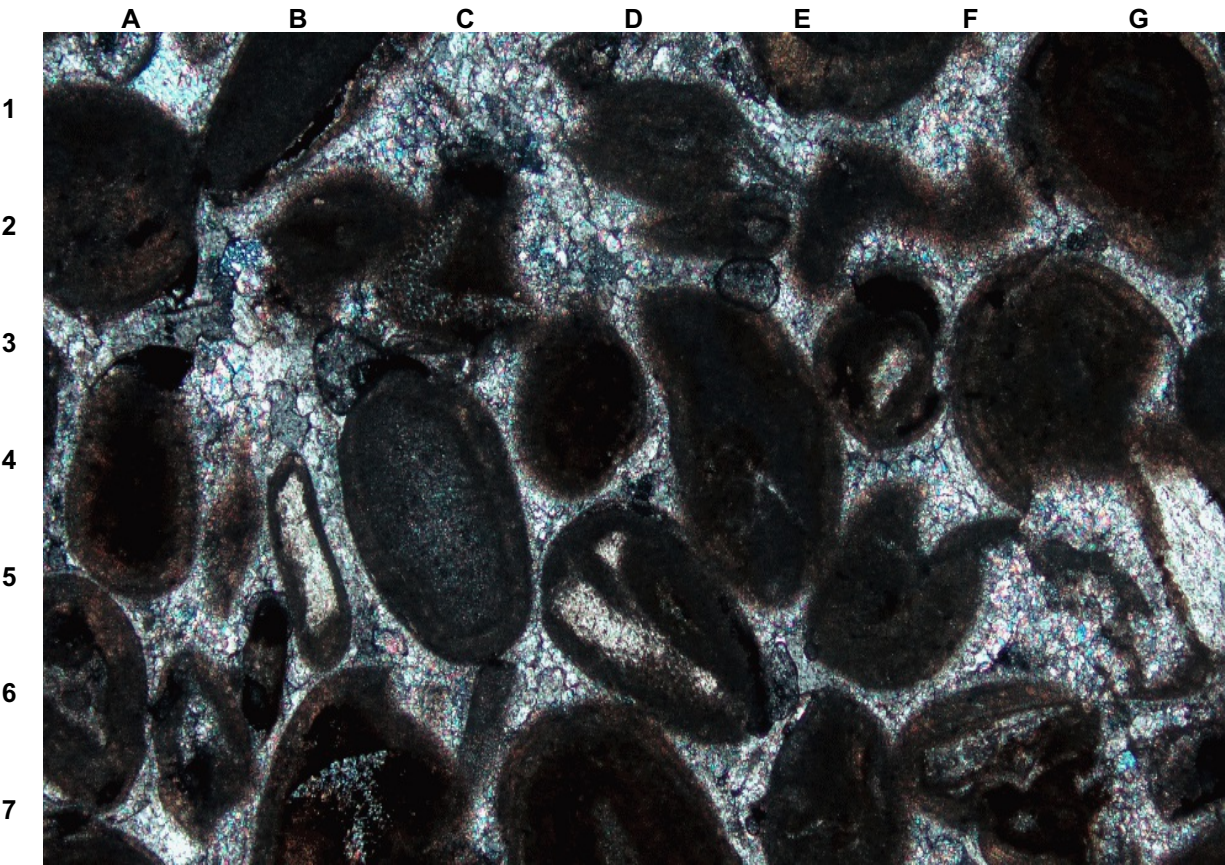
PETROGRAPHICAL EXAMINATION OF STONE - PHOTOMICROGRAPH



Photomicrograph Details			
Sandberg Sample Ref:	G54932	Client Ref/Site Mark:	-
Microscope Light:	Plane polarised	Objective Magnification:	x5
Photomicrograph Description			
General view of the stone structure under plane polarised light. The ooids are generally spherical to subround exhibiting concentric texture (e.g. B-C/4-6, E-F/3-4, A/1-2 etc.) and elongate relict bioclasts can be seen at C-D/5-6 & B/5-5 the central parts of which exhibit the original aragonitic texture. Sparry calcite cement matrix is bright intergranular material.			

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Plate
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PETROGRAPHICAL EXAMINATION OF STONE - PHOTOMICROGRAPH



Photomicrograph Details			
Sandberg Sample Ref:	G54932	Client Ref/Site Mark:	-
Microscope Light:	Cross polarised	Objective Magnification:	x5
Photomicrograph Description			
General view of the stone structure under cross polarised light. The ooids are generally spherical to subround exhibiting concentric texture (e.g. B-C/4-6, E-F/3-4, A/1-2 etc.) and elongate relict bioclasts can be seen at C-D/5-6 & B/5-5 the central parts of which exhibit the original aragonitic texture. Sparry calcite cement matrix is bright intergranular material.			

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Where test results are given, the results and our conclusions relate only to the samples tested and apply to the sample(s) as received, except where sampling has been conducted by Sandberg LLP.

Materials, samples and test specimens are retained for a period of 2 months from the issue of the final report.

Tests reported on sheets not bearing the UKAS mark in this report/certificate are not included in the UKAS accredited schedule for this laboratory.

Opinions and interpretations expressed herein are outside the scope for UKAS accreditation.

End of report.

