



Salt Ash - Site 220  
Washed Sand for  
Concrete & Asphalt  
2 0 2 1



*Specification Compliance with:*  
*AS2758.1, AS4058,*  
*B80, R53, R82, R83, RMS 3152*





11/02/2021

HC Ref: P20024– Washed Sand – Salt Ash

**Attn: Robert Mackenzie**

Macka's Sand Pty Ltd

2684 Nelson Bay Rd

Salt Ash

NSW 2318

**RE: Concrete & Asphalt Sand**

Dear Robert,

Please find the reports and related documents attached. Please contact me if you have any questions.

Sincerely,

A handwritten signature in black ink, appearing to read "Natasha", enclosed within a large, hand-drawn oval.

Natasha O'Neill

**Technician**

Hunter Civilab



## Introduction

Hunter Civilab have been commissioned to conduct sampling & testing of Washed Sand located at the Salt Ash Deposit – Site 220. The purpose of the testing was to evaluate the material for use as fine aggregate for concrete and asphalt production.

## Specifications

- AS 2758.1-2014 - Aggregates and Rock for Engineering Purposes, Part 1: Concrete Aggregates
- AS/NZ 4058:2007 – Pre-Cast Concrete Pipes (Pressure and Non-pressure)
- RMS B80, Edition 7 / Revision 4 – Concrete Work for Bridges
- RMS R82, Edition 4 / Revision 3 – Lean-mix Concrete Subbase
- RMS R83, Edition 3 / Revision 2 – Concrete Pavement Base
- R53, Edition 3 / Revision 1 – Concrete (for General Use), Mortar and Grout
- RMS 3152, Edition 2 / Revision 4 – Aggregates for Asphalt

## Results

The sand has tested well and is expected to conform to the above specifications on the tests that have been undertaken. The grading envelope on the grading report is our recommendation for concrete supply based on historical data and the tolerances in Table 2 for natural fine aggregate in AS2758.1. The asphalt specification RMS 3152 has tighter tolerances on supply than AS2758.1 and these are referenced in the result summary.

## Reactivity Summary

The reactivity of the sand is classified as non-reactive when tested with the cementitious materials consisting of 100% Port Kembla GP Cement and test method AS1141.60.1. The petrographic states:



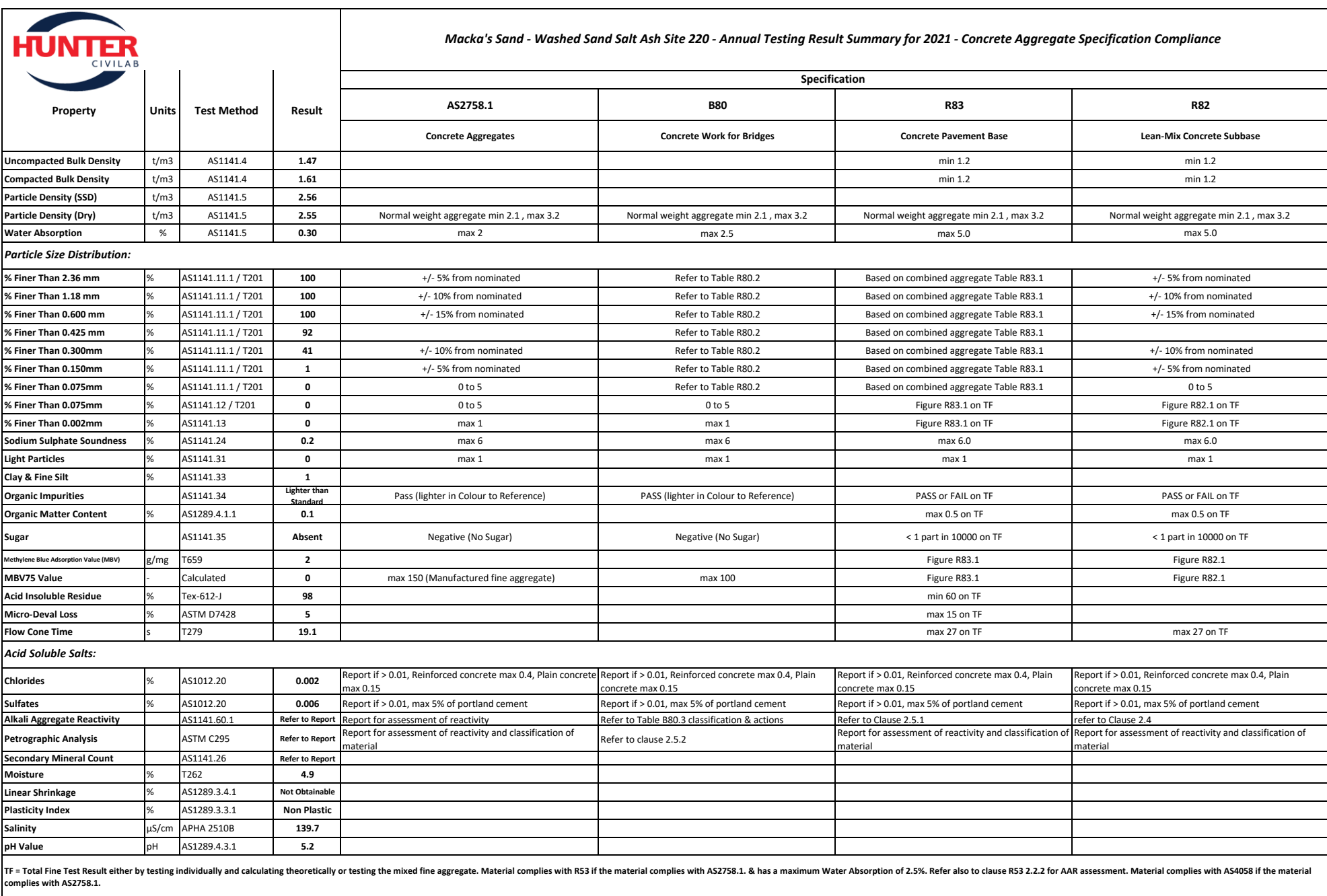
“Thus, the sand as a whole is predicted to have potential for mild and/or slow deleterious alkali-silica reactivity in concrete.”


And

“The supplied sand sample is predicted to be suitable for use as fine concrete sand provided that appropriate precautions are taken in mix and engineering design to deal with its perceived potential for deleterious alkali-silica reactivity when used under conditions which might promote such reaction.”

### **Testing & Limitations**

Testing has been conducted in accordance with ISO/IEC 17025 “General Requirements for Testing & Calibration Laboratories” in a NATA endorsed facility where referenced. Test results should be assessed using precision in terms of repeatability, reproducibility, measurement uncertainty and effects of sampling.



 <b>Property</b>	<b>Macka's Sand - Washed Sand Salt Ash Site 220 - Annual Testing Result Summary for 2021 - Asphalt Aggregate Specification Compliance</b>				
	<b>Units</b>	<b>Test Method</b>	<b>Result</b>	<b>Specification</b>	
					<b>RMS 3152</b>
					<b>Aggregates for Asphalt</b>
Uncompacted Bulk Density	t/m3	AS1141.4	1.47		
Compacted Bulk Density	t/m3	AS1141.4	1.61		
Particle Density (SSD)	t/m3	AS1141.5	2.56		Report
Particle Density (Dry)	t/m3	AS1141.5	2.55		Report
Water Absorption	%	AS1141.5	0.30		max 1.5% (quartz sands)
<b>Particle Size Distribution:</b>					
% Finer Than 2.36 mm	%	AS1141.11.1 / T201	100		+/-6% from nominated
% Finer Than 1.18 mm	%	AS1141.11.1 / T201	100		+/-6% from nominated
% Finer Than 0.600 mm	%	AS1141.11.1 / T201	100		+/-5% from nominated
% Finer Than 0.425 mm	%	AS1141.11.1 / T201	92		+/-5% from nominated
% Finer Than 0.300mm	%	AS1141.11.1 / T201	41		+/-5% from nominated
% Finer Than 0.150mm	%	AS1141.11.1 / T201	1		+/-3% from nominated
% Finer Than 0.075mm	%	AS1141.11.1 / T201	0		+/-2% from nominated
% Finer Than 0.075mm	%	AS1141.12 / T201	0		Report
% Finer Than 0.002mm	%	AS1141.13	0		-
Sodium Sulphate Soundness	%	AS1141.24	0.2		max 12
Light Particles	%	AS1141.31	0		
Clay & Fine Silt	%	AS1141.33	1		
Organic Impurities		AS1141.34	Lighter than Standard		
Organic Matter Content	%	AS1289.4.1.1	0.1		
Sugar		AS1141.35	Absent		
Methylene Blue Adsorption Value (MBV)	g/mg	T659	2		
MBV75 Value	-	Calculated	0		
Acid Insoluble Residue	%	Tex-612-J	98		
Micro-Deval Loss	%	ASTM D7428	5		
Flow Cone Time	s	T279	19.1		
<b>Acid Soluble Salts:</b>					
Chlorides	%	AS1012.20	0.002		
Sulfates	%	AS1012.20	0.006		
Alkali Aggregate Reactivity		AS1141.60.1	Refer to Report		
Petrographic Analysis		ASTM C295	Refer to Report		
Secondary Mineral Count		AS1141.26	Refer to Report		
Moisture	%	T262	4.9		
Linear Shrinkage	%	AS1289.3.4.1	Not Obtainable		
Plasticity Index	%	AS1289.3.3.1	Non Plastic		
Salinity	µS/cm	APHA 2510B	139.7		
pH Value	pH	AS1289.4.3.1	5.2		

# Material Test Report

**Report Number:** P20024-1B  
**Issue Number:** 1  
**Date Issued:** 11/02/2021  
**Client:** Macka's Sand Pty Limited  
 2684 Nelson Bay Road, Salt Ash NSW 2318  
**Contact:** Andrew Pickard  
**Project Number:** P20024  
**Project Name:** Materials Testing - Washed Sand  
**Project Location:** Salt Ash Quarry - Site 220  
**Work Request:** 2319  
**Sample Number:** 20-2319A  
**Date Sampled:** 18/12/2020  
**Dates Tested:** 18/12/2020 - 11/02/2021  
**Sampling Method:** AS 1141.3.1 9.4 - Sampling aided by power equipment - other than backblading method  
**Material:** Washed Fine Dune Sand  
**Material Source:** Site 220 Salt Ash



Hunter Civilab  
 62 Sandringham Avenue Thornton NSW 2322  
 Phone: (02) 4966 1844  
 Email: natasha.oneill@huntercivilab.com.au



Accredited for compliance with ISO/IEC 17025 - Testing

*Natasha O'Neill*

Approved Signatory: Natasha O'Neill  
 Technician

NATA Accredited Laboratory Number: 14975

Particle Size Distribution (AS1141.11.1)				
Sample Washing	Sample was Washed			
Sieve	Passed %	Passing Limits	Retained %	Retained Limits
1.18 mm	100		0	
0.6 mm	100		0	
0.425 mm	92		8	
0.3 mm	41		51	
0.15 mm	1		40	
0.075 mm	-0		1	

Particle Distribution (AS 1141.12)	Min	Max
Material Finer than 75µm (%)	0	

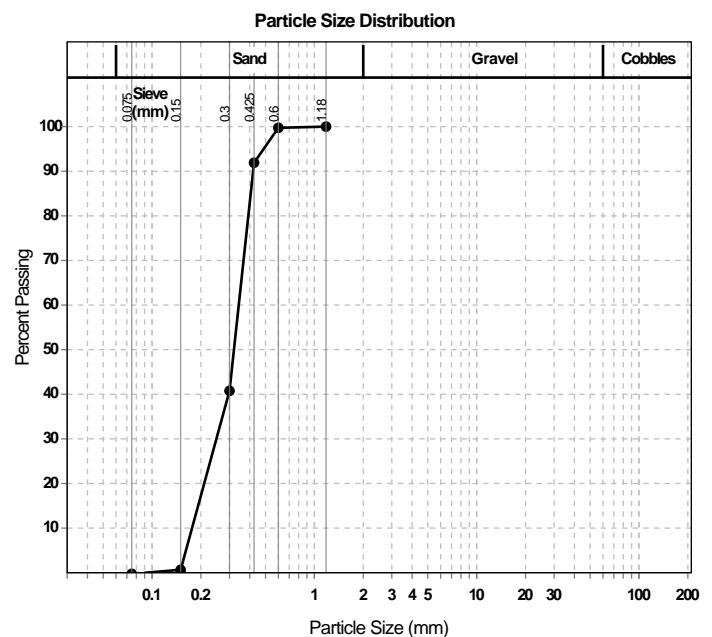
Bulk Density of Aggregate (AS 1141.4)	Min	Max
Uncompacted (t/m <sup>3</sup> )	1.47	
Compacted (t/m <sup>3</sup> )	1.61	
Moisture Condition	Dry	
Nominal Size	Under 5mm	

Density and Water Absorption of Fine Aggregate (AS 1141.5)	Min	Max
Apparent Particle Density (t/m <sup>3</sup> )	2.57	
Particle Density Dry (t/m <sup>3</sup> )	2.55	
Particle Density SSD (t/m <sup>3</sup> )	2.56	
Water Absorption (%)	0.3	

Clay and Fine Silt (AS 1141.33)	Min	Max
Volume of Clay and Silt (%)	1	

Methylene Blue (RMS T659)	Min	Max
Start Oven Dry Date/Time:		
Finish Oven Dry Date/Time:		
	Test 1	Test2
Methylene Blue Adsorption Value (mg/g)	2	2
Mean Methylene Blue Adsorption Value (mg/g)	2	

Light Particles (AS 1141.31)	Min	Max
Nominal Size of Aggregate (mm)	Less than 7	
Light Particles (%)	0	



Sodium Sulphate Soundness (AS 1141.24)	Min	Max
Sieve Aperture	% Loss	
75 - 53mm		
53 - 37.5mm		
37.5 - 26.5mm		
26.5 - 19mm		
19 - 13.2mm		
13.2 - 9.5mm		
9.5 - 4.75mm		
4.75 - 2.36mm		
2.36 - 1.18mm		
1.18 - 0.600mm		
0.600 - 0.300mm	0.2	
<b>Total Weighted Loss (%)</b>	<b>0.2</b>	

Organic Impurities other than Sugar (AS 1141.34)	Min	Max
Organic Impurities	Lighter than standard	
Method of Colour Assessment	Visual using a reference solution	

Sugar (AS 1141.35)	Min	Max
Sugar	Absent	

# Material Test Report

**Report Number:** P20024-1B  
**Issue Number:** 1  
**Date Issued:** 11/02/2021  
**Client:** Macka's Sand Pty Limited  
2684 Nelson Bay Road, Salt Ash NSW 2318  
**Contact:** Andrew Pickard  
**Project Number:** P20024  
**Project Name:** Materials Testing - Washed Sand  
**Project Location:** Salt Ash Quarry - Site 220  
**Work Request:** 2319  
**Sample Number:** 20-2319A  
**Date Sampled:** 18/12/2020  
**Dates Tested:** 18/12/2020 - 11/02/2021  
**Sampling Method:** AS 1141.3.1 9.4 - Sampling aided by power equipment - other than backblading method  
**Material:** Washed Fine Dune Sand  
**Material Source:** Site 220 Salt Ash



Hunter Civilab  
62 Sandringham Avenue Thornton NSW 2322  
Phone: (02) 4966 1844  
Email: natasha.oneill@huntercivilab.com.au



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A handwritten signature in black ink, appearing to read "Natasha O'Neill", enclosed within a rectangular box.

Approved Signatory: Natasha O'Neill  
Technician

NATA Accredited Laboratory Number: 14975

## Moisture Content (RMS T262)

Moisture Content (%)	4.9
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# Material Test Report

**Report Number:** P20024-1A  
**Issue Number:** 1  
**Date Issued:** 11/02/2021  
**Client:** Macka's Sand Pty Limited  
2684 Nelson Bay Road, Salt Ash NSW 2318  
**Contact:** Andrew Pickard  
**Project Number:** P20024  
**Project Name:** Materials Testing - Washed Sand  
**Project Location:** Salt Ash Quarry - Site 220  
**Work Request:** 2319  
**Sample Number:** 20-2319A  
**Date Sampled:** 18/12/2020  
**Dates Tested:** 18/12/2020 - 28/01/2021  
**Sampling Method:** AS 1141.3.1 9.4 - Sampling aided by power equipment - other than backblading method  
**Material:** Washed Fine Dune Sand  
**Material Source:** Site 220 Salt Ash



Hunter Civilab  
62 Sandringham Avenue Thornton NSW 2322  
Phone: (02) 4966 1844  
Email: gb@huntercivilab.com.au



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Approved Signatory: Grant Burgess  
Senior Technician  
NATA Accredited Laboratory Number: 14975

Atterberg Limit (AS1289 3.1.2 & 3.2.1 & 3.3.1)		Min	Max
Sample History	Oven Dried		
Preparation Method	Dry Sieve		
Liquid Limit (%)	Not Obtainable		
Plastic Limit (%)	Not Obtainable		
Plasticity Index (%)	Non Plastic		

Linear Shrinkage (AS1289 3.4.1)		Min	Max
Moisture Condition Determined By	AS 1289.3.1.1 / AS 1289.3.1.2 / AS 1289.3.9.1 / AS 1289.3.9.2		
Linear Shrinkage (%)			
Cracking Crumbling Curling			

Organic Matter Content (AS 1289.4.1.1 )		Min	Max
Organic Material Present (%)	0.1		

pH Value of Soil (AS 1289 4.3.1)	
Depth	
pH	5.2
Electrical Conductivity (µS/cm)	



3/62 Sandringham Av,  
Thornton NSW 2322  
PH: 02 49661844

## Conductivity

<b>Client:</b>	Macka's Sand Pty Limited	<b>Project No:</b>	P20024
<b>Principle:</b>	-	<b>Report No:</b>	P20024_20-2319A_CON.1
<b>Project:</b>	Materials Testing - Annuals	<b>Sample No:</b>	20-2319A
<b>Location:</b>	Williamtown - Site 220		

### Test Method: APHA 2510B with AS1289.4.3.1 Clause 5 (Preparation)

### Sample Detail

**Date Sampled:** 18/12/2020

**Sampling Method:** AS1141.3.1 (9.4) - Sampling aided by power equipment other than backblading method

**Date Tested:** 28/1/2021

**Sample Description:** Washed Fine Dune Sand

**Material Source:** Site 220 - Salt Ash

**Client reference:** -

**Fraction Tested:** -2.36mm

### Result

<b>Conductivity at 25°C (Temperature Compensated):</b>	139.7 $\mu$ S/cm
<b>Temperature of Sample:</b>	25.1 °C

Remarks:



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**Authorised Signatory:**

**Name:** James Wyatt  
**Position:** Quality Manager  
**Date:** 3/02/2021



3/62 Sandringham Av, Thornton

NSW 2322

PH: 02 49661844

### Flow Time and Voids Content of Fine Aggregate by Flow Cone -RMS T279

<b>Client:</b>	Macka's Sand Pty Limited	<b>Project No:</b>	P20024
<b>Principle:</b>	-	<b>Report No:</b>	P20024_20-2319A_FC.1
<b>Project:</b>	Materials Testing - Annuals	<b>Sample No:</b>	20-2319A
<b>Location:</b>	Salt Ash Quarry - Site 220		

**Date Sampled:** 18/12/2020

**Sampling Method:** AS1141.3.1(9.4) - Sampling aided by power equipment other than backblading method

**Date Tested:** 19/01/2021

**Material Description:** Washed Fine Dune Sand

**Material Source:** Site 220 - Salt Ash

**Client Reference:** -

**For use as:** Fine Aggregate

### Results

**Dry Density:** 2,549 kg/m<sup>3</sup>

**Oversize Material:** 0 %

#### Flow Time (s):

Test 1	Test 2	Test 3	Average
19.1	19.1	19.2	19.1

**Uncompacted Void Content:** 42.8 %

### Remarks:



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#### Authorised Signatory:

**Name:** Natasha O'Neill  
**Position:** Technician  
**Date:** 3/02/2021

# SYDNEY ANALYTICAL LABORATORIES

Page 1 of 3

Office:  
PO BOX 48  
ERMINGTON NSW 2115

Laboratory:  
1/4 ABBOTT ROAD  
SEVEN HILLS NSW 2147  
Telephone: (02) 9838 8903  
Fax: (02) 9838 8919  
A.C.N. 003 614 695  
A.B.N. 81 829 182 852  
NATA No: 1884

## ANALYTICAL REPORT for:

VALLEY CIVILAB

PO BOX 3127  
THORNTON 2322

ATTN: JAMES WYATT

JOB NO: SAL27819C  
CLIENT ORDER: P20024  
DATE RECEIVED: 11/01/21  
DATE COMPLETED: 19/01/21  
TYPE OF SAMPLES: AGGREGATE  
NO OF SAMPLES: 1



.....  
Issued on 19/01/21  
Lance Smith  
(Chief Chemist)

**ANALYTICAL REPORT**

JOB NO: SAL27819C  
CLIENT ORDER: P20024

SAMPLES	Cl %	SO4 % as SO3
1 20-2319A	0.002	0.006

MDL	0.001	0.001
Method Code	C32	C33
Preparation	P5	P5

RESULTS ON DRY BASIS  
SAMPLE MATERIAL: WASHED FINE DUNE SAND  
DATE OF COLLECTION: 18/12/20

**ANALYTICAL REPORT**

JOB NO: SAL27819C

CLIENT ORDER: P20024

**METHODS OF PREPARATION AND ANALYSIS**

The tests contained in this report have been carried out on the samples as received by the laboratory. In the case where an analyte or group of analytes are received outside of recommended holding times, the analysis will proceed and the report annotated. Analysis is carried out within analyte holding times where possible.

P5	Sample dried, split and crushed to -150um
C32	Acid Soluble Chloride - AS1012.20
C33	Acid Soluble Sulphate - AS1012.20



## MATERIAL FINER THAN 2 $\mu$ m REPORT

Client:	Valley Civilab	Report Number:	10848/R/27534-1
Client Address:	Unit 3/62 Sandringham Avenue, Thornton	Project Number:	10848/P/414
Project:	Material Testing - Valley Civilab	Lot Number:	
Location:	Thornton	Internal Test Request:	10848/T/17013
Supplied To:	Valley Civilab	Client Reference/s:	PO# 00001414 WR#2319
Area Description:		Report Date / Page:	4/02/2021 Page 1 of 1

Test Procedures:	AS1141.13	
Sample Number	10848/S/76748	Sample Location
Sampling Method	Tested As Received	Client Sample ID
Date Sampled	18/12/2020	20-2319A
Sampled By	hc-james	P20024
Date Tested	12/01/2021	
Material Source	Macca's Sand	Material Type
		Washed Fine Sand

**Material Finer Than 2  $\mu$ m (%)****0.0**

Remarks	Results apply to the sample/s as received.
---------	--

 <b>NATA</b>	Accredited for compliance with ISO/IEC 17025 – Testing	
Accreditation Number:	1986	
Corporate Site Number:	10848	
		
		Approved Signatory: Timothy Mathie
		Form ID: Rev 1

# Report for Potential Alkali-Silica Reactivity of Aggregates Accelerated Mortar Bar Method

Wollongong Laboratory  
1/140 Industrial Rd Oak flats

Lab Ph: +61242574458

Client:	Valley Civilab	Report No:	T17013S76748521
Address:	Unit 3/62 Sandringham Avenue, 2322, Thornton, NSW	Project No:	10848/P/414
Project:	Material Testing- Valley Civilab	Request No:	10848/T/17013

Sample No: 10848/S/76748	Client's ID: 20-2319A
Material Description: Washed Fine Dune Sand	Material Source: Macka's Sand
Cement Type: Port Kembla GP	Cement Source: Cement Australia
Material Sampling Method: Sampled by client	Date / Time Sampled: 18/12/2020

## Test Method: AS 1141.60.1

Test Date	Age (Days)	Expansion (%)			Average
		Bar 1	Bar 2	Bar 3	
16/01/21	1	-0.005	-0.000	0.000	-0.000
18/01/21	3	-0.000	-0.000	-0.000	-0.000
22/01/21	7	0.025	0.030	0.030	0.030
25/01/21	10	0.055	0.065	0.060	0.060
29/01/21	14	0.110	0.120	0.110	0.110
05/02/21	21	0.210	0.205	0.200	0.200

## Expansion V's Age



**Aggregate Reactivity Classification:- Slowly Reactive**

Remarks: Results apply to samples as received.



WORLD RECOGNISED  
**ACCREDITATION**

Accreditation Number: 10848  
Corporate Site Number: 1986

Accredited for compliance with ISO/IEC 17025 - Testing



Name: Timothy Mathie  
Function: Authorised Signatory  
Date: 05-Feb-21



**Boral Construction Materials  
Materials Technical Services**Unit 4, 3-5 Gibbon Road  
Baulkham Hills NSW 2153 Australia  
PO Box 400, Winston Hills NSW 2153

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**TEST REPORT**

CLIENT: HUNTER CIVILAB

FILE NO: 629/21

PROJECT: Testing of Washed Fine Dune Sand.

REQUEST NO: 92826

TEST PROCEDURE: ASTM 7428, Standard Test Method for Resistance of Fine Aggregate to Degradation by  
Abrasion in the Micro-Deval Apparatus

DATE TESTED: 13-21.1.21

Sample Description:	Washed Fine Dune Sand
Project No:	P20024
Work Request No:	2319
Client Sample No:	20-2319A
Date Sampled:	18.12.20
Date Received:	12.1.21
Laboratory Sample No:	248601
<b>Test Method:</b>	<b>Test:</b>
ASTM D7428*1	Micro-Deval Abrasion Test % Loss The % loss of the control Agg. tested closest to the time at which the sample was tested = 19.5
	<b>Results</b>
	5.0

Sample with Particle Density figures provided by client

NOTE: \*1Sample tested without preparing standard grading as per ASTM D7428 Clause 8 Note 2 &amp; Sample tested to ASTM D7428 and reported.

P. Ross, Q C File, File



Approved Signatory

Kamal Ali

Date 21.1.21 Serial No. AGG92826.KA.1Accredited for compliance with ISO/IEC 17025 - Testing  
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Test results in this Test Report relate only to the samples tested

NATA Accredited Laboratory

Number: 547



**Boral Construction Materials  
Materials Technical Services**

Unit 4, 3-5 Gibbon Road  
Baulkham Hills NSW 2153 Australia  
PO Box 400, Winston Hills NSW 2153

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**TEST REPORT**

CLIENT: HUNTER CIVILAB  
P.O .Box 3127, Thornton NSW 2322

FILE No.: 629 / 21

PROJECT: Testing of Washed Fine Dune Sand. Work Request #2319.  
Project :P20024.

REQUEST No.: 92826

**TEST PROCEDURE:**

Tex-612 - J – Acid Insoluble Residue for Fine Aggregate

Laboratory Sample Number:	248601
Date Sampled:	18.12.20
Date Received:	12.01.21
Date Tested:	14.01.21
Sample Description:	Washed Fine Dune Sand Client Sample No.20-2319A Hunter Civilab


Field No.: 1

**TEST RESULTS:**

Acid Insoluble Residue (%)	98
----------------------------	----

**Notes:**

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Test results in this Test Report relate only to the samples tested.  
Sample was provided by the client.

  
Otilia Costache,  
14.01.2021  
Peter Ross, Mat.File, File.



# GEOCHEMPET SERVICES

ABN 25 065 630 506  
PETROGRAPHIC, GEOLOGICAL & GEOCHEMICAL CONSULTANTS

28 Cameron Street  
Clontarf, QLD 4019

Telephone: (07) 3284 0020  
Email: [info@geochempet.com](mailto:info@geochempet.com)  
[www.geochempet.com](http://www.geochempet.com)

## PETROGRAPHIC REPORT ON A WASHED FINE DUNE SAND SAMPLE (20-2319A) FOR MACKA'S SAND PTY LTD

prepared for

**HUNTER CIVILAB  
THORNTON, NSW**

Purchase Order: 00001412

Invoice Number: G2102501

Issued by

C. A. Bruggemann  
BAppSc, MEngSC, MIEAust  
1 February 2021

Reviewed by

T.F. D. Spring  
BAppSc MAppSc MAusIMM  
1 February 2021

*FEBRUARY, 2021*

*Hc210201*

*1 of 6*

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# GEOCHEMPET SERVICES, BRISBANE

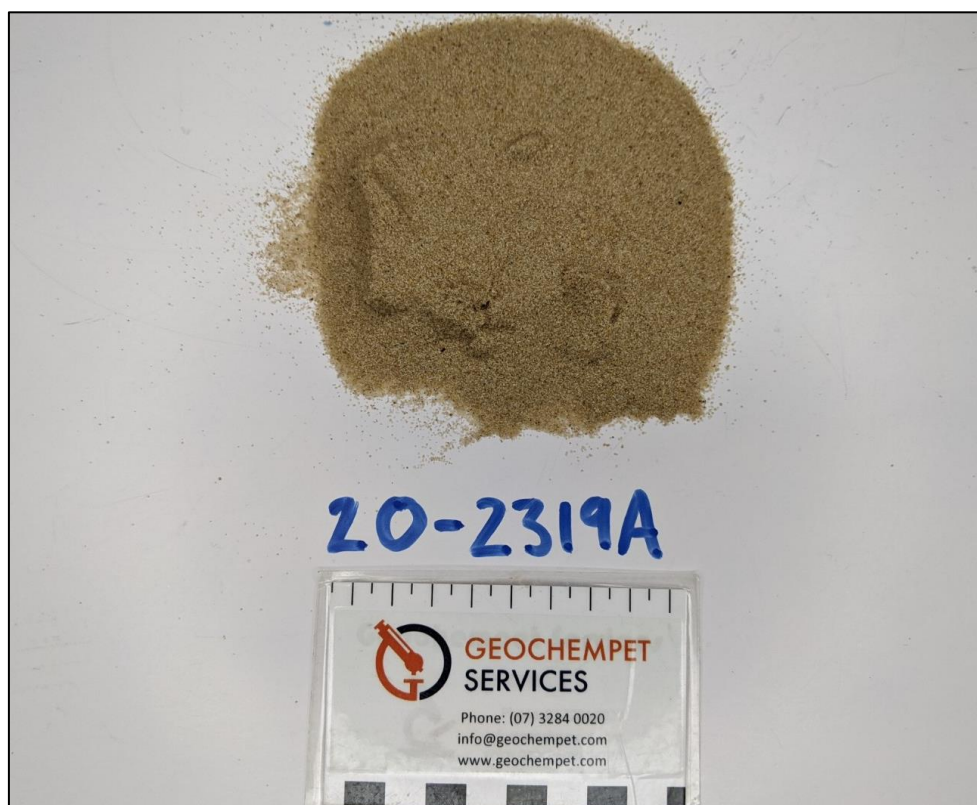
**Sample Label:** 20-2319A **Date Sampled:** 18/12/2020  
**Product Type:** Washed fine dune sand **Date Received:** 18/01/2021  
**Project Number:** P20024 – Materials Testing **Work Request Number:** 2319  
**Client:** Macka's Sand Pty Ltd  
**Work Requested:** Petrographic analysis in relation to use as concrete sand; petrographic assessment of potential for alkali-silica reactivity

**Methods** Account taken of ASTM C295 Standard Guide for *Petrographic Assessment of Aggregates for Concrete*, the AS2758.1 – 2019 *Aggregates and rock for engineering purposes part 1; Concrete aggregates (Appendix B)*, the AS1141 Standard Guide for the *Method for sampling and testing aggregates*, of the content of the 2015 joint publication of the Cement and Concrete Association of Australia and Standards Australia, (HB 79-2015) entitled *Alkali Aggregate Reaction - Guidelines on Minimising the Risk of Damage to Concrete Structures in Australia*.

**Identification** Medium to fine quartz sand

## **Description**

The sample consisted of about 1 kg of yellowish brown, quartz-rich, clean sand. Clasts are mainly sub-rounded.



**Plate 1:** Image of a subsample of the supplied sand

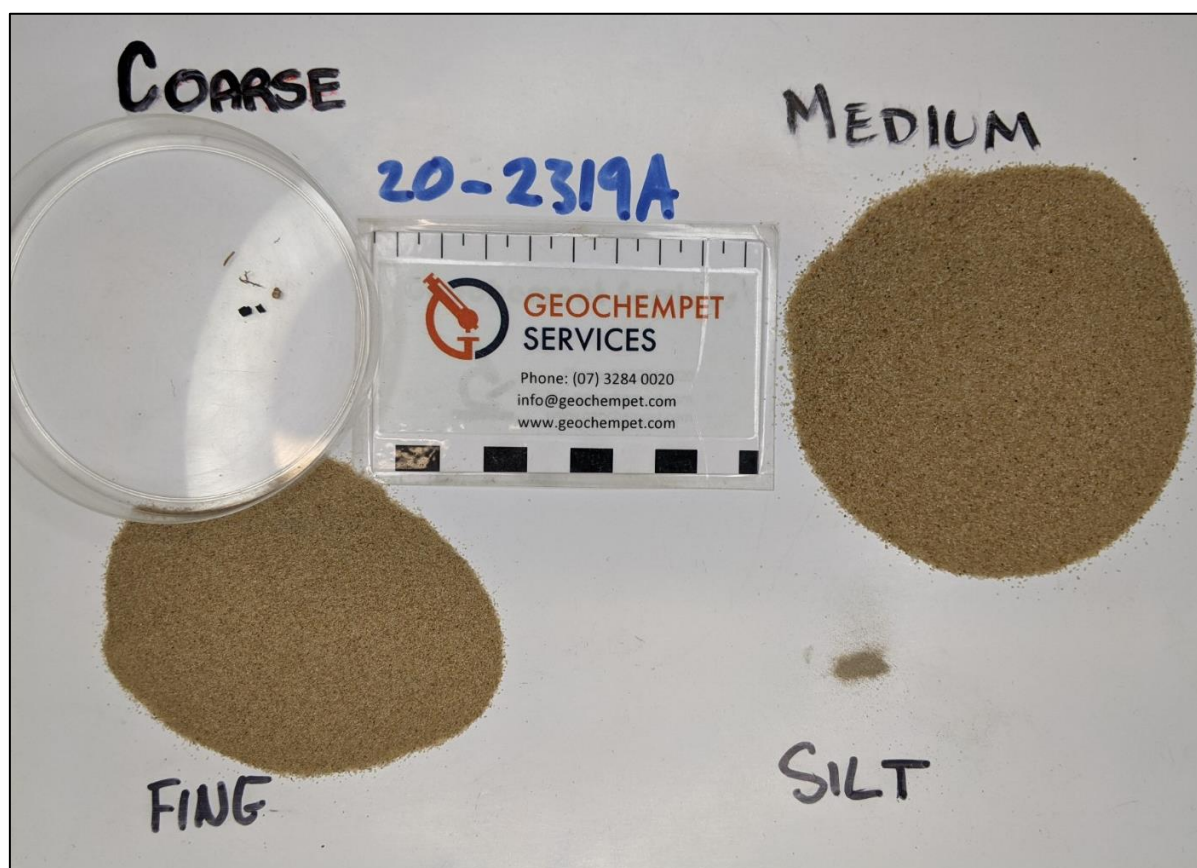
# GEOCHEMPET SERVICES, BRISBANE

In a crude, dry sieving test of small subsample these results were tabulated:

Sieve Size	Wt % of sample
Coarse (>1.18mm)	0.1%
Medium (>0.3mm)	66.4%
Fine (>0.075mm)	33.4%
Silt (<0.075mm)	0.1%

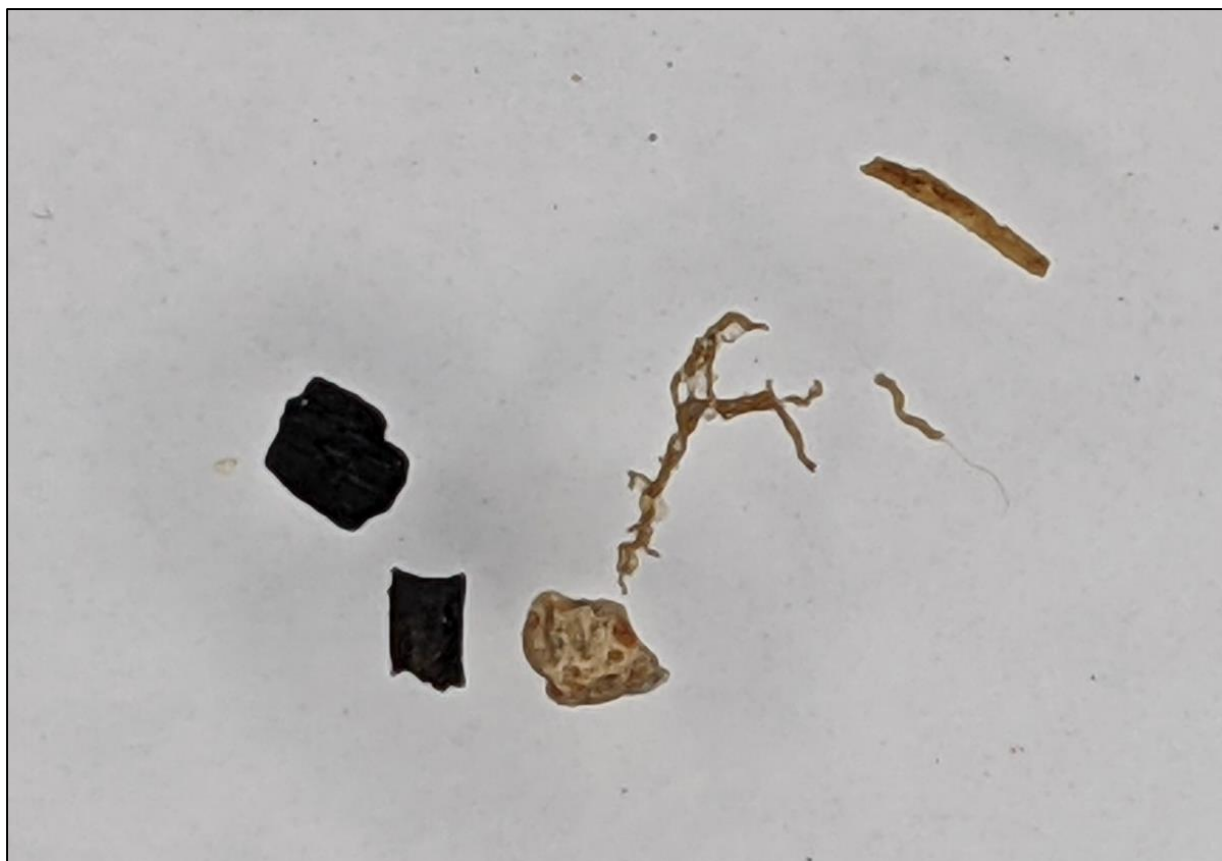
The trace coarse fraction is composed of mainly plant material and charcoal fragments.

A sub-sample was swirled in a beaker of water, with the majority of grains settling immediately. Some minor suspended silt and plant fragments were observed, with argillized scum on the surface.



**Plate 2:** Photograph of sieve fractions

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**Plate 3:** Minor coarse fraction as recorded above, composed of plant matter, charcoal fragments and a single lithic clast. *Image width ~20 mm.*

A thin section was prepared for microscopic examination in transmitted polarized light. A count of 100 widely spaced points falling within sectioned sand clasts gave the following composition:

- 64% quartz as single, free, unstrained to mildly strained grains (64%) or as simple composite crystalline aggregates of quartz grains (<1%)
- 22% quartz as moderately strained simple or crystalline composite grains
- 3% quartzite (moderately strained)
- 2% chert
- <1% vein quartz
  
- 5% feldspar (5% K-feldspar and <1% plagioclase)
- 1% other mineral grains (including zircon, rutile, epidote and opaque oxides)
- <1% free mica
  
- 2% lithic clasts of acid volcanic (<1% finely microcrystalline quartz)
- <1% lithic clasts of intermediate volcanic
- 1% lithic clasts of meta-arenite/meta-siltstone (<1% quartz)
  
- <1% secondary iron oxide staining
  
- trace plant fragments



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A simultaneous count of total free silica content yielded 91%, comprising mostly free quartz grains (86%), with 3% simple quartz locked within lithic clasts of quartzite and 2% finely microcrystalline quartz within chert and acid volcanics.

In thin section the sand is seen to consist largely of quartz in the form of unstrained to mildly strained free quartz grains (64%). Simple or polycrystalline grains of moderately strained quartz amount to about 22%.

Other siliceous clasts include 3% quartzite (consisting of moderately strained quartz), 2% chert and <1% vein quartz.

About 5% feldspar grains were noted, along with 1% of other mineral grains, including heavy minerals such as rutile, zircon, epidote and opaque oxides as well as <1% free mica.

Other lithic clasts include 2% acid volcanics, <1% intermediate volcanics and 1% meta-arenite/meta-siltstone.

Trace amounts of plant material are also present along with minor secondary iron oxides within indentations on the grains and along weathering cracks.

An extensive soft weak and/or non-durable mineral count was performed according to AS1141.26, using three slides with 600 counts per slide. The average soft, weak or deleterious mineral content was seen to be **0.8%**, specifically:

- 0.5% sericite forming as alteration/weathering within the quartzite and lithic fragments
- 0.2% earthy secondary iron oxides within indentations on the grains and along weathering cracks
- 0.1% mica as free mineral grains

## **Comments and Interpretations**

The submitted washed fine dune sand sample (labelled 20-2319A), may be regarded as clean, medium to fine quartz sand.

The total **free silica content** (or **total quartz content**) is **91%**, comprising mostly free quartz grains (86%), and 3% simple quartz locked within lithic clasts of quartzite and 2% finely microcrystalline quartz within chert and lithic clasts of acid volcanics.

Being composed almost entirely of hard, strong, durable, rounded siliceous mineral grains and lithic clasts, the sand is interpreted to be **physically suitable for use in concrete**.

In relation to potential for alkali-silica reactivity in concrete it is noted that the sand carries about 25% of moderately strained quartz and about 2% of finely microcrystalline quartz (within clasts of acid volcanic/tuffaceous rock and chert). Thus, the sand as a whole is predicted to have **potential for mild and/or slow deleterious alkali-silica reactivity in concrete**.

The supplied sand sample is predicted to be **suitable for use as fine concrete sand** provided that the appropriate precautions are taken in mix and engineering design to deal with its perceived

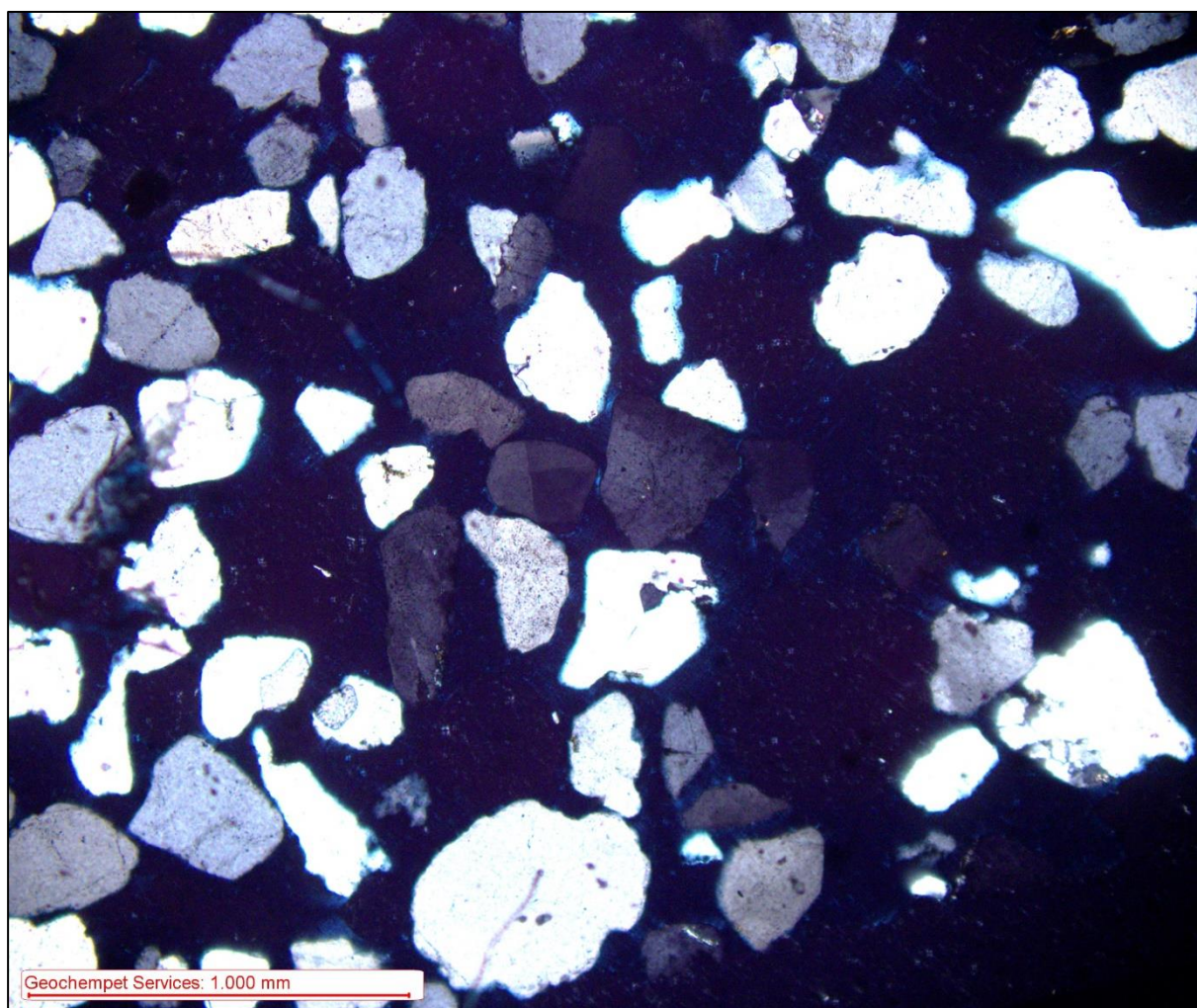
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potential for deleterious alkali-silica reactivity when used under conditions which might promote such reaction.

Guidance on appropriate precautions can be obtained from the 2015 joint publication of the Cement and Concrete Association of Australia and Standards Australia, entitled *Alkali Aggregate Reaction - Guidelines on Minimising the Risk of Damage to Concrete Structures in Australia*.

## **Free Silica Content**

The free silica content is 91%.



**Plate 4:** Micrograph taken at low magnification, cross polarised, transmitted light image of common quartz sand grains (showing various degrees of straining).





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**SECONDARY MINERAL COUNT  
(AS 1141.26)  
ON A WASHED FINE DUNE SAND SAMPLE (20-2319A)  
FOR MACKA'S SAND PTY LTD**

prepared for

**HUNTER CIVILAB  
THORNTON, NSW**

Purchase Order: 00001412

Invoice Number: G2102501

Issued by

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BAppSc, MEngSC, MIEAust  
1 February 2021

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1 February 2021

*FEBRUARY, 2021*

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## SECONDARY MINERAL CONTENT USING A PETROLOGICAL MICROSCOPE\*

**Sample Label:** 20-2319A **Date Sampled:** 18/12/2020  
**Product Type:** Washed fine dune sand **Date Received:** 18/01/2021  
**Project Number:** P20024 – Materials Testing **Work Request Number:** 2319  
**Client:** Macka's Sand Pty Ltd  
**Identification** Medium to fine quartz sand

### Discussion

It is noted that strictly AS 1141.26 is intended for use with basic igneous rocks. Therefore, the requested method is not directly applicable to the sample supplied.

However, the general intent of the method is to determine the secondary minerals because they are usually soft, weak or non-durable. Accordingly, the methods of AS 1141.26 have been modified (through a difficult count across thin sections of sand) to generate the results tabulated below.

Sect. No.	Durable Minerals (in places of primary minerals)		Soft, weak or non-durable minerals (in place of secondary minerals)			Voids		(M) Total Min. Count	(T) Total Point Count
	(P) Point	%	(S) Points	%	Av. %	(VC) Points	%	P+S	
A	596	99.3	4	0.7	0.8%	0	0	600	600
B	595	99.2	5	0.8		0	0	600	600
C	594	99.0	6	1.0		0	0	600	600

\*The determination has been made using a Test Method essentially similar to that described in AS 1141.26.

**Section A** contained numerous sand grains

**Section B** contained numerous sand grains

**Section C** contained numerous sand grains

The supplied washed fine dune sand sample is considered to be quartz sand which may be described broadly for engineering purposes as medium to fine quartz sand. The sand carries a very small amount of soft, weak and deleterious minerals within weathered lithic clasts and in indents on grain surfaces, along with very minor free mica. The total soft/weak mineral count is **0.8%**.

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## **The average content of weak, soft or non-durable minerals**

- 0.5%    sericite forming as alteration/weathering within the quartzite and lithic fragments
- 0.2%    earthy secondary iron oxides within indentations on the grains and along weathering cracks
- 0.1%    mica as free mineral grains