

Mineral Resources Tasmania

Mineralogical/Petrology Report

LJN2019-017b

AGGREGATE ANALYSES, ROBBINS ISLAND GRAVEL PIT



An unpublished Mineral Resources
Tasmania Report for:

HBMI Pty Ltd

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SUMMARY

Representative portions of the Robbins Island aggregate were examined mineralogically by XRD and stereomicroscopy and polarised light microscopy to determine its petrology and mineralogy, particularly related to AAR (Alkali Aggregate Reactivity) potential.

The quartzite aggregate has moderate AAR potential as it contains a significant proportion of moderately stressed quartz.

INTRODUCTION

A bag of coarse aggregate was submitted by HBMI Pty Ltd to determine the mineralogy of the aggregate, from Robbins Island.

The main objective of this study is to determine the potential for alkali-aggregate reactions (AAR) in the aggregate/sand.

Alkali-aggregate reactions, particularly alkali - silica reactions, are a potentially deleterious form of reaction in concrete, which may cause significant cracking and deterioration (British Cement Association, 1988). The reaction is relatively well known in some parts of the world, but has been rarely reported in Australia (Shayan, 1991). The reactions are usually related to unstable silica minerals such as stressed quartz, chert and chalcedony (British Cement Association, 1988). Recent studies suggest that there appears to be more potential with coarser aggregates containing stressed quartz, than with finer aggregates (Cement and Concrete Association of New Zealand, 1991). There are a few proven cases in Tasmania, and the potential for reactions with some Tasmanian aggregates is probably quite significant, given appropriate conditions (Alderman, et al., 1947; Threader, 1992, Bottrill, 1992).

The sample details are given in Table 1.

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TABLE 1: SAMPLE DETAILS.

MRT Reg. No.	Sample Number	Location	Sample Description
G409253	20/14 Con Agg – Robbins Island.	Robbins Island	20mm quartzite aggregate

METHODOLOGY

To determine the AAR potential of the rock, a representative portion of the material was prepared as grain mount thin sections to study the mineralogy and textures. Some was tested by XRD to confirm the quartz content.

PETROGRAPHIC EXAMINATION

In hand specimen, the sample consists of a medium grained, white to pale grey quartzite with some limonite staining in fractures and patches, with no obvious pyrite, veining, organic matter or other particles or contaminants.



Fig. 1. Sample G409253, Aggregate sample as received, Plain light, FOV (field of view) ~100mm.

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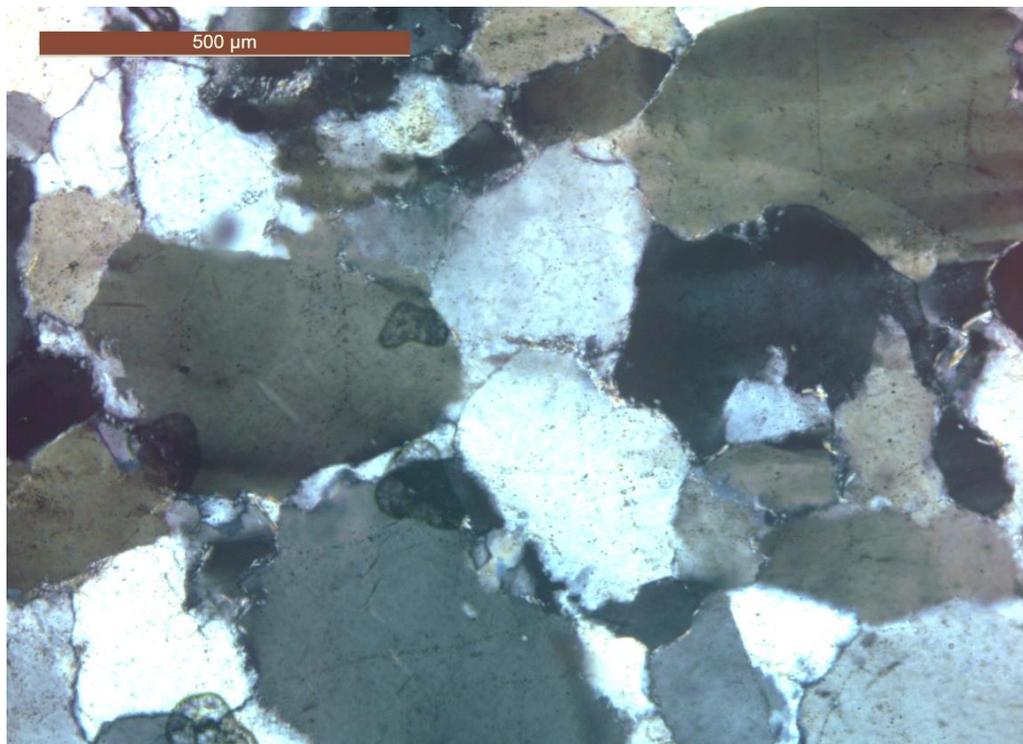


Fig. 2. Sample G409253, Polarised light, crossed polars, showing some weakly to moderately stressed quartz grains (grey to white and creamy).

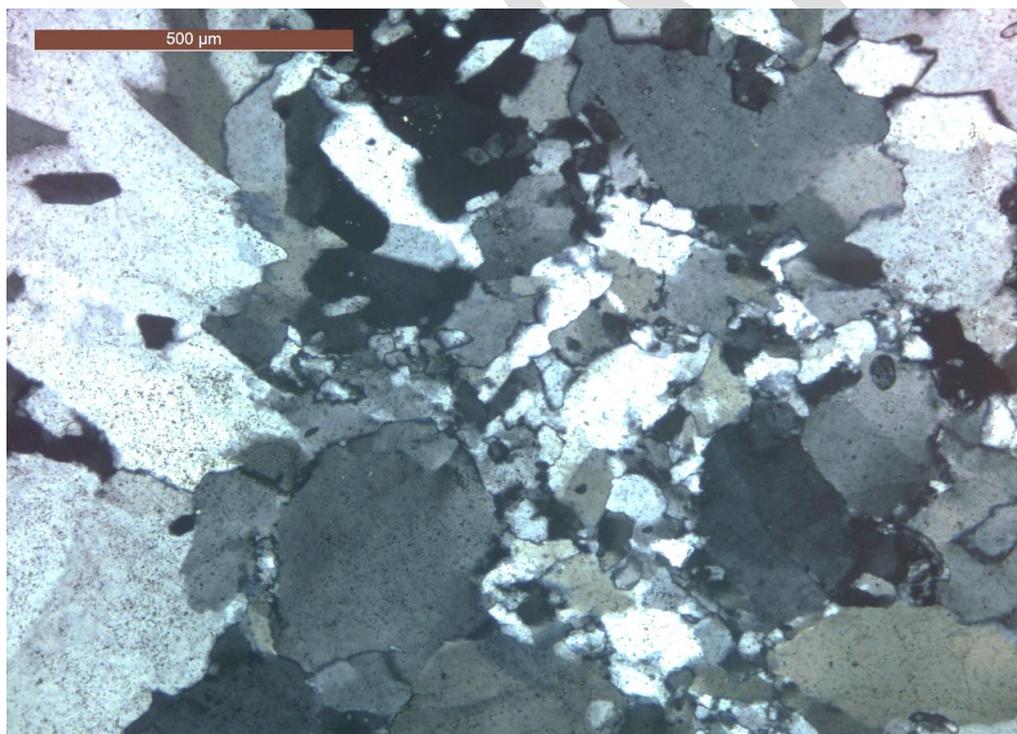


Fig. 3. Sample G409253, Polarised light, crossed polars, showing some weakly to moderately stressed quartz grains (grey to white and creamy), partly recrystallised to finer grains.

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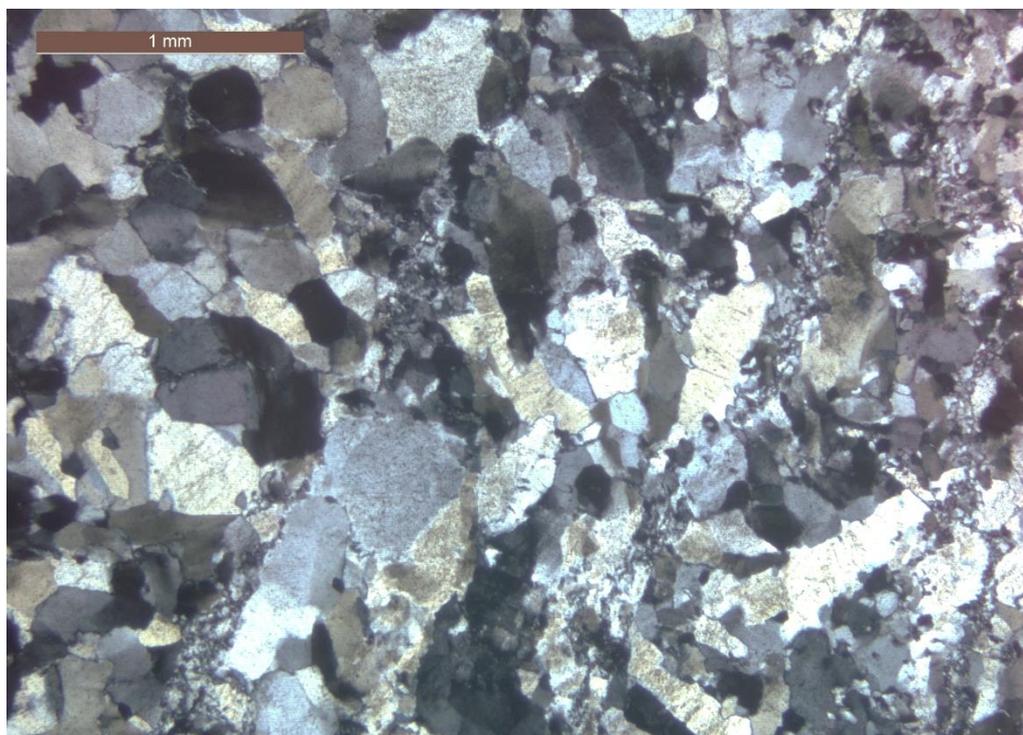


Fig. 4. Sample G409253, Polarised light, crossed polars, showing some weakly to moderately stressed quartz grains (grey to white and creamy), with partly recrystallised cherty shear zones.

In thin section the sample consists mostly of natural quartz grains, between 0.05 – 0.6 mm in size, well rounded to angular, with no indication of any clays, coatings, weathering or alteration (Fig. 2-4). Trace minerals include traces of opaque oxides. There is no detectable feldspar, carbonates or organic matter.

Mineralogically the sample is dominated by quartz (>99%), but about 1% of this is as chert (very fine grained quartz) (Fig. 4). About 25% of the quartz grains contain moderately to highly stressed quartz (Figs. 2-4).

XRD ANALYSES

The samples were prepared, examined and analysed in the MRT laboratories, Rosny Park, Tasmania. They were run on a Rigaku Miniflex 600 X-Ray Diffractometer system: a 600W generator 150mm goniometer with a Cu tube; 40kV/15mA, sample spinner and a D/teX Ultra High Speed 1D Detector with Be

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window, -3° to $145^{\circ} 2\theta$ scanning range and 2° - $140^{\circ} 2\theta$ measuring range, with a scanning speed of 0.01 to 100 $^{\circ}$ /min, A graphite monochromator and a K β Ni- filter, The analysis software used is the PDXL2 using the ICCD database.

The results are shown in Appendix 1 and indicate only quartz and no detectable secondary minerals. No clays, sulphides, sulphates or other deleterious constituents were detected.

DISCUSSION AND CONCLUSIONS

There is a moderate amount of highly stressed quartz plus a small amount of chert grains in this quartzite which can indicate a potential AAR risk.

The AAR potential of this aggregate is moderate.

REFERENCES

- Alderman, A.R., Gaskin, A.J., Jones, R.H. and Vivian, H.E., 1947. Studies in cement aggregate reaction, Part 1. *CSIRO Bull.* 229, p.7-42
- Bottrill, R.S., 1992. Petrography of some concrete from the Gordon damsite. Unpub. Rept. from the Tasm. Dept. Mines to the H.E.C., Hobart.
- British Cement Association, 1988. The diagnosis of alkali-silica reaction. British Cement Association, London. 36 pp.
- Shayan, A., 1991. Alkali - aggregate reaction and its prevention. CSIRO, Melbourne.
- Threader, 1992. Potentially reactive aggregates in Tasmania. Concrete Institute of Tasmania, Hobart

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These analyses collected in the MRT laboratories, along with some other data on the samples submitted, may enter the MRT databases but every attempt will be made to ensure the data remains closed file and not be available externally, except at your request.

DRAFT

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Appendix 1: XRD Analyses

MRT Laboratory Report

Client: G. Russell, HBMI
Sample Source: Robbins Island
MRT Job Number: LJN2019-017b
Analysis: Approximate Mineralogy
Method: X-Ray Diffraction
Analyst: L. Unwin
Date: 26/2/2019

Analysis Results – G409253

General information

Analysis date	2019/02/26 11:26:59	Measurement date	2019/02/14 10:35:26
Sample name	LJN2019-017	Operator	lunwin
File name	G409253.ras		
Comment	Shifted -0.04		

Quantitative analysis results

Phase name	Content(%)	Formula
Quartz	100	SiO ₂