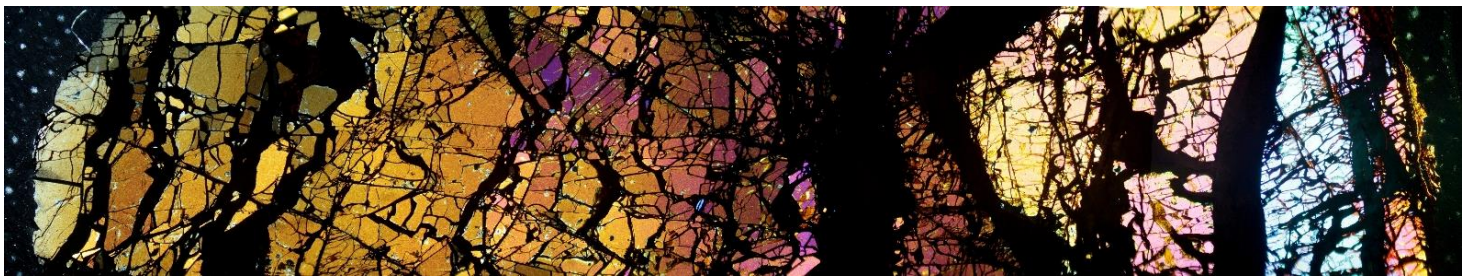

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PETROGRAPHIC REPORT ON A SAND SAMPLE (TYN18S-00587) FROM TYNONG QUARRY

prepared for

FULTON HOGAN
TYNONG, VIC

Purchase Order: OJ 617442

Invoice Number: 00008104

Client Ref: Yvonne Pitt

Issued by

C. A. Nix BAppSc MEngSc
3 April 2018

Sample Number: TYN18S-00587 **Date Sampled**: 01/03/2018

Product Type: Sand **Date Received**: 12/03/2018

Source: Tynong Quarry

Work Requested Petrographic analysis in relation to use as concrete

Methods Account taken of ASTM C295 Standard Guide for *Petrographic Assessment of Aggregates for Concrete*, the AS2758.1 – 2014 *Aggregates and rock for engineering purposes part 1; Concrete aggregates (Appendix B),* the AS1141 Standard Guide for the *Method for sampling and testing aggregates*

Identification Quartz medium to coarse sand

Description

The sample consisted of about 5 kg of broadly pale yellowish brown, damp sand. The sand displays subangular to subrounded quartz grains and minor more rounded lithic clasts.

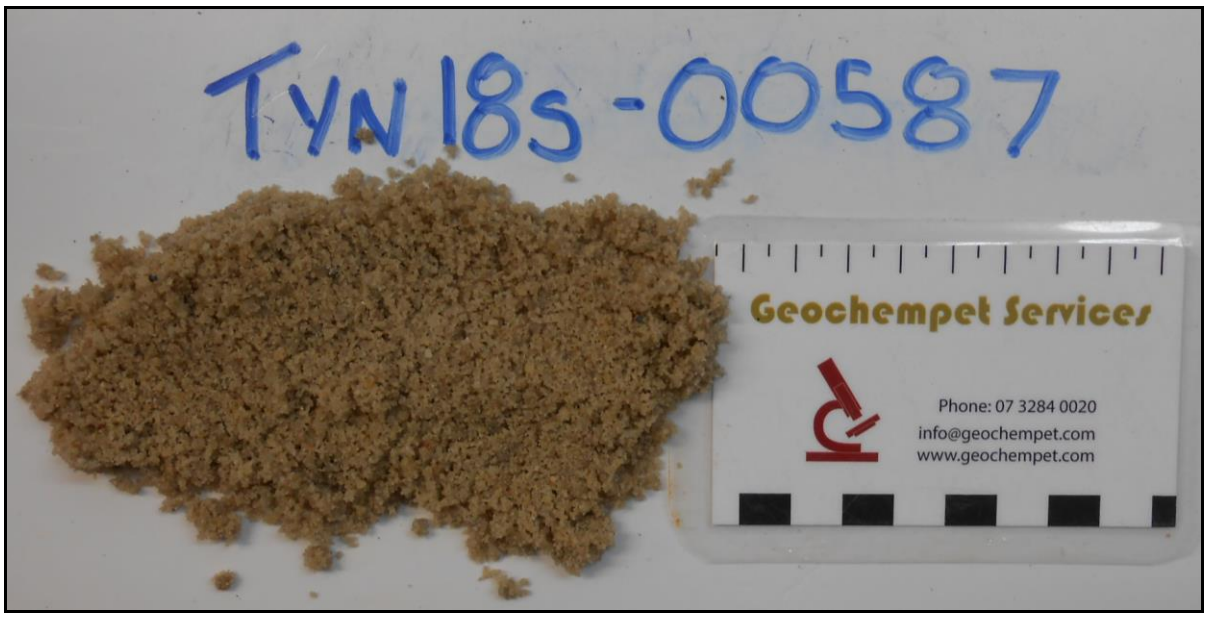

Figure 1: Digital image of sub-sample from supplied coarse sand sample.

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

Sieve Size	Wt % of sample
Coarse (>1.18mm)	40.6%
Medium (>0.3mm)	42.0%
Fine (>0.075mm)	16.6%
Silt (<0.075mm)	0.8%

Clasts range up to 4mm. The coarse fraction consisted of mainly quartz grains, minor lithic fragments. A subsample swirled with water in a beaker generated little or no turbidity indicating minor silt and free clay present.

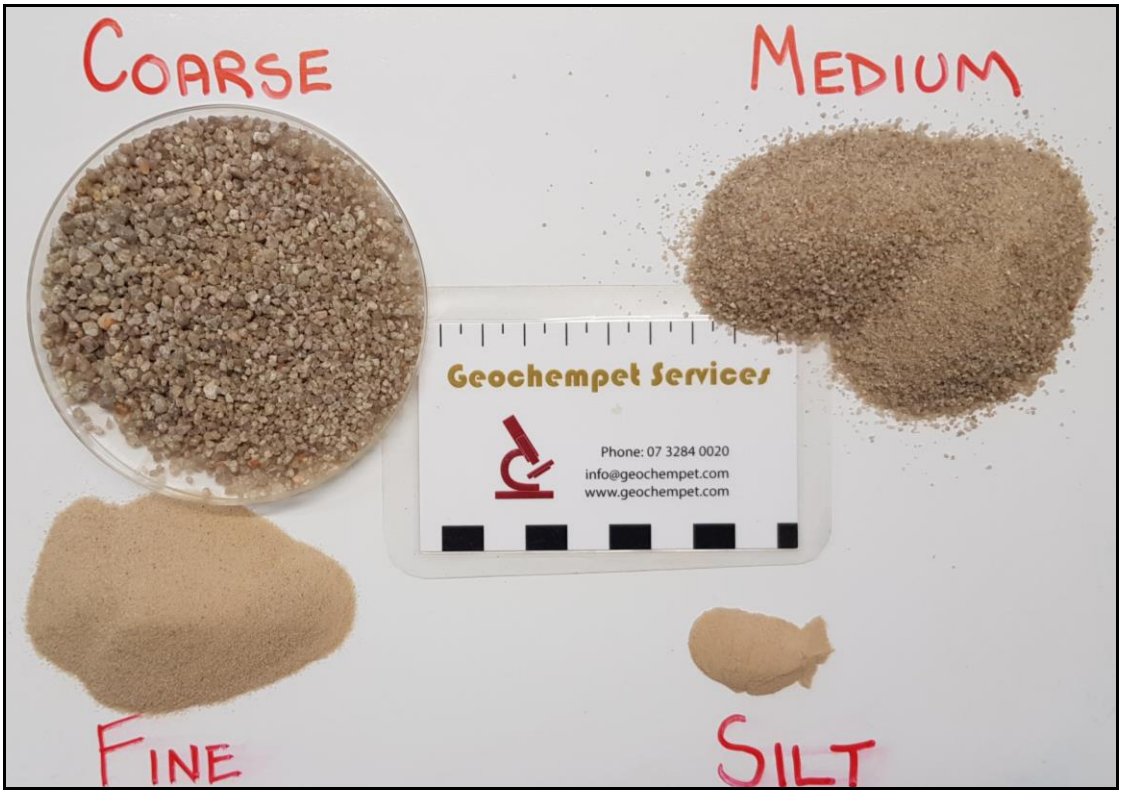

Figure 2: Digital image of sieve fractions recorded above.

Figure 3: Digital image of sieve fractions recorded above.

A thin section was prepared to allow detailed microscopic examination in transmitted, polarized light. A count of 100 widely spaced points in thin section indicated the following approximate composition (volume percent):

80%	quartz as single unstrained or mildly strained grains (73%) and similar crystalline composite grains (7%)
12%	quartz as moderately strained crystalline composite grains
8%	quartzite (1% moderately strained)
<1%	feldspar grains
<1%	other free mineral grains
trace	secondary iron oxide coatings

Microscopically, quartz is seen to occur as single grains (73%), simple crystalline composite grains of unstrained to mildly strained quartz (7%), as crystalline composites of moderately strained quartz (12%), and also as clasts of quartzite (8%).

Other free mineral fragments include feldspar (<1%).

Secondary iron oxide coatings appear to be in trace amounts.

Comments and Interpretations

This supplied sand sample (labelled TYN18S-00587) from Tynong Quarry is identified as essentially clean, water-worn quartz sand which may be regarded broadly as medium to coarse for engineering purposes.

The **free silica content** (or quartz plus chert content) of the supplied sand is about **>99%**, comprising >92% quartz as free grains or simple crystalline composites and 8% quartz locked within lithic fragments of quartzite and arenite.

Being composed mainly of hard, strong and durable, water-worn, coarse mineral and rock fragments, the sand is interpreted to be **physically suitable for use as concrete sand**.

The sand as a whole is predicted to have **potential for mild or slow deleterious alkali-silica reactivity in concrete**. It carries about 13% of moderately strained quartz.

Thus, sand of the type represented in the supplied sample is interpreted to be **suitable for use in concrete** provided that appropriate precautions are taken in mix and engineering design to take account of its perceived potential for mild or slow deleterious alkali-silica reactivity.

Guidance on how to deal with the perceived mild to slow potential for deleterious alkali-silica reactivity may be found in 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 >99%

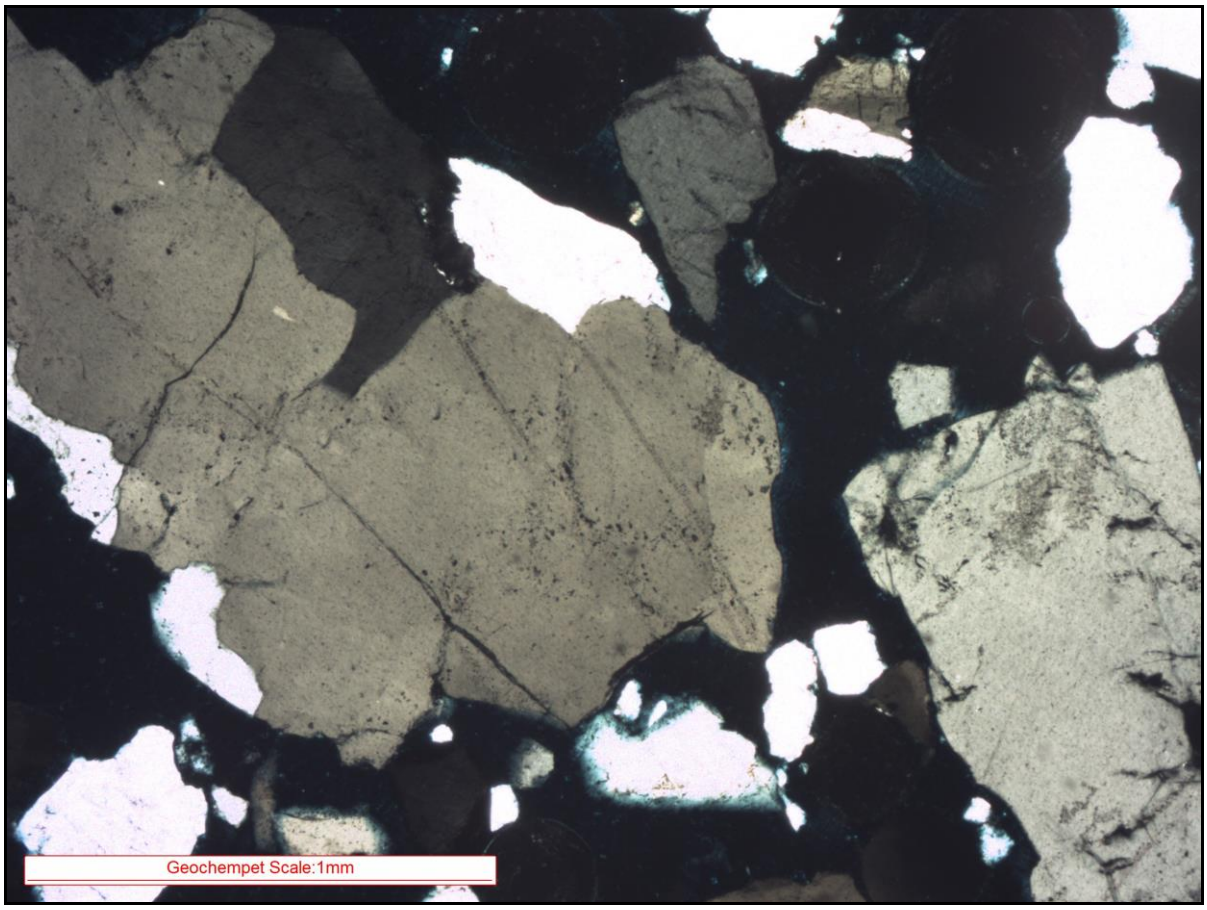

Figure 4: Image taken at low magnification in transmitted cross polarised light, shows a typical view observed through section. Image is dominated by sub-angular to sub-rounded quartz and clasts of quartzite.