Geology & Resource Potential Assessment of Fishes Quarry, Interlaken Road, Southern Midlands

Report for Southern Midlands Council

by

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1 INTRODUCTION & BACKGROUND INFORMATION

Southern Midlands Council operates a construction materials quarry located approximately 5km northwest of Oatlands and accessed from the eastern side of Interlaken Road (Figure 1). The quarry is on private grazing land and is covered by Mining Lease 1490P/M (3 hectares), which is current until 27/9/2017. The quarry has provided a range of road making and general construction materials since 1992 and is considered by Council to be an important asset, due largely to the diversity of crushed stone products facilitated by the somewhat unusual geological setting (see discussion of geology below).

Figure 1. *Location of Fishes Quarry, immediately east of Interlaken Road, approximately 5km northwest of Oatlands (image supplied by Integrated Land Management & Planning).*

Council wishes to upgrade its existing permitting status to Level 2 and extend the lease area, therefore future production options and resource potential are under consideration. Barry Williams, Integrated Land Management and Planning, is assisting Council manage tenement and permitting issues and Ken Morrison, K C Morrison Pty Ltd, has been asked to provide a geological assessment of the site to assist forward planning.

On Monday 11th November, 2013 Jack Lyall, Council officer managing quarry operations and materials requirements, met with Ken Morrison at the Oatlands Council Chambers, followed by a site visit to the quarry to demonstrate the materials and overview the issues

under consideration. Following the overview, Ken Morrison examined and mapped the key aspects of the quarry geology and resource potential. This report documents the field observations and makes some conclusions regarding future options.

All coordinates quoted are by hand held GPS and using GDA94 datum.

2. GEOLOGY

The quarry is developed on a Jurassic dolerite sill with a thin overlying unit of Triassic quartz-clay sandstone and siltstone (Figure 2). The dolerite has intruded the sedimentary rocks as a hot magma and thermal alteration around the contact zone has resulted in bleached, hard, brittle, blocky siliceous hornfels within the sedimentary unit and fine grained blocky, brittle chilled margin dolerite. Both contact altered rock types extend for only a few metres either side of the contact and represent minor fractions of the exposed resource. Locally, deep weathering and oxidation has decomposed the contact rocks.

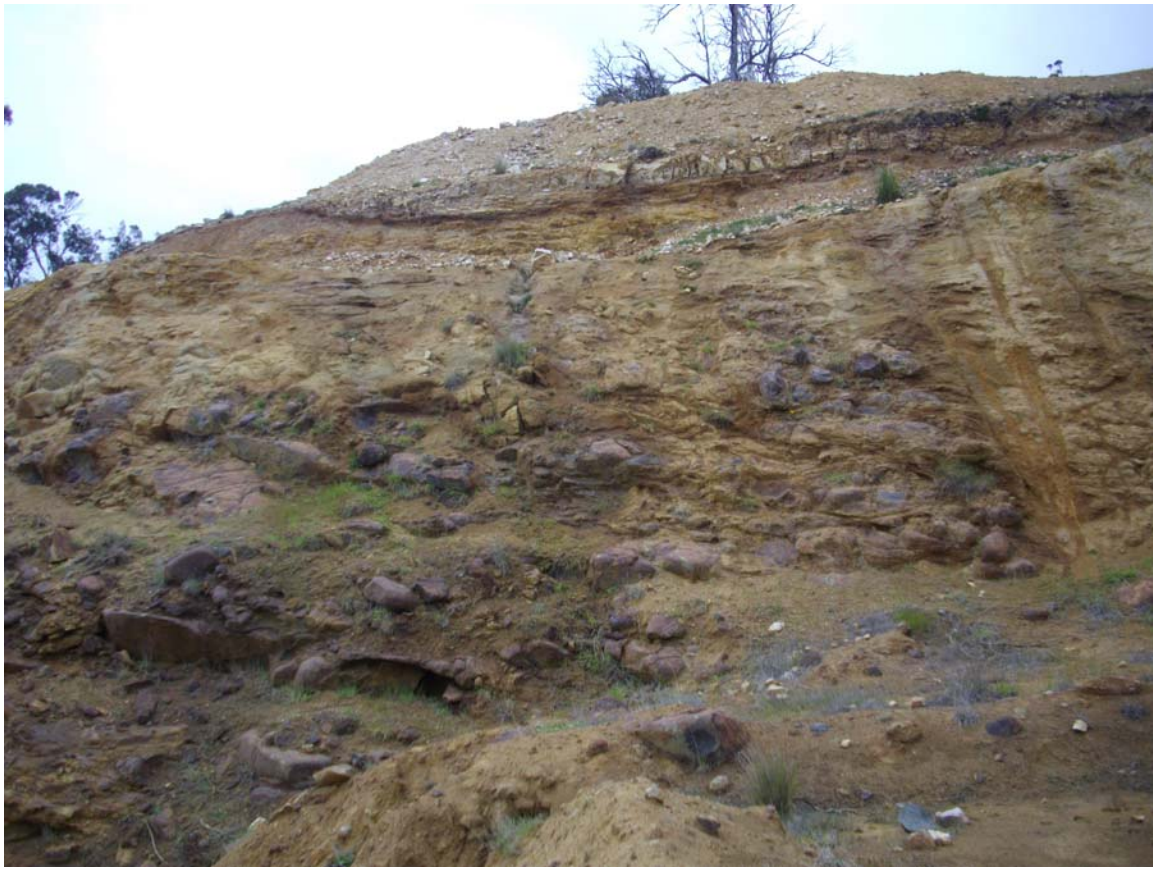

Figure 2. *Rounded boulder sized kernels of fresh hard dolerite embedded in weathered soft dolerite, overlain by silicified sandstone, southern end of the current quarry. Note the increasing proportion of fresh dolerite with depth (face approximately 6 metres high).*

At the southern end of the quarry the dolerite-sandstone contact is near horizontal (with minor buckling deformation – Figure 2) but at the northern end the contact dips north at a shallow angle and transgresses the sandstone bedding slightly (Figure 3).

Figure 3. *Shallow north dipping contact between bleached, partly silicified flat lying sandstones, overlying deeply weathered oxidized dolerite, northern end of the quarry. This dolerite is an excellent source of brown gravel for road making but the sandstone is clay rich and unstable and is generally left for rehabilitation landscaping.*

In the central part of the quarry the dolerite is essentially subcropping, with just a thin lag of sandstone regolith occurring on the ground surface immediately behind the quarry high wall. Sedimentary rock overburden increases in thickness towards both the north and south.

Thermal alteration at the roof contact of the dolerite sill has resulted in vertical and horizontal cooling joints in the dolerite, which in turn have allowed weathering and oxidation to penetrate deeper than would normally be seen in a fresh bluestone quarry. Normally this situation would down grade the rock quality, however the abundance of deeply weathered dolerite at Fishes Quarry is a suitable brown gravel source material and is therefore an integral part of the quarry viability (see discussion below).

Some 100 metres southeast of the quarry centre, boulders of scoriaceous basalt have been piled into a corner of the paddock. These rocks are presumed to be derived from the remnant patches of Tertiary basalt outcrop mapped on the Geological Survey of Tasmania 1:50,000 Series Oatlands Sheet. The basalts play no role in the economic geology of the quarry

3. CONSTRUCTION MATERIALS & RESOURCE POTENTIAL

Fishes Quarry has been and is a source for two main road building products:
1) Crushed stone brown gravel for gravel roads, blended to approximately 70% deeply weathered dolerite plus 30% fresh bluestone dolerite aggregate (Figure 4).

Figure 4. *Aggregate for gravel road construction – approximately 70% deeply weathered dolerite and 30% fresh bluestone dolerite. Minor amounts of pale blocky hornfelsed sandstone can be tolerated.*

2) Crushed bluestone aggregate for use as base material in sealed road construction, blended to approximately 85% fresh dolerite plus 15% deeply weathered dolerite (Figure 5).

The unusual geological setting of a sub horizontal sill with the roof contact preserved almost at ground surface has resulted in fracture transmitted weathering in the dolerite,

down to at about the natural floor level of the quarry, without ramping down into a pit. These conditions have produced a much higher proportion of brown weathered dolerite than would normally meet specifications for a crushed stone dolerite quarry. However, given the high proportion of gravel roads within the municipality, the weathered material is an asset.

Figure 5. *Aggregate for constructing the base of sealed roads – approximately 15% deeply weathered dolerite and 85% fresh bluestone dolerite. Almost none of the sedimentary rock can be tolerated.*

In addition to the two main products, small stockpiles of other blends, and coarse bluestone aggregate, are maintained on site for occasional use on civil works in the municipality, such as drains, hard stand gravel and general fill. Substantial amounts of decomposed clayey sandstone and deeply weathered clayey dolerite surplus to needs are exposed in the current workings and are available for rehabilitation landscaping.

Considering both the optimum mix of materials needed and the current rock exposure in the quarry face, the best potential for demonstrating additional resource to support an expanded operation, is to develop in a southeasterly direction from the dolerite high wall in the central part of the current quarry (Figure 6). Drilling ahead of the current face is required to confirm the resource.

Figure 6. *Dolerite high wall in the centre of the current quarry. After pre stripping approximately 0.5m of soil and regolith, the proportions of fresh and weathered dolerite are ideal for current needs and the floor level allows for control of drainage entering the quarry from the southern (right) side. Additional resource potential appears best to the southeast, i.e. obliquely to the right.*

Exposed benches and remnant protrusions represent approximately 5 years of reserves at current production levels, plus substantial amounts of inferior material which would be suitable for rehabilitation (Jack Lyall, pers. comm.). Excavation of these remnants would also substantially tidy up the site and make more usable room for operating on the quarry floor. Limits to relatively high grade materials in the current quarry can be mapped at approximately 525,632mE, 5,319,096mN at the southern end and approximately 525,616mE, 5,319,249mN at the northern end. Increasing waste material is the main problem to the north (Figure 7) and a combination of increasing waste, decreasing wall height and a need for drainage control limit the southern end. This still leaves a 150 metre north-south panel of good quality road construction materials with minimum waste, flanked to the north and south by materials suitable for rehabilitation earthworks.

Figure 7. *Northern end of the quarry, showing good quality weathered and fresh dolerite to the right, grading to increasing waste due to deeply weathered high clay dolerite and sandstone to the left (north) of photo.*

4. CONCLUSIONS

- The geology of Fishes Quarry consists of a sub horizontal dolerite sill intruded into bedded sandstone, with the roof contact sub cropping above the middle of the current quarry face. The intrusive contact and associated fracturing, deep oxidation and weathering have resulted in a range of construction material rock types which can to summarised into three categories: bluestone, brown gravel, and waste rock and clay. By selective crushing and blending the bluestone and brown gravel categories have to date satisfied the road making and general civil works needs of the Southern Midlands Council in the area. Substantial amounts of waste rock and clay are available for site rehabilitation.
- Pre stripped and partly benched material exposed in the current workings are estimated by Council to be sufficient for a further five years of reserves at current production rates. This scenario can also include staged rehabilitation landscaping and some drainage control.
- The exposed geology indicates that the best potential for additional resources of high grade material is in a southeasterly direction from the centre of the current

quarry face and it is recommended that any plans to expand production or extend current production rates longer than about five years should include a drilling program to test that potential. A recommended minimum drilling program to achieve resource confidence is 4 x 25 metre vertical cored diamond drill holes collared about 30 metres behind the current face and spaced about 40 metres apart. Estimated total cost for the campaign would be in the order of $50,000. The drilling program, including geology and reporting, could be initiated and completed within a few months so, depending on Council's priorities for the site, there may be no urgency to make a quick decision regarding circumstances which may develop years from now.

Ken Morrison
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