I hereby give notice that an ordinary meeting of the Golden Bay Community Board will be held on:

Date:	**Monday 20 May 2024**
Time:	**1.00pm**
Meeting Room:	**Golden Bay Service Centre**
Venue:	**78 Commercial Street, Tākaka**

Golden Bay Community Board
Hapori Whānui ō Mohua

MINUTES ATTACHMENTS

Mining at Sam's Creek 5 May 2024

The ore body that Siren Gold currently holds the licence for has been explored by many companies since the 1980s. It is of volcanic origin, called a pluton, which amounts roughly to a volcano that didn't have quite enough energy to blow its contents into the atmosphere, but the lava cooled and set while still making its way to the surface.

There have been several estimates of how much gold and other elements it holds. The accompanying technical geology paper gives a summary in the table and text on page 4. The paper notes a high sulphide content.

Key facts are an identified ore body containing 10.7 million tonnes of rock with the following average concentrations of metals, in parts per million.

Arsenic	6,972
Zinc	324
Lead	148
Copper	16
Molybdenum	5.6
Gold	1.8
Silver	1.1
Bismuth	0.4

That implies the following weights of elements in the ore body (given here in tonnes).

Arsenic	74,600
Zinc	3,467
Lead	1,583
Copper	171
Molybdenum	60
Gold	19.3
Silver	11.8
Bismuth	4.28

The extraction process would be to mine the rock, transport it to a processing factory where it is ground to fine powder and treated with cyanide to make the gold soluble. The cyanide-treated rock powder is then pumped out as a slurry to a waste area, variously referred to as a slime dump or tailings dam. The mine image at left is from Google maps by searching for 'Waihi Coromandel'. It covers approx 2.5km square.

The ore body and Sam's Creek are in the gorge of the Takaka River, upstream from Upper Takaka. The terrain is very steep and it would be impractical to process the ore nearby. In the 1980s CRA said that if they went ahead with the mine they would construct a processing works and tailings dam 'on flat land near Upper Takaka'. Such land is part of the Arthur Marble Aquifer recharge area. Consequently any material leaching

The Sams Creek Peralkaline Granite Hosted Gold Deposit, Northwest Nelson, New Zealand — A New Variant on Alkaline Intrusion-Related Gold Deposits

R L Brathwaite[1] and K Faure[2]

ABSTRACT

At Sams Creek a peralkaline granite porphyry dyke hosts gold-bearing sulfide-quartz-siderite veins. The granite dyke intrudes Ordovician-Silurian metapelite and quartzite, and has thin lamprophyre dykes along its contacts. The mineralised veins and the granite and lamprophyre dykes have been deformed during several phases of folding, the youngest of which is Early Cretaceous. The granite has been hydrothermally altered, with early magnetite-siderite±biotite alteration overprinted by sulfide and quartz-siderite veins and quartz-perthite-albite-siderite-pyrite-rutile±sericite alteration assemblages. The sulfide veins are composed of arsenopyrite + pyrite ± gold ± galena ± sphalerite ± chalcopyrite ± pyrrhotite ± graphite, with minor quartz and siderite. The gold contains significant silver (up to 30.8 wt per cent) and ranges in fineness from 692 to 844. Immiscible liquid-rich fluid inclusions, in quartz protected from recrystallisation by enclosing arsenopyrite, contain carbonic liquid that homogenised at temperatures of 320 - 355°C.

The Sams Creek gold deposit is distinguished from the orogenic gold deposit type by its stockwork veining, magnetite-siderite±biotite alteration, high sulfide content, ore mineralogy and the absence of mineralisation in the metapelite country rocks. Features of the Sams Creek gold deposit do not fit neatly into existing classifications of granite-related gold-bearing deposits. The peralkaline composition of the Sams Creek granite and the absence of molybdenite and paucity of chalcopyrite, are major points of difference with gold-rich porphyry copper deposits. The presence of a low sulfidation-state ore mineral assemblage, carbonate alteration and carbonic fluid inclusions at Sams Creek are typical of many of the reduced granitic intrusion-related type of gold deposit. However, notable differences are:

1. the reduced type granites are metaluminous and calc-alkaline; and
2. Sams Creek only has high As in contrast to elevated Bi, W, As, Mo, Te, and Sb in the reduced type.

The Sams Creek deposit also shows affinities with gold deposits associated with alkaline magmatism, and it appears to be a new variant of this type as an As-Au deposit associated with a peralkaline granite and lamprophyre.

INTRODUCTION

Gold mineralisation at Sams Creek, 25 km south of Takaka in northwest Nelson, was discovered in 1974 by GW Patterson of CRA Exploration. The mineralisation was subsequently investigated by CRA Exploration (Hawke, 1982, 1984; Rosengren, 1985; Clemenston, 1987), and is currently being explored by Oceana Gold Ltd (formerly GRD Macraes Ltd) (www.oceanagold.com). The gold is associated with arsenopyrite-pyrite-quartz-siderite mineralisation in a peralkaline granite porphyry dyke, which intrudes lower Palaeozoic metasedimentary rocks. The first published record of the dyke noted that it was a recrystallised riebeckite microgranite (Shelley, 1984). Windle and Craw (1991) considered that the granite dyke had been buckled and dismembered by folding, but they concluded that the mineralising fluids were of metamorphic origin. Tulloch (1992) described the mineralogy and chemistry of the granite as peralkaline and noted that the granite was altered by late and/or postmagmatic fluids. Osborne (1997) suggested that the mineralisation was produced by late stage magmatic hydrothermal fluids. The mineralisation is confined to the granite and the ore mineralogy, hydrothermal alteration and stable isotope compositions of the vein minerals are consistent with a magmatic-hydrothermal origin (Faure, Brathwaite and de Ronde, 2003).

Here we describe the Sams Creek deposit as a granite-hosted gold-sulfide deposit which, although it has been deformed and largely recrystallised shows many features that are similar to the reduced granite related (eg Thompson and Newberry, 2000; Lang and Baker, 2001) and alkaline intrusion related gold deposit types (eg Jensen and Barton, 2000).

REGIONAL SETTING

The Sams Creek area lies within the Eastern Sedimentary Belt of the Takaka terrane (Figure 1), a belt of Lower Palaeozoic metasedimentary rocks (Grindley, 1980; Cooper, 1989; Rattenbury, Cooper and Johnston, 1998). This terrane was deformed and metamorphosed under lower greenschist facies conditions prior to intrusion of the Late Devonian (367 Ma) Rameka Complex (Cooper, 1989). The terrane was subsequently intruded by granite and granodiorite of the Early Cretaceous Separation Point Suite (Tulloch, 1983; Muir *et al*, 1995). Three phases of deformation have been identified in the region: a first phase of recumbent folding (F_1), a second of inclined folds (F_2) about subhorizontal north-south trending axes, and a third (F_3) of localised northeast to southeast trending folds (Grindley, 1980; Jongens, 1997). Bradshaw (2000) has shown the Early Devonian Baton Formation is affected by the F_1 and F_2 folding, and

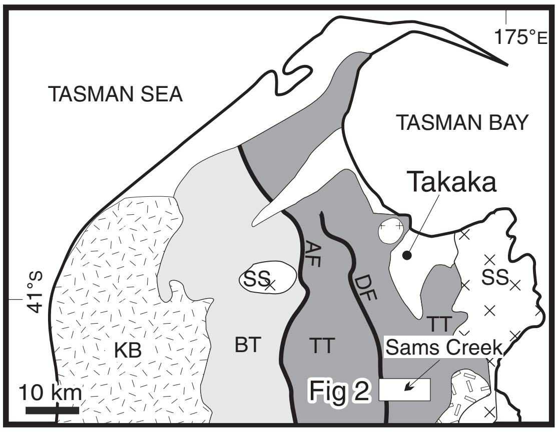

FIG 1 - Regional location map of Sams Creek area, west Nelson. Buller Terrane (BT), Takaka Terrane (TT), Karamea Granite Batholith (KB), Separation Point Suite Granitoids (SS), Riwaka Complex (RC), Anatoki Fault (AF), Devil River Fault (DRF). Inset shows location of Figure 2.

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TABLE 2

Comparison of Sams Creek gold deposit with other types of gold deposits.

	Sams Creek Au deposit	Porphyry Cu-Au-Mo deposits	Reduced granite Au deposits	Alkaline intrusion related Au deposits	Orogenic Au deposits
Granite: type composition oxdidation-state	A Peralkaline Oxidised-reduced	I Calc-alkaline Oxidised	I Sub-alkaline Reduced	A and I Alkaline-peralk Oxidised	No direct spatial relationship
Lamprophyres	Yes	No	Local	Variable	Variable
Tectonic setting	Anorogenic	Subduction-related plutonic arcs	Continental inboard plutonic arcs	Continental inboard plutonic arcs	Orogenic slate belts
Vein style	Stockwork	Stockwork and breccia	Stockwork and breccia (shallow) Planar (deep)	Stockwork	Planar fault-hosted
Metals+Fe+Au	As, Zn, Pb, Ag	Cu, Mo, Pb, Zn, Ag	Bi, Mo, W, Sb, (Sn)	Cu, Mo, Te	As, W, Sb
Sulfide content	High 10 - 30 %	High	Low <5 %	High	Low <3 %
Ore minerals+gold	apy, py, gn, sl, cp, po	py, cp, bn, mo	po, py, apy, mo, sch	cp, bn, py, mo, mt, hm	py, apy, sch, stbn
Sulfidation-state	Low	High	Low	Moderate	Low
Alteration: early Alteration: late	mt-sd-(bt) qtz-sd-py-rt-(ser)	kspar-bt-mt qtz-ser	ab-kspar ser-cb	kspar-bt-mt-anh cb-(ser)	ser-cb-qtz-chl
Fluid inclusions	V-rich carbonic	V-rich and high salinity	CO_2-rich and high salinity	Mod-high salinity and CO_2-rich	Liquid-rich carbonic
References	This study	Sillitoe (2000)	Thompson and Newberry (2000)	Jensen and Barton (2000)	Groves *et al* (1998)

Abbreviations: ab = albite, anh = anhydrite, apy = arsenopyrite, bt = biotite, bn = bornite, cb = carbonate, chl = chlorite, cp = chalcopyrite, ep = epidote, gn = galena, kspar = potassium feldspar, mo = molybdenite, mt = magnetite, peralk = peralkaline, po = pyrrhotite, py = pyrite, qtz = quartz, sch = scheelite, ser = sericite, sd = siderite, sl = sphalerite, stbn = stibnite.

stibnite, and has early magnetite-siderite±biotite alteration. Additional differences from orogenic gold deposits are the stockwork-type veining and absence of mineralisation in the metapelite country rocks at Sams Creek. Windle and Craw (1991) proposed that the Sams Creek deposit was of the 'slate belt' (orogenic gold type) and contended that the mineralisation was confined to the granite because of its distinctive Fe^{3+}-rich composition. However, this view is at odds with their description of deformation textures in the quartz and sulfide veins, which indicates that the mineralisation pre-dated the deformation and metamorphism. It is conceivable that the mineralisation could be syntectonic, but the lack of any through-going structural control on the veins and the gross relationship of the mineralisation and the alteration to the granite host rock are inconsistent with a syntectonic origin (cf Marshall and Gilligan, 1993). Also, its A-type chemistry, suggests that the Sams Creek granite was emplaced in an anorogenic tectonic setting.

As listed in Table 2, features of the Sams Creek gold deposit show similarities and differences with the various types of gold-rich porphyry and granite-related deposit types. The high sulfide content, stockwork style sulfide-quartz veining and the presence of an early magnetite-biotite hydrothermal alteration are features of many gold-rich porphyry Cu deposits (eg Sillitoe, 2000). However, the tectonic setting, high-SiO_2 and peralkaline composition of the Sams Creek granite, the absence of molybdenite and paucity of chalcopyrite, the low sulfidation state of the ore mineral assemblage and the carbonic fluid inclusions are major points of difference.

A low sulfidation-state ore mineral assemblage (with arsenopyrite, pyrite and pyrrhotite), carbonate alteration and carbonic fluid inclusions are typical of the reduced-granitic intrusions type (eg Thompson and Newberry, 2000; Lang and Baker, 2001). However, there are some notable differences between the reduced-granitic intrusions type and the Sams Creek gold deposit. The Sams Creek granite is A-type and peralkaline, whereas granites of the reduced type are generally I-type and metaluminous and sub-alkaline or rarely alkaline granite. The Sams Creek gold deposit has a high sulfide content and only has high As in contrast to a low sulfide content and elevated Bi, W, As, Mo, Te ± Sb in the reduced type.

An association of gold-rich deposits with alkaline magmatism has also been recognised (eg Jensen and Barton, 2000). The Sams Creek gold deposit shows affinities with this type, although there are some differences (Table 2). The alkaline intrusion-related type covers a range of compositions from alkaline to peralkaline and are typically oxidised. Early magnetite-biotite alteration and late carbonate alteration are typical, as at Sams Creek. Some examples of this deposit type have an association with alkaline lamprophyres (eg Rock *et al*, 1989), such as the Porgera gold deposit in Papua New Guinea. However, alkaline granites with high SiO_2, comparable with the Sams Creek granite, are commonly associated with Mo±Au mineralisation and have moderate to high, rather than low, sulfidation states in the ore mineral assemblage.

Gold deposits associated with granitoids are a diverse group and the Sams Creek gold deposit, while showing some features of the various groups, appears to be a new variant of the alkaline intrusion-related type, as an As-Au deposit associated with a peralkaline granite and lamprophyre.

CONCLUSIONS

Stockwork vein mineralisation at the Sams Creek gold deposit, consisting of quartz, siderite, and arsenopyrite + pyrite ± Au ± galena ± sphalerite ± chalcopyrite ± pyrrhotite ± graphite, is restricted to a peralkaline granite porphyry dyke that intruded metasedimentary rocks. The granite dyke and the sulfide and quartz-siderite veins within it have been deformed and recrystallised during two phases of folding, the youngest of which is of Early Cretaceous age from the regional geological history. Therefore the emplacement of the granite and associated mineralisation is at least pre-Early Cretaceous.

The presence of stockwork veining, magnetite-siderite±biotite alteration, a high sulfide content with significant galena, sphalerite and chalcopyrite, and the absence of mineralisation in the metapelite country rocks distinguish the Sams Creek deposit from the orogenic gold deposit type. In relation to granite type, sulfide content and alteration, the Sams Creek gold deposit resembles alkaline intrusion-related gold deposits, whereas in its low sulfidation-state ore mineralogy with arsenopyrite, it is more akin to reduced-granite gold deposits. The association of a peralkaline granite with alkaline lamprophyre is a key feature and suggests that the occurrence of these rock types provides a target for exploration of analogues of the Sams Creek deposit in other terranes. The fact that the Sams Creek was only discovered in the 1980s is an enigma, because the gold-bearing sulfide-quartz veins at Sams Creek crop out in a region that was intensively prospected for gold in the late 1800s.

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Navigation Safety Sign Replacement Project

Tasman Harbourmaster Office
May 2024

Thriving and resilient Tasman communities

tasman district council | Te Kaunihera o te tai o Aorere

In partnership with DoC and MPI to create multi-agency signs

Multi-agency sign location suggestions
- Whanganui Inlet
- Collingwood
- Parapara
- Tarakohe

Tarakohe

Multi-agency sign example

Akaroa Harbour

Collingwood

Agencies involved …

- Department of Conservation
- Ministry Primary Industries (Fisheries NZ)
- Tasman District Council
- Consultation with Iwi and Golden Bay Community Board

➢ Nelson District Council's Harbourmaster Team are interested in following our lead on this project to update signage in Nelson

Westhaven/
Whanganui Inlet

Who will pay?

Signage real estate and costs to be split three ways $^{1}/_{3}$ TDC, $^{1}/_{3}$ DoC, $^{1}/_{3}$ MPI

Tasman Harbourmaster is applying for Community Grant Funding for Recreational Craft Safety from Maritime NZ

Benefits to the Golden Bay community …

- More attractive looking signage
- Less impact on the environment by having fewer signs
- All rules and regulations are in one place
- Signs that are easy to read & understand

➢ The same theme will be used throughout Tasman

Tukurua

Torrent Bay Jetty

Enhanced comprehension and awareness of navigation safety rules will increase water safety for everyone

CST-1183 Totaranui north WS

CST-1184 Totaranui south WS

Sign Concept

A0 – 1189 mmx841mm
Recommended size 1200x800mm