

TENNENT ISOKANGAS PTY LTD

NEW NORTH MT FARRELL MINE WATER QUALITY ASSESSMENT

Tullah, TAS

HZ00019.01-AA

April 2006

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Alan Robertson
Tennent Isokangas Pty Ltd
PO Box 1718
Milton, QLD 4064

Attention: Mr Robertson



Dear Sir,

RE: New North Mt Farrell Mine Water Quality Assessment

This letter presents our report on the water quality assessment for the New North Mt Farrell Mine, Tullah TAS.

If you have any questions relating to this report or if we can be of further assistance, please do not hesitate to contact the undersigned.

For and on behalf of

COFFEY GEOSCIENCES PTY LTD

IAN REEVES

TASMANIAN STATE MANAGER

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1 Copy Saracen Mineral Holdings Ltd

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Important Information about your Coffey Report

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Figure 1 New North Mt Farrell Mine Locality Map and Lake Rosebery Sampling Points

1. INTRODUCTION

This report presents the results of the water quality assessment conducted on the New North Mt Farrell Mine, Tullah Tasmania. The assessment was commissioned by Mr Alan Robertson from Tennent Isokangas Pty Ltd for Saracen Mineral Holdings (Saracen).

It is understood that Saracen is exploring the area surrounding the historical workings of the North Mt Farrell and New North Mt Farrell Mines for base metal mineralisation. At the time of the field investigation, drilling was focused beneath workings of the New North Mt Farrell Mine.

We also understand it is Saracen's intention to dewater the New North Mt Farrell Mine shaft to regain access to the original workings. Initial dewatering will be done down to the 1 Level where access will be gained via an adit immediately to the southeast of the shaft.

The aim of the investigation was to conduct a water quality assessment of samples taken from the shaft to determine its suitability for release into Lake Rosebery.

2. BACKGROUND INFORMATION

2.1 Geology

The Tasmanian Geology Survey 1998, 1:250,000 Geological Atlas of Southwest Tasmania shows the geology around the New North Mt Farrell Mine consists of a dominantly thickly bedded quartz sandstone and siliceous conglomerate (Owen Conglomerate) to the east separated by the Henty Fault to the dominantly felsic volcanoclastics and sedimentary sequences of the Tyndall Group to the west. Based metal mineralisation is found along the contact between these lithological units.

2.2 Climate

The Bureau of Meteorology (Hobart) indicates the average annual rainfall for the Tullah is 1950mm.

3. ON SITE EVALUATION

3.1 Field work

The field investigation was conducted on the 8th and 9th of March 2006, by a Geotechnical Geologist from Coffey's Hobart office and comprised of the following:

- Sampling water from the New North Mt Farrell Mine shaft from three levels to establish the likely presence of analyte stratification. Samples were taken from 30m, 150m and 280m below surface level. These samples were obtained using a BS500 bomb sampler (rented through Enviro Equip in Melbourne) which allowed for discrete sampling at specific depths.
- Sampling water from two locations within Lake Rosebery close to the natural discharge point for water coming from the New North Mt Farrell Mine area (see Figure 1). The purpose of this testing was to determine the background levels of metals in Lake Rosebery and to take a QA/QC sample.

3.2 Surface Conditions

The New North Mt Farrell Mine is located immediately east of the Murchison Highway on the lower slopes of Mt Farrell just to the north of the township of Tullah (see Figure 1). The shaft is positioned adjacent to North End Creek which drains to the west into Lake Rosebery. Any water outflow from the mine will follow this

drainage course.

3.3 Subsurface Conditions

Dipping the shaft indicated the shaft conveyances used in the mine now probably rest at the bottom of the shaft at a depth of 305m below surface. Using the shaft dimensions of nominally 3.6m x 1.5m (two conveyance compartments and one manway) and a total height of water of 280m (305m total shaft depth minus the 25m from surface to water level), the volume of water in the shaft is calculated to be 1560.8m³ (not including water contained on the levels). A back of the envelope calculation based on level plans from the mine indicates there is approximately 800m of development on 1 Level. Assuming drive dimensions of 2mx2m and 35m³ of water in the shaft down to 1 Level, the minimum volume of water to be removed to regain access to 1 Level is 3235 m³. This calculation does not provide for water in the country rock or in open voids which may exist.

3.4 Analytical Testing

Samples from both the New North Mt Farrell Mine shaft and Lake Rosebery were tested for the following analytes:

- Metals: arsenic, cadmium, chromium, cobalt, copper, lead, manganese, molybdenum, nickel, selenium, tin and zinc
- Anions: sulphate, chloride, fluoride, nitrate and nitrite
- Cations: calcium, potassium, magnesium and sodium
- Others: pH, temperature, conductivity, dissolved oxygen, total P and total N, dissolved organic carbon and redox

3.5 Results

The following results for samples taken were received from Amdel Laboratories in Melbourne. Please note the depth measurements are metres below water level and not metres below surface level. Water level was 25 metres below surface level.

Stratification is evident with metals generally found at higher concentrations at greater depths. Considering that, it is proposed to only initially dewater to the first level, analyses has focused on the water in the surface waters (NNFM3), although this stratification will need to be considered when further dewatering is planned.

3.5.1 Metals

Table 1 presents the metal results of samples from the shaft and Lake Rosebery, and the ANZECC guidelines for 95% protection of aquatic systems. The metals that exceed the guidelines to any extent are cadmium, lead, manganese and zinc. The background levels in Lake Rosebery need to be considered when considering water quality, because while the ANZECC guidelines for zinc are 0.08 mg/L, the background levels in Lake Rosebery are approximately 0.015. Coffey have previously conducted surveys of Lake Rosebery and Lake Pieman water, which suggest the background level for zinc can be up to 0.03 mg/L. Table 1 also presents the required dilution rates to reduce the metal concentrations in the shaft to either ANZECC guidelines or Lake Rosebery concentrations when these are higher than the ANZECC guidelines. The highest dilution rate is for zinc with a 1:138 dilution ratio. A dilution ratio of 1:92 would be required to bring lead concentrations down to ANZECC guidelines.

3.5.2 Cation and Anions

Table 2 present the results of sampling of cations and anions in the shaft and Lake Rosebery. The only parameter that is elevated in the shaft compared to Lake Rosebery is sulphate. Sulphate in the shaft is approximately two orders of magnitude higher than background levels. However, this level is lower than discharge limits for mines that discharge into west coast waters and is insignificant from a toxicological perspective.

* Sample depths from shaft (NNFM) are meters below water surface level. For depth below shaft collar add 25 meters.

Sample	Depth (m)*	DOC (mg/L)	Mg	Hg	As	Cd	Cr	Co	Cu	Fe	Pb	Mn	Ni	Sn	Zn
ANZECC 95%**				0.0006	0.0013	0.0002	0.001		0.0014		0.0034	1.9	0.011		0.008
NNFM3	5	26	12	<0.0001	0.007	0.002	<0.001	0.025	0.002	20	0.313	36	0.045	<0.001	1.8
NNFM2	125	26	73	<0.0001	0.065	0.035	0.006	0.051	0.033	44	7.139	290	0.092	0.029	11
NNFM1	255	32	180	0.0002	0.053	0.016	0.003	0.16	0.006	170	3.542	790	0.4	0.002	10
LR1	0.1	14	0.8	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	0.31	0.002	0.048	<0.001	<0.001	0.016
LR2	0.1	13	0.8	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	0.28	<0.001	0.033	<0.001	<0.001	0.01
Dilution Required to meet ANZECC guidelines or background concentrations					1:	5	10			1	92	19	4		138

Sample	Depth (m)*	Cl	Fl	SO4	Ca	Mg	K	Na
NNFM3	5	11	0.8	89	21	12	1.3	8.1
NNFM2	125	12	1.4	58	140	73	3.4	11
NNFM1	255	18	<0.5	3100	250	180	6.5	19
LR1	0.1	5.5	0.8	1.4	1.6	0.8	<1.0	4.4
LR2	0.1	5.4	0.8	0.9	1.5	0.8	<1.0	4.2

Sample	Depth (m)*	Total N	Total P	DOC	Nitrate	Nitrite	pH	Temp	Conductivity (mS/cm)	Redox
NNFM3	5	6	<0.1	26	<0.5	<0.5	5.19	14.72	0.3159	-32
NNFM2	125	<2.0	<0.1	26	<0.5	<0.5	4.58	15.09	2.607	29
NNFM1	255	<2.0	<0.1	32	<0.5	<0.5	5.74	20.38	3.316	81
LR1	0.1	4.5	<0.1	14	<0.5	<0.5	7.28	18.16	0.0315	113
LR2	0.1	<2.0	<0.1	13	<0.5	<0.5	7.28	18.16	0.0315	113

3.5.3 Nutrients

Table 3 presents the results of sampling of nutrients and other parameters in the shaft and Lake Rosebery. Total nitrogen (TN) is elevated in the surface waters of the shaft but total phosphorous (TP), nitrate and nitrite are less than detection for all samples collected. Phosphorous is considered the controlling nutrient in freshwater. Therefore, the nutrient levels in the samples tested reduce the likelihood of the discharge causing eutrophication in the lake. Dissolved organic carbon (DOC) is similar for all samples, while pH in the shaft is nearly three units lower than Lake Rosebery. The surface waters in the shaft are reducing whereas the lake waters are oxidising.

4. DISCUSSION

Water in the shaft is of a lower quality than that in Lake Rosebery. In particular, metals are elevated and pH is lower. There is currently no data relating to water quality on 1 Level, therefore water quality in the discharge may change during pumping. There are several options available for disposal of this water.

4.1 Direct Disposal to North End Creek

It is unlikely that the Department of Primary Industry, Water and Environment (DPIWE) would allow direct disposal of water from the NNFM workings to North End Creek because of the quality of the shaft water would be expected to have an impact on the creek. In addition, where the creek water would be discharges in to an area of the lake where only minimal mixing would occur.

4.2 Disposal to North End Creek after Treatment

It is assumed that DPIWE would require a reduction of the metal concentrations and increase of pH of mine water prior to discharge to the creek. Options include treatment using lime or other proprietary materials. This option would require capital expenditure and ongoing operating costs. Considering the volume of water to be discharged from the mine to access 1 Level maybe relatively small (3-4 ML) water treatment appears an expensive option.

4.3 Direct Discharge to Surface Waters of Lake Rosebery

As with the option for direct disposal of mine water to the creek, this option may not be acceptable to DPIWE because the water would be discharged to an area of Lake Rosebery with minimal mixing potential resulting in localised impact.

4.4 Direct Discharge to Sub-surface Waters of Lake Rosebery

This option is more likely to be acceptable to DPIWE if the discharge is in deeper water (eg 30-50 metres). In order to support this option, Coffey suggest that further characterisation of the toxicity associated with the shaft water is carried out. One method is toxicological testing using a NATA registered laboratory. This type of testing uses living organisms to assess potential effect of discharging contaminated water and provides a better indication of likely impact than chemical analyses alone. In support of this option, Coffey have previously commissioned testing of waters being discharged into west coast lakes and streams. That testing demonstrated that the DOC in west coast waters reduces the toxicity of waters with elevated metals by an order of magnitude. This is the result of divalent metals binding to the DOC and thereby reducing the bioavailability (toxicity) of the metals. In conjunction with the dilution available with discharge to deep waters and the potentially relatively small volume of water to be pumped from the shaft, this option appears to be the most cost effective. Coffey have the expertise to organise this testing and analyses the results. Coffey could

also assist in the preparation of a submission to DPIWE. Coffey suggest that this option be considered. A more rigorous estimate of contaminated water in the shaft and old workings should also be undertaken.

Coffey trusts this report meets your current requirements. Please do not hesitate to contact the undersigned should you require clarification of any aspect of this report.

For and on behalf of
COFFEY GEOSCIENCES PTY LTD

IAN REEVES
TASMANIAN STATE MANAGER

Attachments: Important information about your Coffey report

