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RGC EXPLORATION PTY. LIMITED

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**EXPLORATION LICENCE NO. 42/87**
**INCORPORATING M.L.'S 43M/85 & 123M/~~74~~ 47**

("Zeehan Area")

ANNUAL REPORT FOR THE PERIOD
OCTOBER 1993 TO SEPTEMBER 1994

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Compiled by:

SCOTT HALLEY
Senior Geologist



16 August 1994

tion:

hian Department of Mines
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xploration - Perth
xploration - Zeehan

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SUMMARY

E.L. 42/87 is centred on the silver-lead mining centre of Zeehan, and completely encloses the Aberfoyle/Gippsland joint venture M.L.'s over Queen Hill, where a reported geological resource of 3.6 Mt at 1.2% Sn has been defined.

Work began in 1989 and was initially aimed at delineating areas with potential for Queen Hill/Renison style tin mineralisation, and as a result the Sylvester and Parting Lake grids were established. Early results from the Sylvester area were sufficiently encouraging for RGC to sign an Option to Purchase agreement with Oceania (Tas) P/L over two MLs they hold in the area. Since then, exploration has mainly focussed on the Sylvester grid, and only recently has attention returned to Parting Lake. Since 1991 exploration focus has shifted to base metals (Ag-Pb-Zn) as a consequence of the continued decline in tin prices.

In the Sylvester area, targeting of Sn, Pb, Zn anomalism and a deep sourced magnetic anomaly within Upper Oonah Fm carbonates in the footwall of the Balstrup Fault has resulted in the discovery of a significant massive sulphide replacement body with sub-economic levels of Pb-Zn-Ag. 13 diamond drillholes totalling 5,165m have been drilled along this line of mineralisation, and the sulphide body has now been intersected over a 1 km strike length and remains open at depth, below 450m, over its entire length. An inferred resource of 6 Mt @ 3.3% Pb, 5.5% Zn and 40 g/t Ag is estimated, however the spacing between drillholes is too wide to guarantee continuity of grade and thickness between holes. This figure is therefore only a guide to the maximum resource that could be firmed up by further drilling.

The potential for higher grade mineralisation and perhaps greater thicknesses exists at the eastern end of the Sylvester Prospect where the massive sulphide mineralisation has directly replaced dolomite. The potential here (2 - 3 million tonnes) is too small

for RGC to consider as a priority target. A small drilling program has been designed to test the potential of this eastern end and this project is currently being offered to other companies as a joint venture proposal.

# 1. INTRODUCTION

E.L. 42/87 was acquired by Renison Ltd in August 1987 as a result of a successful tender application. The E.L. encloses the Aberfoyle/Gippsland joint venture consolidated M.L.'s over Queen Hill, and Renison's interest in the area was initially linked to negotiations with the joint venture partners over the possible acquisition of the M.L.'s (Figure 1).

Work on the E.L. was deferred while negotiations continued, with the intention that once the M.L.'s were in Renison's control, a combined exploration programme would be conducted over both the M.L.'s and the surrounding E.L. However negotiations fell through, and in 1989 RGC Exploration began an exploration programme on behalf of Renison Ltd, without control of Queen Hill having been obtained.

As a result of detailed mapping, rock chip geochemistry and an aeromagnetic survey, conducted during 1988/89, two areas were chosen as warranting more detailed follow-up work. The Comstock and Parting Lake grids were established to cover these two areas, however the Comstock area was later renamed the Sylvester area to avoid confusion with the Comstock prospect near Queenstown.

In the Sylvester area, three major regional faults intersect highly deformed psammo-pelites and carbonates of the Upper Oonah Formation and less deformed turbidites of the Crimson Creek Formation. Several lines of evidence suggest a granitoid ridge extends E-W beneath the area, toward the postulated Queen Hill cupola. The Sylvester, Balstrup and Tenth Legion faults could reasonably be expected to communicate a depth with such a ridge and provide fluid access to sedimentary carbonates.

Two M.L.'s in the area, held by Oceania (Tas.) P/L., were considered to cover a portion of the prospective geology and as a result RGC signed an Option to Purchase agreement with the holders of the M.L.'s to secure tenure of the area.

During 1990 former E.L. 95/87, which adjoined E.L. 42/87 to the west of the Sylvester area, became available as ETA 219. RGCE tendered for the area because it covered the westward extension of the major regional faults mentioned above. The area was granted to RGCE and ultimately amalgamated into E.L. 42/87.

The expanded E.L. covers 40 square kilometres of countryside that varies from buttongrass and tea-tree swamp to partially forested hilly terrain. It covers Zeehan townsite and many of the old silver-lead mines of the now abandoned Zeehan field. Access is provided by a number of all-weather roads, as well as numerous 4WD tracks and old, partially overgrown tramways.

Work on the E.L. was initially targeted at locating economic concentrations of tin of the style typified by the Montana deposit (carbonate replacement), the Severn deposit (Fault stockwork) and Queen Hill (fault and carbonate replacement). The Upper Oonah Formation and the so-called Poverty Point Beds (also called Montana Beds) were considered the most prospective units because of the presence within them of significant carbonate beds capable of hosting replacement-style deposits.

However as a result of the location of a significant base metal skarn on the Sylvester grid, the emphasis shifted toward testing the base metal potential of the prospect. This trend was reinforced during 1990/91 when RGCE decided to drastically reduce its tin exploration programme as a result of continued low tin prices and the consequent poor performance of the Renison Bell tin mine.

After the completion of 15 diamond drillholes, exploration of the Sylvester Grid was suspended in 1992 when it became unlikely that either the grade or tonnage of the resource could be improved to economic levels with further drilling. Exploration then focussed on the Parting Lake Grid, culminating in the drilling of a single diamond drillhole to test for the possibility of base metal and/or stanniferous replacement deposits above a gravity interpreted granitic cupola.

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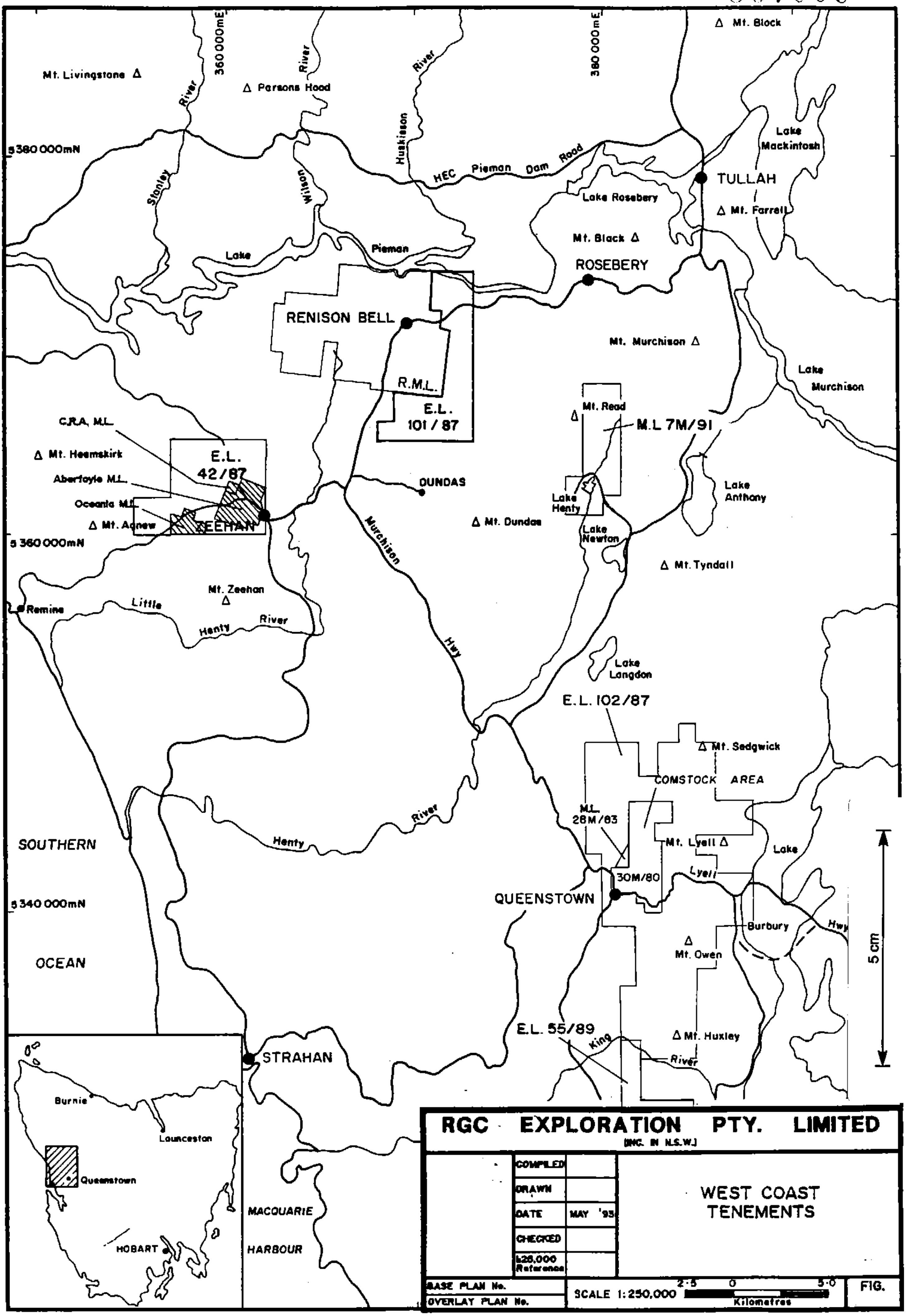

Mt. Livingstone
Parsons Hood
Mt. Block
360 000mE
River
Stanley
Wilson
Huskisson
5380 000mN
HEC Pieman Dam Road
Lake Mackintosh
TULLAH
Lake Rosebery
Mt. Farrell
Mt. Black
Lake
Pieman
ROSEBERY
RENISON BELL
R.M.L.
E.L. 101/87
Mt. Murchison
Lake Murchison
Mt. Read
M.L 7M/91
C.R.A. M.L.
Mt. Heemskirk
E.L. 42/87
Aberfoyle M.L.
Oceania M.L.
Mt. Agnew
ZEEHAN
DUNDAS
Lake Henty
Lake Anthony
Mt. Dundas
Lake Newton
Murchison Hwy
5 360 000mN
Mt. Tyndall
Mt. Zeehan
Remine
Little Henty River
Lake Langdon
E.L. 102/87
Mt. Sedgwick
COMSTOCK AREA
M.L. 28M/83
Henty River
SOUTHERN
OCEAN
Mt. Lyell
30M/80
Lyell
Lake
5 340 000mN
QUEENSTOWN
Burbury
Hwy
Mt. Owen
5 cm
E.L. 55/89
King River
Mt. Huxley
STRAHAN
Burnie
Launceston
Queenstown
HOBART
MACQUARIE HARBOUR
RGC EXPLORATION PTY. LIMITED
(INC. IN N.S.W.)
COMPILED
DRAWN
DATE MAY '93
CHECKED
1:25,000 Reference
WEST COAST TENEMENTS
BASE PLAN No.
OVERLAY PLAN No.
SCALE 1:250,000
2·5 0 5·0
Kilometres
FIG.

## 2. TENURE

E.L. 42/87 is held solely by Renison Ltd and explored by RGC Exploration Ltd (RGCE). It covers 21 square kilometres, most of which is vacant Crown land. The following mining leases are excluded from the E.L.

| | |
|---|---|
| 35M/72; | C.R.A. Exploration P/L (Oonah Hill) |
| 36M/81; | Aberfoyle Exp. P/L & Gippsland Oil & Min.'s N.L. (Queen Hill) |
| 43M/85; | Oceania (Tas.) P/L (Sylvester Mine) |
| 123M/47; | Oceania (Tas.) P/L (Comstock Mine) |
| 64M/74; | Kynance P/L (Kynance Mine). |

In May, 1990 an Option Agreement to purchase M.L.'s 43M/85 and 123M/47 was signed with Oceania (Tas.) P/L. Under the terms of the agreement Renison may explore the area for up to five years.

In December, 1990, RGCE successfully tendered for ETA 219 which adjoined E.L. 42/87 to the west. The ETA was given E.L. No.39/90, and in April 1991 was amalgamated into E.L. 42/87.

In September 1992, E.L. 42/87 was reduced from 40 square kilometres to 21 square kilometres.

## 3. WORK COMPLETED 1993/94

### 3.1 Mining Review

A mining review of the Sylvester deposit was carried out by Tim Elmer, a mining engineer with the RGC Exploration Group. The objective of the study was to assess the potential for the style of mineralisation encountered at Sylvester to support a mining operation. The report considered the probable mining methods that would need to be employed, the likely mining costs, the results of metallurgical test work, likely milling costs, and the sensitivity to commodity prices and smelter charges. Elmer's report is included as Appendix 1. One of the conclusions of the report is that the grade required to make Sylvester an interesting proposition is at least double the current estimated average grade.

The best potential at Sylvester for finding higher grades and greater thicknesses of sulphides is at the eastern end of the currently defined zone. At the western end of the zone, the dolomite has been replaced by a prograde skarn assemblage of magnetite + serpentine. Although some of this has been replaced by sulphides, the skarn assemblage will not be as reactive to later fluids as the dolomite will be. The prograde skarn only extends half way across the Sylvester Prospect, with recrystallised carbonates occurring adjacent to the Balstrup Fault at the eastern end. This would provide a more reactive host for the base-metal bearing fluids. The best intersection recorded to date (SY003; 6.6m horizontal @ 8.2%Zn, 4.1%Pb, 48ppmAg) was in this area. A drilling program of 4 holes totalling 900m could test the shallow potential in this area. The proposed drilling would intersect the mineralisation 100m and 200m below surface, 200m away from any existing holes. The potential at Sylvester within this zone is around 2 - 3 million tonnes, a target that is too small to be of interest to RGC.

For the past few months RGC have been attempting to find a joint venture partner to complete the testing of the Sylvester prospect. CRA were approached because of their current interest in exploring the Zeehan area for base metals. Pasminco were also approached because a small tonnage target may be of interest to them, having a mill within trucking distance. Other potential joint venture partners are also being considered.

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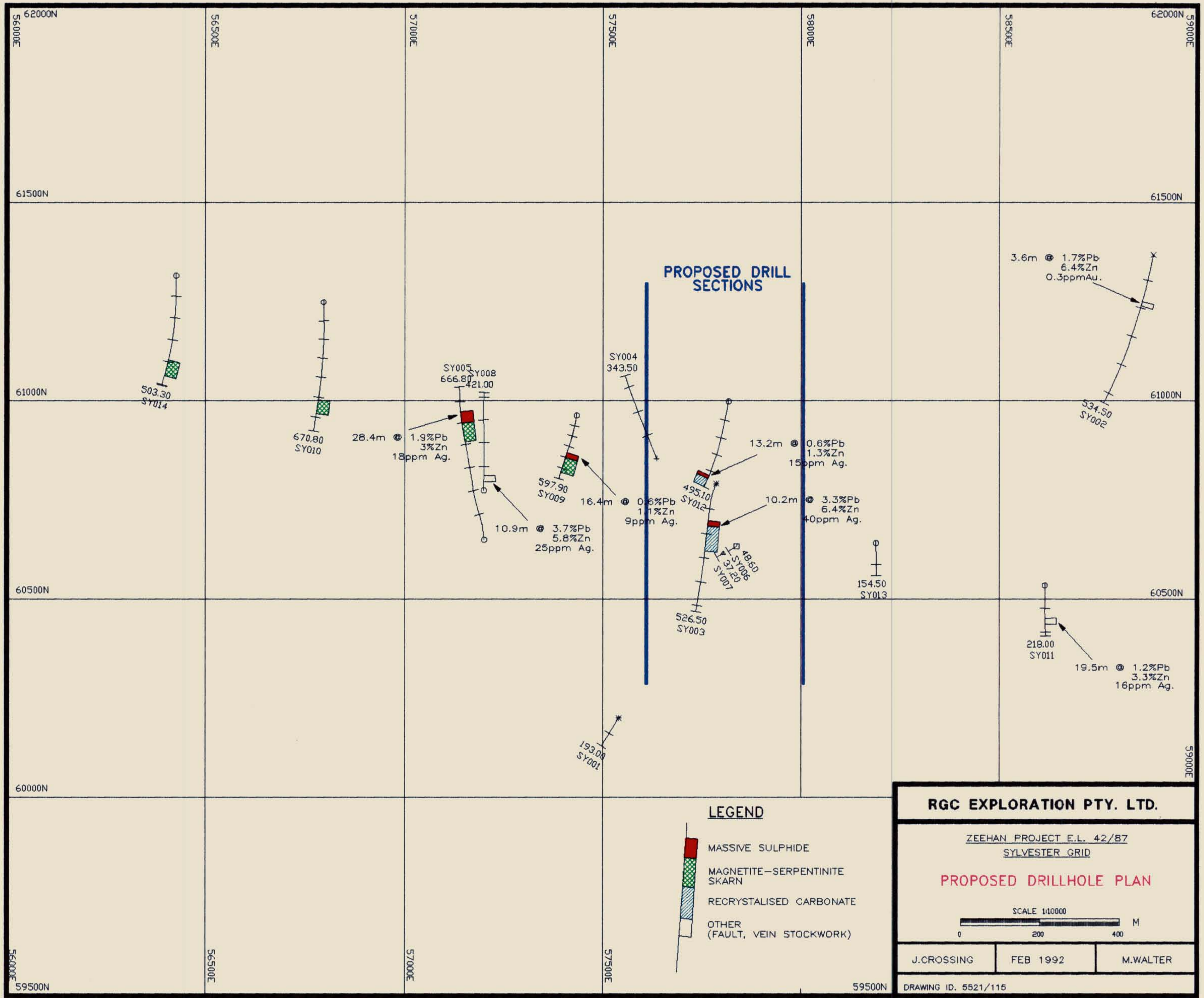
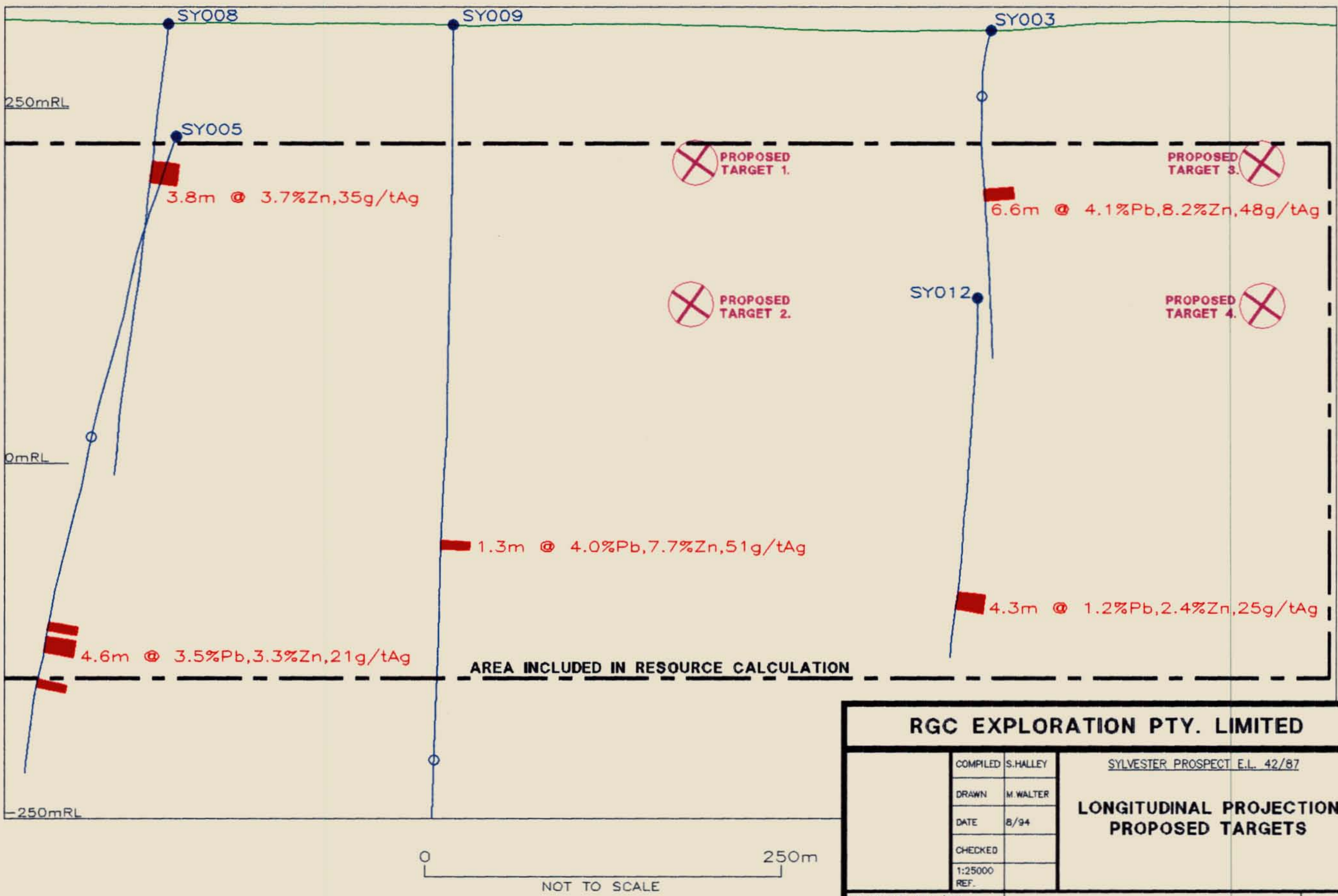


62000N
61500N
61000N
60500N
60000N
59500N
56000E
56500E
57000E
57500E
58000E
58500E
59000E
PROPOSED DRILL SECTIONS
503.30 SY014
670.80 SY010
SY005 666.80
SY008 421.00
28.4m @ 1.9%Pb 3%Zn 18ppm Ag.
10.9m @ 3.7%Pb 5.8%Zn 25ppm Ag.
597.90 SY009
16.4m @ 0.6%Pb 1.1%Zn 9ppm Ag.
SY004 343.50
13.2m @ 0.6%Pb 1.3%Zn 15ppm Ag.
495.10 SY012
10.2m @ 3.3%Pb 6.4%Zn 40ppm Ag.
48.60 SY006
37.20 SY007
526.50 SY003
154.50 SY013
3.6m @ 1.7%Pb 6.4%Zn 0.3ppmAu.
534.50 SY002
218.00 SY011
19.5m @ 1.2%Pb 3.3%Zn 16ppm Ag.
193.00 SY001
LEGEND
MASSIVE SULPHIDE
MAGNETITE–SERPENTINITE SKARN
RECRYSTALISED CARBONATE
OTHER (FAULT, VEIN STOCKWORK)
RGC EXPLORATION PTY. LTD.
ZEEHAN PROJECT E.L. 42/87
SYLVESTER GRID
PROPOSED DRILLHOLE PLAN
SCALE 1:10000
0
200
400
M
J.CROSSING
FEB 1992
M.WALTER
DRAWING ID. 5521/115


5 cm




**RGC EXPLORATION PTY. LIMITED**

| | |
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| COMPILED | S.HALLEY |
| DRAWN | M.WALTER |
| DATE | 8/94 |
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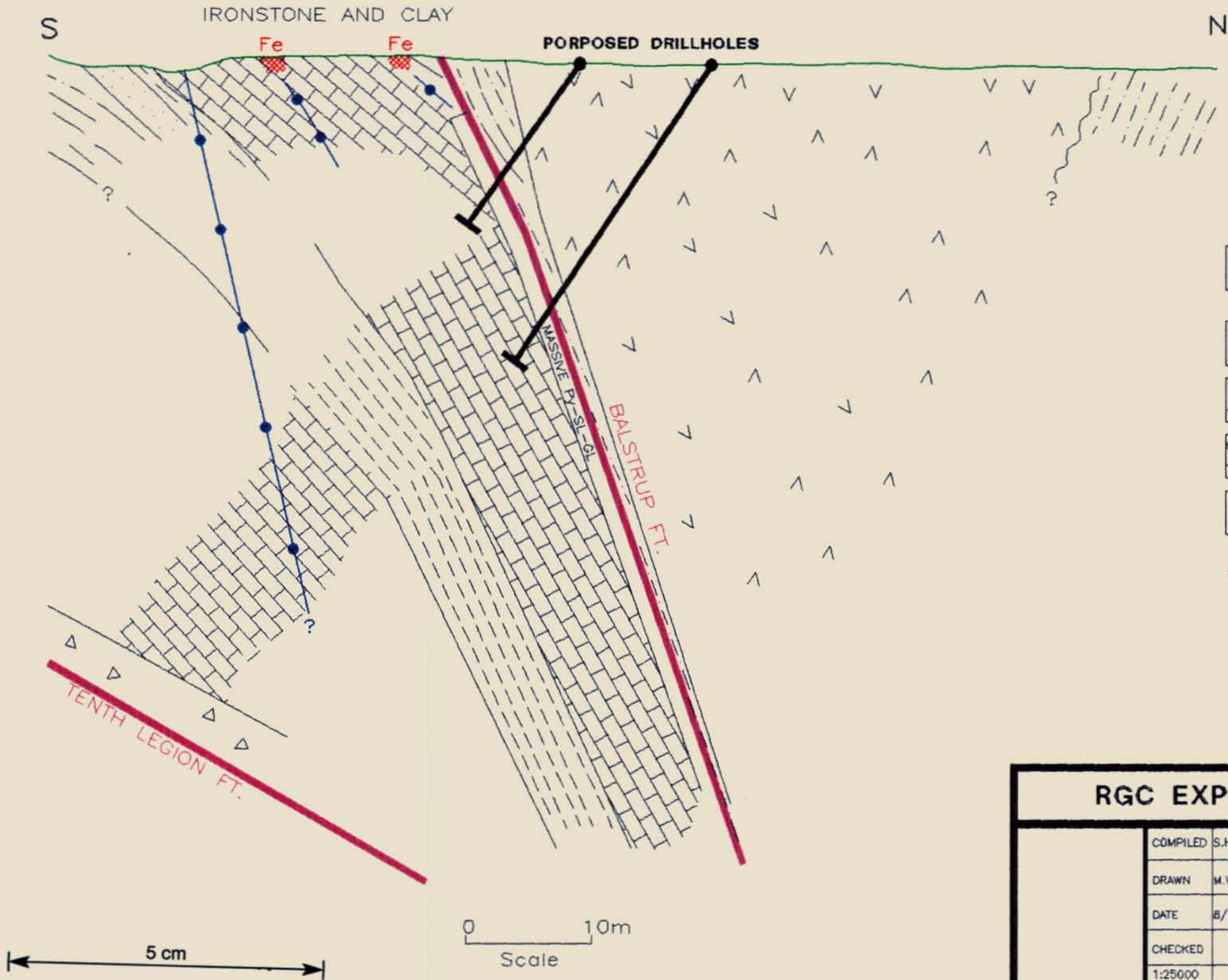
SYLVESTER PROSPECT E.L. 42/87

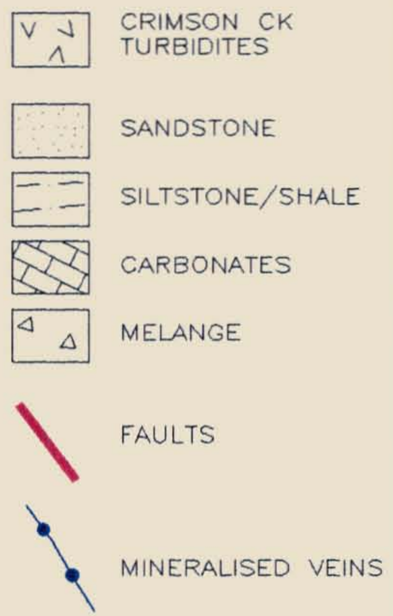
**LONGITUDINAL PROJECTION PROPOSED TARGETS**

DRAWING ID: 5521/129
FILENAME: ZPROJ

FIG. 3

867013




**RGC EXPLORATION PTY. LIMITED**

| | | |
|---|---|---|
| COMPILED | S.HALLEY | SYLVESTER PROSPECT E.L. 42/87 |
| DRAWN | M.WALTER | **SYLVESTER GRID DRILLHOLE CROSS SECTIONS** |
| DATE | 8/94 | |
| CHECKED | | |
| 1:25000 REF. | | |

DRAWING ID: 5521/128
FILENAME: SY12-94

FIG. 4

867014

# APPENDIX 1

## SYLVESTER MINING REVIEW

AUTHOR: Tim Elmer

## CONCLUSION

The Sylvester mineralisation as currently defined is not an attractive prospect. At reasonable commodity prices the resource will not support a mining operation due to low grades, and any attempt to develop an average cost operation would be disadvantaged by unfavourable ore body geometry and a reasonable possibility of some degree of quite awkward ground conditions.

Developed as a 600,000 tpa cut and fill underground operation the revenue from production, after smelter and realisation costs is insufficient to cover site operating costs.

The area does however offer a favourable location for development and a favourable geological environment for additional mineralisation.

If the only additional mineralisation was considered to be base metal vein style resources then, assuming the grade was adequate, there is no reason why this could not support a mining operation except that this style of operation may not be favourable to the RGC Group.

## INTRODUCTION

The Sylvester base metal deposit lies within EL 42/87 approximately 4 kilometres due west of Zeehan near the old Comstock workings. Access is gained via the Trial Harbour road, in fact the mineralisation is crossed by the Trial Harbour road.

Detail on the mineralisation is summarised in the RGC Exploration Report T/93/22 compiled by DJF Crossing in May 1992.

Very briefly, from that report, "the mineralisation is hosted by Upper Oonah carbonates in the immediate foot wall of the Balstrup Fault. It is distal to and genetically related to a skarn complex that extends along the Balstrup Fault. The mineralisation is believed to have formed as a result of replacement of carbonate and/or earlier formed magnetite serpentinite skarn by hydrothermal fluids circulating along the Balstrup Fault".

The global mineralisation is estimated to contain 11 million tonnes grading 2.0% Pb, 3.5% Zn and 21 g/t Ag with a strike length of 1,000 metres and a down-dip extension of 400 metres. It is still open at depth.

Within the global mineralisation is a higher grade zone (cut-off of 1% Zn) grading 3.3% Pb, 5.5% Zn and 40 g/t Ag and estimated to contain 6 million tonnes.

The inferred resource is based on five core intercepts, however, additional intercepts along strike have not been included in the calculations. The inferred resource starts approximately 80 metres below surface and continues to approximately 460 metres below surface dipping at around 68° to the NE and averaging 4 metres wide.

The purpose of this report is to comment on the potential for this mineralisation to support a mining operation. Only underground mining has been considered.

## GENERAL

### Introduction

To support an underground operation at grades of 3.3% Pb, 5.5% Zn and 40 g/t Ag, Sylvester would be the lowest grade base metal operation in Australia. This in itself is not significant if the mineralisation is capable of supporting a low cost mining operation with cost effective treatment characteristics resulting in the production of good quality, desirable concentrates.

The format of this review has been to review available data on each of the main operational areas in an attempt to qualify performance characteristics and hence estimate some relative costing. The opportunity has been used to review some general aspects of the lead/zinc industry since even at a superficial level this resource could only be considered marginal.

A deal of time has been spent on smelting arrangements and commodity prices since the two appear to be very much out of equilibrium.

Overview

Taylor's Law suggests that the optimum production rate for a 6 million tonne ore body is in the order of 600,000 tonnes per annum.

It is questionable as to whether an orebody in the configuration of Sylvester could comfortably sustain a production rate of this magnitude, however, for the sake of this exercise, it has been assumed it could. A lower tonnage would result in higher unit operating costs but lower capital costs.

The relatively shallow start to the mineralisation, along with its narrow width and considerable lateral extent, suggests a decline access mine rather than shaft. However, truck haulage to 460 metres is getting beyond accepted limits and a haulage shaft would have to be considered certainly below this level and, in optimisation studies, above this level.

Any underground operation would be similar to Renison in development and stoping concepts and would utilise similar "style" equipment.

For mining purposes it was assumed that all 6 million tonnes would be available for mining at the calculated grades ignoring (for this exercise) dilution and ore losses.

It was assumed that treatment would be via a 600,000 tonne per annum concentrator built on site utilising conventional crushing, grinding and flotation techniques and that only two concentrates would be produced, being a lead and a zinc concentrate.

All concentrates would be trucked to Melba Flats, railed to Burnie and shipped to Japan for smelting.

The location of the Sylvester deposit both with respect to Zeehan and terrain is favourable for development especially in Tasmanian terms and no major infrastructure or logistical difficulties would be expected. Power supply would be available from Zeehan, however, some upgrading may be required. The Trial Harbour road between Zeehan and Sylvester would need some degree of upgrading.

Some environmental conflicts may exist with the development of an operation this close to Zeehan, especially with respect to tailings disposal and water supply, however, it is unlikely that they would prove to be insurmountable.

## MINING

The higher grade mineralised zone at Sylvester does not lend itself to cost effective productive mining due both to unfavourable geometry and, at this stage, some geotechnical concerns.

1. Geometry

The high grade zone is calculated as being 4 metres wide (average) existing as a continuous "sheet" 1,000 metres long and 400 metres down-dip. It is parallel to, and in the immediate foot wall of the Balstrup Fault. Its location with respect to the fault varies from being in contact to up to 15 metres into the footwall. Generally the fault itself is not mineralised (hole SY008 being the exception) and generally mineralised sulphides make up the immediate footwall of the fault.

The geometry of the ore zone is similar to the Henty mineralisation with respect to its width, dip and the possibility of structurally related poor hanging wall conditions. Given that the higher grade zone is geochemically defined rather than structurally defined, in reality the zone would most likely be discontinuous and of relatively variable width (with maybe some opportunity for some productive stoping).

Generally the configuration does not lend itself to bulk mining utilising economies of scale. Very tight grade control drilling would be required to define ore blocks under any situation but especially if some form of non-entry type mining was proposed (i.e. bench or open stoping). Any mining method would be highly development intensive due to the narrow ore width, yet an operation utilising efficient equipment, where possible, requiring a large development "profile" would be required to minimise mining unit costs.

2. Geotechnical

Significant sulphide intercepts along with the immediate hanging wall and footwall zones were inspected in the Zeehan core shed and RQD records reviewed.

The RQD's indicate:

(a) Where mineralisation exists in a massive pyrrhotite matrix it is usually quite competent but that in a pyrite matrix it deteriorates quite substantially. [This may also be a function of elevation.]

(b) The fault zone is very poor ranging from puggy material in the upper zone to rubble in the lower zone and is in the order of 2 metres wide.

(c) True "fault" hanging wall conditions could be expected to be very average with RQDs in holes SY009 and SY012 being in the order of 65%.

(d) Ground conditions in the upper footwall zone (i.e. above the mineralisation) could be expected to be poor in that RQDs in SY008 are very poor (0%) to 167 metres and are only just more reasonable in SY005, (<40%) to 100 metres.

Although the core inspected had been split and hence had deteriorated greatly since RQDs were logged, the inspection tended to confirm the above but in addition indicated that

(a) mineralisation represented by SY008 (if in fact it is representative of significant mineralisation) could prove a difficult mining prospect;

(b) some "interesting" ground conditions could be experienced during lower footwall development in the serpentinite-carbonate skarn due both to possible limited tensile strength within the serpentinite itself and possible low friction angles both within the serpentinite and along its carbonate contacts. RQDs in all footwall core are generally quite variable.

(c) the existence of carbonate bands within the sulphides that may contribute to poor hanging wall conditions away from the main fault.

Mining Concepts

Obviously there is considerably more to consider in mine design and development concepts than the above two "primary" areas, however, these areas are fundamental to mining method selection which generally controls the mine layout.

The overall impression from a review of these areas is the need for conservatism with respect to stope excavations.

Comprehensive geotechnical evaluation would be an essential aspect of any feasibility study. At this stage the need for limited hanging wall exposure and quality grade control suggest cut and fill with some benching. Depending on the location of the "main fault" and other "hanging wall" considerations significant hanging wall cable support would be required to preserve stope integrity and prevent excessive dilution.

Benching would be preferable to cut and fill in that it would be more productive and would reduce significantly waste development hence reduce stoping and development costs. However, it does involve greater hanging wall exposure.

Stoping widths of 4 metres is still very much "narrow vein" mining and although all stopes ideally would be mechanised, inefficiencies would be high yet productivity from hand held stoping would be inadequate and unit costs even higher.

Given the similarities to Renison, Renison's costs have been "consulted" in some areas, however, Renison's haulage equipment would be unlikely to fit in all stopes so equipment selection would need to be revisited.

Difficult ground within the footwall development could probably be controlled with "designed" development support, although pattern support would not help reduce development costs.

On the other hand, the condition and location (with respect to ore zones) of the Balstrup fault in the upper zones, would result in very difficult mining conditions as would the ore zone itself in the upper areas. Depending on their extent a consideration could be to eliminate them from any potential mining resource until mining exposure is achieved.

### Mining Costs

Mining costs were estimated to be $35 to $45 per tonne (Appendix 1) with cost estimates based loosely on Renison and to a lesser extent on Henty. Although stoping unit costs could be expected to be significantly greater than Renison, haulage and development unit costs would be similar and general and mine administration would be expected to be lower due to a less complex (at this stage) ore body configuration. Operating costs were generally based on a cut and fill operation.

The capital cost for underground development was estimated to be in the order of $43 million including $14.5 million capital decline and return air development, $4.5 million for pre-production operating development and $5 million for diamond drilling but excluding $11 million for ongoing capital development.

A development program is estimated at 3 to 4 years however this may be optimistic especially if evaluation mining development (as per Henty) was considered as it should be.

## CONCENTRATION

### General

The limited test work completed on Sylvester core produced some very ordinary results.

As noted in the Enviromet Limited report, MO50392 (April 30th, 1992).

*"Results from rougher flotation tests demonstrated lead concentrates of 50% Pb grade could be produced with lead recoveries of around 80% for SY003 and 90% for SY005. Zinc concentrate grades were low (30% to 40% Zn for SY003) and were lowest for SY005 due to high recoveries of iron sulphides, diluting the concentrates. Additions of lime to pH 10.8 for zinc roughing showed some (although insufficient) depression of iron sulphides. Zinc recoveries were 83% for SY003 and 90% for SY005."*

For a "first pass" (only two samples were tested) recoveries of Pb and Zn were not unreasonable, however, concentrate quality was quite poor especially for Zn with the concentrate for hole SY005 being as low as 6.5% Zn. In addition, although recovery of Ag in all samples was average at around 66% only 42% reported to the Pb concentrate, the "financially favourable" product, a point noted by J Butler (12/5/92).

The major difficulty with the Zn concentrates (and to a lesser extent, but still of concern, with the Pb concentrate) was the iron component (in hole SY005 up to 50% of the concentrate). As also noted by J Butler "the differential flotation of Zn and Fe would probably involve an "interesting exercise".

In addition, the mineralisation represented by the SY008 intersection appears, once again, to be of concern and would require testwork in its own right. This intersection was very oxidised almost to the absence of sulphides and may exhibit quite different characteristics to the main "sulphide" type mineralisation.

[The possibility of a magnetite concentrate as a by product for use in the coal industry has been raised. This aspect was not really considered in any detail since magnetite grades within the mineralised sulphides appear minimal. [It may be a consideration if the prospect was to become further advanced].

Although the test work to date is accepted as being somewhat superficial it must be noted that the test concentrates so far produced were not of saleable quality. It is apparent that extensive test work would be required to develop techniques and a circuit to produce saleable products. The assumed products and recoveries are however of reasonable quality.

For the purposes of this exercise, recoveries of 90% for both Zn and Pb were assumed (in line with test work) reporting to a 52% Zn concentrate and a 65% Pb concentrate (a significant improvement on existing testwork). Silver recovery was assumed to be 66% with 42% reporting to the Pb concentrate and 24% to the Zn concentrate (in line with testwork).

## Costing

Treatment costs (Appendix 1) were estimated to be $15.00 per tonne/milled on the basis of a 600,000 tpa concentrator on site.

The concept of transporting run of mine ore to Rosebery for toll treatment was not considered in any detail because of both the high tonnage and low grade involved. For lower tonnages this option may be a more practical alternative depending on the ore's compatibility with the Rosebery circuit and head grades.

Capital costs for the construction of an on-site crusher and concentrator could be expected to be in the order of $25 million to $30 million depending on its complexity. As a comparison, the Hellyer mill for 1 million tpa is estimated to have cost $46.6 million in 1989 dollars (Ref 1).

## SMELTING

A considerable part of this review was spent trying to rationalise the current base metal smelting arrangements. In real terms, smelting costs, as a percent of contained Zn and Pb in concentrates, are almost at record highs, a situation attributable to commodity prices being at near record lows, in conjunction with the concept that smelting charges are more a reflection of the supply/demand of concentrate rather than actual charges for the cost of smelting and refining. (REF5).

To put things into perspective, under existing smelter arrangements and commodity prices (as at 30/9/93) a tonne of 65% lead concentrate (no silver) contains US$236.90 of metal but is worth US$45.99 to the miner at the smelter gate, that is 19% of the metal value.

The figures for a 52% zinc concentrate are US$451.46, US$182.21 and 40% respectively.

The development of any base metal mining operation under this situation would require much higher grades than is generally the case in Australia and this situation is reflected in the fact that few Australian base metal miners are currently cash positive let alone profitable.

Given the volatility in smelting charges, an attempt has been made to express smelting charges as a percent of commodity prices rather than to use actual charges [this process was documented by Vogel and Grey[2], however, although their zinc results are reasonable there appears to be a discrepancy with the lead results].

The rationale for this process is that since smelter charges are more a reflection of concentrate supply and demand they, i.e. the charges, are more related over the long term to commodity prices than they are to the cost of the services.

For this exercise base Zn smelting charges were assumed to be 17.5% of the Zn price in US$/tonne and the base Pb charge 30% of the PB price in US$/tonne. All other aspects of smelting arrangements are as per 1993 documentation.

The concentrates were considered to be clean and without penalties or by product credits with the exception of silver (although, as discussed in the Concentrate section, there would be a possibility of serious iron penalties).

## COMMODITY PRICES

Commodity prices are, in real terms, very low and it was considered unproductive to base any model on existing prices. Unfortunately Renison does not produce any projected prices for base metals so one needs to be guided by commodity analysts, a not terribly satisfactory solution. Analysts' projected prices usually only predict two or three years, a situation which can be misleading with commodities that have a cyclic history. In addition, the rationale behind these predictions needs to be considered.

Projected average 1996 prices (County Natwest - June 1993) were used to develop a smelter return model. [A comparison of current prices compared to the projected prices is listed below.]

These projected prices lie roughly midway between the current lows and the highs of 1989/90 however they should not necessarily be considered to be long term average prices but more the order that could be expected at the end of a three to four year development project that was to start now.

With respect to long term average prices the Zn and Ag prices are probably not unreasonable however the Pb price is probably US$100 above its average of around US$600-650 (US$0.28/lb).

Table 1

| Commodity | 30/9/93 $US/tonne (LME) | Projected 1996 $US/tonne (LME) |
|---|---|---|
| Zinc | 868.2 | 1250.24 |
| Lead | 364.5 | 734.26 |
| Copper | 1718.0 | 2136.65 |
| Silver | 4.04/oz | 5.16/oz |
| Gold | 355.70/oz | 413.00/oz |
| $US/$A | 0.6462 | 0.7200 |

It must be noted that in US$ terms these figures represent a 44% increase in the zinc price and a 100% increase in the lead price in 2½ years. Given RGC's interest in base metals, this area needs to be addressed in somewhat more detail with some urgency since to use increases in commodity prices of this magnitude for feasibility work without significant supporting documentation could be considered somewhat adventurous.

## NET SMELTER RETURNS (NSR)

Using the milling recoveries, concentrate grades, smelter charges and commodity prices discussed previously, the returns from the smelter that could be expected on Sylvester ore were modelled. To simplify matters transport costs from the "mine gate" to the smelter were included in the smelter model so that the resultant figures represent the net worth per tonne of ore at the mine gate, (i.e. the value of the ore less all realisation costs).

As a comparison, the same model was also run using (i) prices as at 30/9/93 with the same smelter arrangements, (ii) prices as at 30/9/93 with actual 1993 smelter arrangements (i.e. actual current net worth of ore), and (iii) 1996 prices with price related smelter arrangements and the lower head grade (i.e., a bulk mining situation). The results are tabulated below.

It was assumed that all concentrate would be shipped to a smelter in Japan with transport costs being similar to those experienced by Mount Lyell. It was also assumed that minimal capital expenditure would be required in this area.

Table 2

| Run | Head Grade | Prices | Smelter Terms | Net Value/ tonne ore $A at Mine Gate | Insitu Value tonne ore $A |
|---|---|---|---|---|---|
| 1 | 5.5% Zn, 3.3% Pb, 40 g/t Ag | 1996 (projected) | % of LME | 52.87 | 138.37 |
| 2 | 5.5% Zn, 3.3% Pb, 40 g/t Ag | 1993 (actual) | % of LME | 35.28 | 100.55 |
| 3 | 5.5% Zn, 3.3% Pb, 40 g/t Ag | 1993 (actual) | Actual (1993) | 23.09 | 100.55 |
| 4 | 3.5% Zn, 2.0% Pb, 21 g/t Ag | 1996 (projected) | % of LME | 32.89 | 86.00 |

The above results with respect to a potential mining operation are discussed in the next section, however the value of the ore at the mine gate compared to the insitu value of the ore is worth some consideration. In Run 1 the difference in dollar terms is $85.50. At a zinc price of A$1736/tonne (US$1250) this represents a grade of 5% Zn/tonne ore.

## DISCUSSION

### Financial

Indicative operating and capital costs are itemised in Appendix 1. As a general comment both are first pass estimates with a number of costs being "scaled" versions from other operations and others being order of magnitude only. Both are probably optimistic.

Total site operating costs would be expected to be in the order of $60 to $70 per tonne of ore milled with mining costs, at between $35 and $45 per tonne, being the most significant and potentially the most variable.

Initial capital costs are indicative at $100 million. As a comparison the Peak mine at Cobar has a published capital cost of $135 million for a 450,000 tpa operation (with shaft not decline access).

From Table 2 (the NSR results) Run 1 indicates that the value of ore at the mine gate (projected 1996 commodity price) is in the order of $53.00 per tonne. Clearly the revenue from the ore is insufficient to cover expected operating costs let alone support capital expenditure of any magnitude.

Broadly the reason is insufficient grade compounded by unproductive expensive mining.

At $70 per tonne site operating costs the NSR, for this prospect to generate a 12% IRR, needs to be in the order of $119.00 per tonne which using projected 1996 prices, translates to grades of around 13% Zn, 6.5% Pb and 85 g/t Ag.

At $60 per tonne costs the figures are $109 per tonne or grades of 12% Zn, 6% Pb and 78 g/t Ag.

Obviously, given the indicative nature of both the capital and operating costs these figures must be considered in the same light.

The site operating costs for Sylvester are high. If operating costs could be reduced to say $40.00 per tonnes milled (a cost similar to that "claimed" by a number of base metal miners in Australia after, in some cases, some quite savage "rationalisation") and all other factors remain the same then the NSR required for a 12% IRR is in the order of $90 per tonne or 10% Zn and 5% Pb (no silver). An alternative grade combination is 8.8% Zn, 5.6% Pb and 90 g/t Ag that is Elura's current designed head grade [Maurice Mawby[4] - 2nd Edit]. It should be noted however that (a) Elura's recoveries are not as favourable as indicated in this report, (b) Elura was developed for 1.1 million tpa and (c) the development cost for Elura in the early 1980's was in the order of $190 million.

## GENERAL

In its existing format the Sylvester mineralisation will not support a mining operation due to low grades but compounded by unfavourable orebody geometry for a low cost operation. The grade would virtually have to double to made this prospect attractive in its existing format and even then moderate cost increases would result in an unfavourable rate of return.

The approach in this review has been conservative with respect to operating concepts (i.e. Company owned and operated plant and equipment) with only a "reasonably" sized operation being considered in an attempt to generate some economies of scale.

If the grade was to be substantially improved (even for a considerable loss in tonnes) a number of options could be considered to optimise and or limit operating and capital exposure such as contract mining, contract or toll milling and obviously different tonnage operations. These aspects have not yet been considered in detail.

The general area in which Sylvester is located is clearly highly mineralised. To date RGC work in this area has concentrated on Renison style and size "ore bodies". It is beyond the scope of this review to comment on the remaining opportunity for "ore bodies" of this nature but there does appear to be a significant amount of vein type mineralisation that may not have received any evaluation.

Assuming sufficient grade there is no reason why vein mineralisation could not support some form of mining operation coupled with perhaps, "pulling the eyes" out of Sylvester style mineralisation.

From RGC's view point this would not be the most favourable style of mining operation. Cost wise it is top heavy, far less flexible in terms of cyclic commodity prices and operating cost control and has a higher risk yet the extent of narrow vein mining is on the increase in Australia pushed by the gold industry and, to a lessor extent, by improvements in technology.

[A brief attempt was made to extract high grade zones from the Sylvester resource in this review but, given the hole spacing, it was considered a dubious exercise.]

Should a resource of this nature exist and RGC choose not to consider development of it in its own right then other options such as sale or joint venture might be considered.

Grades required for this exercise have not been considered in detail but would be highly development dependent. Grades mined at the South Comet mine (open cut and underground) at Dundas between 1990 and 1993 are reported as 11% Zn and 5% Pb, but it is unreported as to what the return was on these grades. Based on a mining structure presented in the review grades in the order of 20% Zn and 10% Pb might be more realistic.

The area of open cut surface mineralisation is another aspect that might warrant further consideration either in its own right or in conjunction with some form of underground operation.

APPENDIX I

Cost Summary

A. Site Operating Costs

| Item | Cost A$/tonne milled | Comment |
|---|---|---|
| 1. Mining | 35.00-43.50 | |
| (a) Stoping | 12.00-16.00 | Dept. on method |
| (b) Development | 10.00-12.00 | Dept. on stoping method |
| (c) Ore Haulage | 4.50 | |
| (d) Services | 4.00 | |
| (e) Mine Admin | 2.00 | |
| (f) Tech. Services & D/D | 2.50 | |
| (g) Special G. Support | 0-2.50 | Dept. on geotech review |
| 2. Milling | 15.00-17.00 | Rosebery ≈$20, Woodlawn ≈ $15 |
| 3. Administration | 9.00-12.00 | Nominal (needs work) |
| TOTAL | 59.00-72.50 | |

B. Capital Costs - Project

| Area Items | Cost A$ million | Comment |
|---|---|---|
| 1. Mine | | |
| (a) Decline and Ret/Air | 14.70 | To 180 metres depth |
| (b) Pre-production Dev. | 4.50 | ½ develop 5 stopes |
| (c) Pumps | 0.70 | Intermediate station |
| (d) Surface Fans | 0.75 | |
| (e) Compressed Air | 0.75 | |
| (f) Mobile Equip & Drills | 12.85 | Inc. 6 trucks, 3 loaders and 6 rigs |
| (g) Power | 1.00 | |
| (h) Other U/G Equip | 1.96 | Fans, pumps, safety, workshop, etc |
| (i) Escape Rise Equip | 0.03 | |
| (j) Changeroom, office & Workshop | 1.00 | |
| (h) Diamond Drilling | 5.00 | ½ from surface, rest underground |
| Sub-total | 43.24 | |

2. Mill

| | | | | |
|---|---|---|---|---|
| (a) | Crusher and Surface Ore | 4.00 | } | 25-30 est. Hellyer $46.6m |
| (b) | Concentrator | 23.50 | } | |
| (c) | Mobile Equip | 1.00 | | Loader, crane and L/Vehicle |
| (d) | Earthworks | 0.25 | | Nominal |
| (e) | Office and Workshop | 0.25 | | Nominal |
| (f) | Initial Consumable | 0.50 | | Nominal |
| | Sub-total | 29.25 | | |

3. Surface

| | | | |
|---|---|---|---|
| (a) | Tailings Dam | 2.50 | Hellyer 2.4 |
| (b) | Water | 0.75 | From mine, tails ret. & creeks |
| (c) | Power | 0.75 | Nominal and may be much higher |
| (d) | Roads | 0.50 | ½ on Trial Harbour road |
| (e) | Anc. Earthworks | 0.25 | |
| (f) | Housing | 2.00 | Single persons qtrs & some houses |
| (g) | Admin Office & Other | 1.00 | Inc. communication & computers |
| (h) | Engineering facilities | 0.40 | Workshop/office/L. Vehicle |
| | Sub-total | 8.15 | |

4. Project Management

| | | | | |
|---|---|---|---|---|
| (a) | Feasibility | | 0.75 | |
| (b) | Design & Engineering | } | | |
| (c) | Construction Mgmt | } | 6.00 | Nominal |
| (d) | Insurance | } | | |
| | Sub-total | | 6.75 | |

5. Working Capital

| | | |
|---|---|---|
| (a) | Mahiting Finance, etc | 1.00 |
| (b) | Training & Comm. | 1.00 |
| (c) | Store Stock | 1.50 |
| | Sub-total | 3.50 |

6. Other ?

**TOTAL** **90.90**

C. On-going Capital

Mine

| | | | |
|---|---|---|---|
| (a) | Decline Dev. & Pumps | 12.00 | Over 8 years |
| (b) | Other | 8.00 | Nominal $1.0m/year for 8 years |
| | TOTAL | 20.00 | |

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