

CONTENTS

	Page No
SUMMARY	1
TENEMENT INFORMATION	2
REVIEW OF PREVIOUS EXPLORATION	2
EXPLORATION RESULTS - LICENCE YEAR 4	6
1) Expenditure	6
2) Chamounix Zinc	6
3) Comstock Valley	11
4) McDowells	14
PARTIAL RELINQUISHMENT	21
YEAR 5 WORK PROGRAM	23
REFERENCES & BIBLIOGRAPHY	24

Table 1	McDowells Drill Core Assays
Figure 1	Tenement Location Map
Figure 2	EL 52/94 Regional Geology and Prospects Map
Figure 3	Chamounix Zinc Prospect Map
Figure 4	CSAMT Line Linda Section
Figure 5	98CZD0003 Graphic Log
Figure 6	Comstock Valley EM Anomalies and Drill Holes Map
Figure 7	McDowells Workings and Geology Map
Figure 8	McDowells G0014A Section
Figure 9	Partial Relinquishment Geology Map
APPENDIX 1	Chamounix Zinc Data and Lead Isotope Report
APPENDIX 2	Comstock Valley Data and Petrography Report
APPENDIX 3	McDowells Data

SUMMARY

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A 120 metre vertical RC percussion/core tail drill hole was completed in April 1998 on the Chamounix Zinc prospect, Linda Valley. 98CZD0003 tested a strong CSAMT conductivity anomaly at 75 metres depth. The target was prognosed as a massive sulphide lens in limestone or shale, buried under glacial gravel.

The hole encountered 12 metres of surficial gravel over 108 metres of Gordon Group limestone. No significant mineralisation was encountered. A cavity in limestone, with abundant ground water flow, was encountered between 77-78.5 metres. Weak mineralisation (0.14 % zinc) was intersected at the base of the cavity. Elevated silver values ranging from 2-7 ppm occurred in all samples assayed and silver was slightly depleted at the position of the zinc high. The ground water and limestone show no evidence of anomalous conductivity. A down hole TEM survey was attempted but the hole is blocked at 15 metres.

The anomaly has not yet been explained. EM or IP and close spaced gravity are recommended as the next exploration steps.

A review of past exploration for limestone-hosted sulphide mineralisation in Comstock Valley included core relogging and petrography and concluded that post lithification stratiform hydrothermal carbonate and sulphide has overprinted the basal part of a dolomitised carbonaceous limestone unit.

EM has effectively detected the weakly mineralised zone and the prospect is adequately drill tested in the western Comstock Valley. This work enhances the potential for effectively exploring the Chamounix prospect in Linda Valley and it should be given priority.

Remapping and sampling of the McDowells workings and drill core confirms that the North Lyell Fault has a reverse sense, with southwest dipping lower Owen Conglomerate faulted over a north dipping sequence of Gordon Group heavily oxidized calc siltstones and sandstones. Reactivation of the original graben-forming North Lyell Fault correlates with regional Devonian D₂ compression and N-S shortening through the Linda Valley.

No gold mineralisation was encountered from either surface rock chips or drill core. No further work is warranted on the prospect.

The less prospective 50% of the EL is defined for relinquishment at the end of the current licence year.

TENEMENT INFORMATION

EL 52/94 Linda (Figure 1) is a 37 km² tenement resulting from the amalgamation of the original EL 52/94 (a 34 km² tenement awarded to Copper Mines of Tasmania Pty Ltd (CMT) as the successful tenderer for ETA 364) and ELA 5/95 (a 3 km² EL Application over the former Exempt Area between the Mineral Lease 1 M/95 and the original EL 52/94).

It extends from the eastern edge of the Mount Lyell Mineral Lease to Lake Burbury in the King River Valley and covers the Sedgwick (Comstock) and Chamounix (Linda) valleys, most of Mt Lyell and the central and eastern portions of Mt. Owen. The Lyell Highway runs east-west through the middle of the EL, including the townsites of Gormanston and Linda.

Exclusions from within EL 52/94 total 6.04 km² comprising; 1 km² of Crown Reserves associated with the Gormanston and Linda townsites, 5 km² Hydro Electric Commission land, including part of Lake Burbury, and a 4 hectare Mining Lease (2W/88 - Wiggins and Batchelor Pty Ltd).

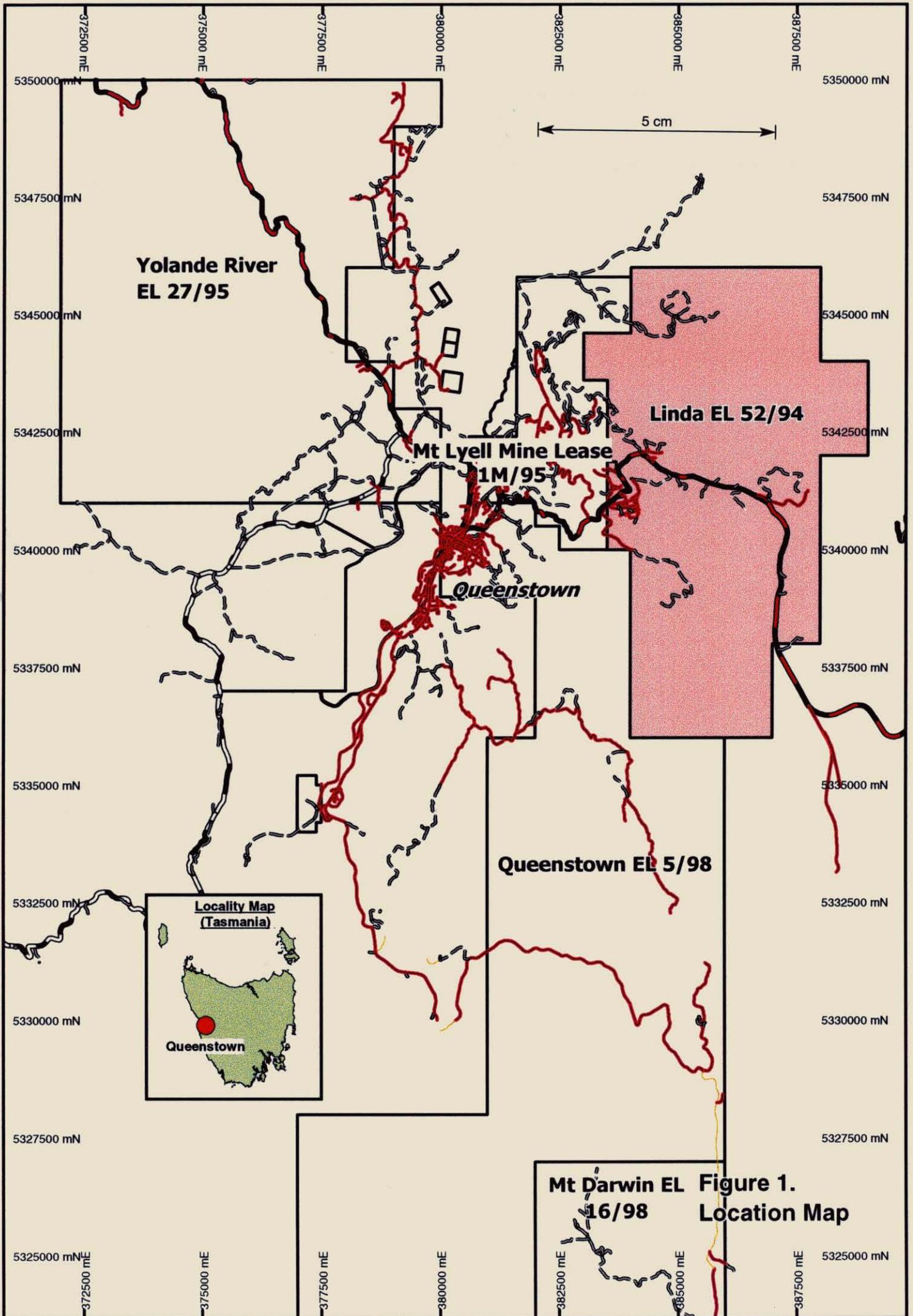
During the past year Mining Lease 47M/73 expired and the 2 hectare block was automatically absorbed into EL 52/94. An additional 1 hectare ML application (7M/98), covering surficial gravels at the SE end of Linda Valley, was lodged with MRT by Williams Quarry Pty Ltd.

EL 52/94 is held 100% by CMT and is currently in Licence Year 4, which expires on 13 January 1999. This report describes exploration completed up until 13 December 1998.

REVIEW OF PREVIOUS EXPLORATION

a) Pre EL 52/94 Exploration

The history of early prospecting and modern company exploration is compiled in detail in the Year 1 Annual Report (Morrison, Wills and Cordery, 1995) and the following summary reviews the main activities relevant to the current CMT exploration strategy.



556005

1966 - 67	Placer Exploration Ltd	SPL-6	Gridding, S.P., Soil geochem - Linda Valley
1966 - 84	Mt Lyell Mining and Railway Co. Ltd	Els 9/66, 10/69, & leases	Gridding, I.P., S.P., EM - Comstock Valley Drilling : King Lyell (Copper Clays), Gormanston (conceptual Great Lyell Fault), Comstock Valley (IP anomaly Gordon Limestone)
1984 - 87	Goldfields Exploration Pty Ltd	ATP Queenstown	Stream sediment, moss geochem - Linda Valley Drilling: Gormanston, (conceptual Great Lyell Fault), McDowells (North Lyell Fault) - old gold workings
1985 - 88	CRA Exploration Pty Ltd	EL 5/85	Stream sediment geochem - Comstock Valley
1987 - 91	BHP Minerals Ltd	EL 102/87	Gridding, EM - Comstock Valley Drilling - Comstock Valley (EM anomaly, Gordon Limestone), Relogging MLMRC Comstock, McDowells drill core Stream sediment geochem - Comstock, Linda Valleys
1988 - 93	Aberfoyle Resources Ltd	EL 5/85	Reconnaissance mapping - East Mt Lyell

A total of six grids are partly or entirely located on ground now covered by EL 52/94. Records of 34 drill holes within the EL have been located. Twenty nine of these were targetting either copper clays or prognosed sub Owen Conglomerate volcanics, drilled within mining leases of the time by MLMRC. Four holes were drilled on electrical geophysical targets in Gordon Limestone underlying the Comstock Valley and one hole was drilled under McDowells gold workings, against the North Lyell Fault in the Linda Valley.

b) CMT EL 52/94 Exploration

Year 1 summary

- Helimagnetics survey flown by UTS
- Literature review of previous exploration
- Copper Clays study (Wills, 1995)
- Reconnaissance mapping and sampling confirmed prospects (Figure 2) at: -
 1. Chamounix Zinc
 2. Burbury Volcanics
 3. King Lyell Copper Clays
 4. North Lyell Fault Zone

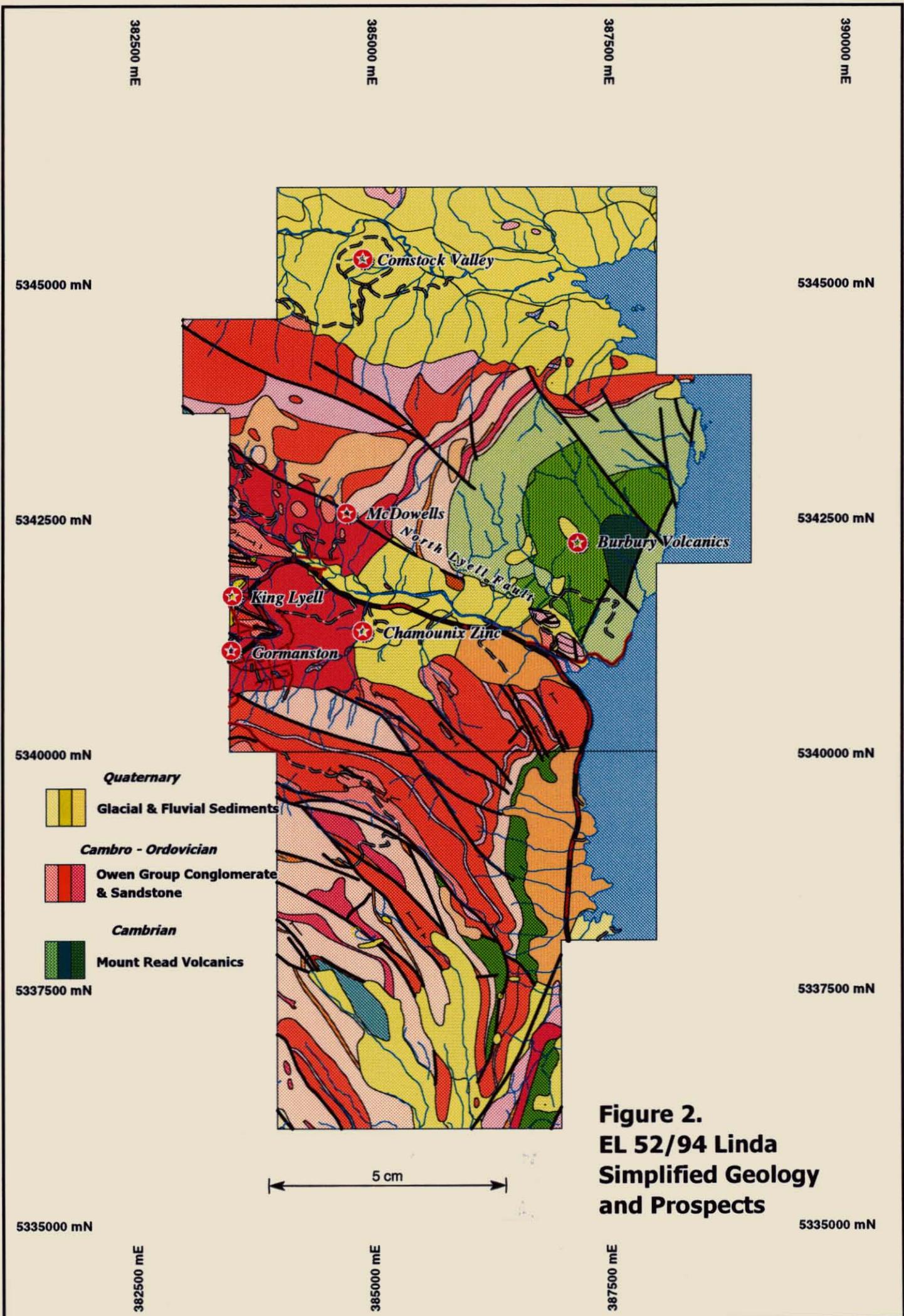


Figure 2.
EL 52/94 Linda
Simplified Geology
and Prospects

Year 2 summary

- Chamounix Zinc outcrop and costean mapping and rock chip sampling. Two percussion drill holes gave a best intersection of 12 metres (downhole) @ 2.4% Zn in the weathered zone.
- King Lyell outcrop mapping sampling. Three percussion drill holes gave best intersection of 8 metres (downhole) @ 3.5% Cu.
- Burbury Volcanics stream sediment survey produced several gold and base metal anomalies and weak gold, copper and lead mineralisation was detected in outcropping silica-hematite-pyrite altered Tyndall Group volcanoclastics.

Year 3 summary

- ERA Maptec study of major structures, based on geology, magnetics and gravity.
- King Lyell resource estimate of 1.2 million tonnes @ 1.37% Cu. Preliminary metallurgy and economics investigations concluded the project was probably sub economic and further exploration was postponed.
- Burbury Volcanics grid based magnetics and soil surveys completed. A broad gold in soil anomaly was detected over the basal Tyndall Group stratigraphy.

EXPLORATION RESULTS - LICENCE YEAR 4*1) Expenditure*

Expenditure on EL 52/94 for the 12 month period ending 30 November 1998 was \$61,991.

*2) Chamounix Zinc***CSAMT**

A regional CSAMT line from Gormanston to Lake Burbury (Line Linda) was surveyed by Zonge Engineering in January 1998. The data generated an impressive conductivity high with an epicentre at 1175 metres, in the vicinity of the Chamounix Zinc prospect, Linda Valley (Figures 3 & 4).

Processing and interpretation by Zonge and CMT concluded that the anomaly is a real rock response centred at 75 metres below surface. Surface mapping predicted that the site geology comprises about 10 metres of glacial gravel overlying Gordon Limestone in a synformal structure. The prognosed target was a lens or structured pod of massive

sulphide hosted in limestone or black shale. No previous exploration had been done over the area and the target required drilling.

Drilling

98CZD0003 commenced as a vertical RC percussion hole on 6 April 1998. The hole was drilled by the Diamond Drilling Tasmania Pty Ltd UDR 650 operated by Tony Cherry. Slow drilling, due to strong water flow in cavernous limestone, stopped the percussion hole at 83 metres and it was extended to 120 metres with an NQ diamond tail.

The hole encountered 12 metres of Quaternary surficial gravel, 16 metres of weathered Gordon Limestone and 92 metres of fresh Gordon Limestone (Figure 5, Appendix 1). Twelve metres of 6 inch steel collar casing were cemented at the base of the gravel and PVC pipe was inserted to 120 meters. All samples were removed from the site and minor earthworks were required to rehabilitate the sump and some collapsed gravel around the collar pipe.

No significant mineralisation was encountered. A cavity in limestone, with abundant ground water flow, was encountered between 77-78.5 metres. Weak pyrite and trace sphalerite mineralisation were observed at the base of the cavity. Assays confirm maximum values in the drill hole of 0.14 % zinc and 0.012 % lead at 78 - 79 metres. Although no alteration was observed in the rocks drilled, background silver levels are relatively high throughout the interval assayed (2-7 ppm). Silver decreases markedly from 78-80 metres, in the interval of highest zinc values (Figure 5).

Conductivity measurements on cavity and near surface ground waters showed no significant difference and the barren limestone is slightly more conductive than both waters. Pulped rock samples from various depths down hole showed no significant conductivity variation. The anomaly has not been adequately explained.

A down hole TEM survey was recommended to test the scenario that the conductive source is located off-section to the CSAMT line and was therefore missed by the drill hole. A possible explanation is that a body of mineralisation sits off-hole at the depth of the cavity and that the cavity may be due to limestone dissolution by sulphide. Karst features induced by sulphide dissolution are recognised in the Navan deposit, Ireland, (W. Peace, University of Melbourne, pers. com., 1998).

On 20 August 1998 Outer Rim Exploration Services attempted a down hole survey but found the hole had collapsed and blocked the PVC pipe at 15 metres depth.

Further geophysical testing of the anomaly is therefore restricted to surface work. A close spaced gravity survey followed by IP or EM are recommended.

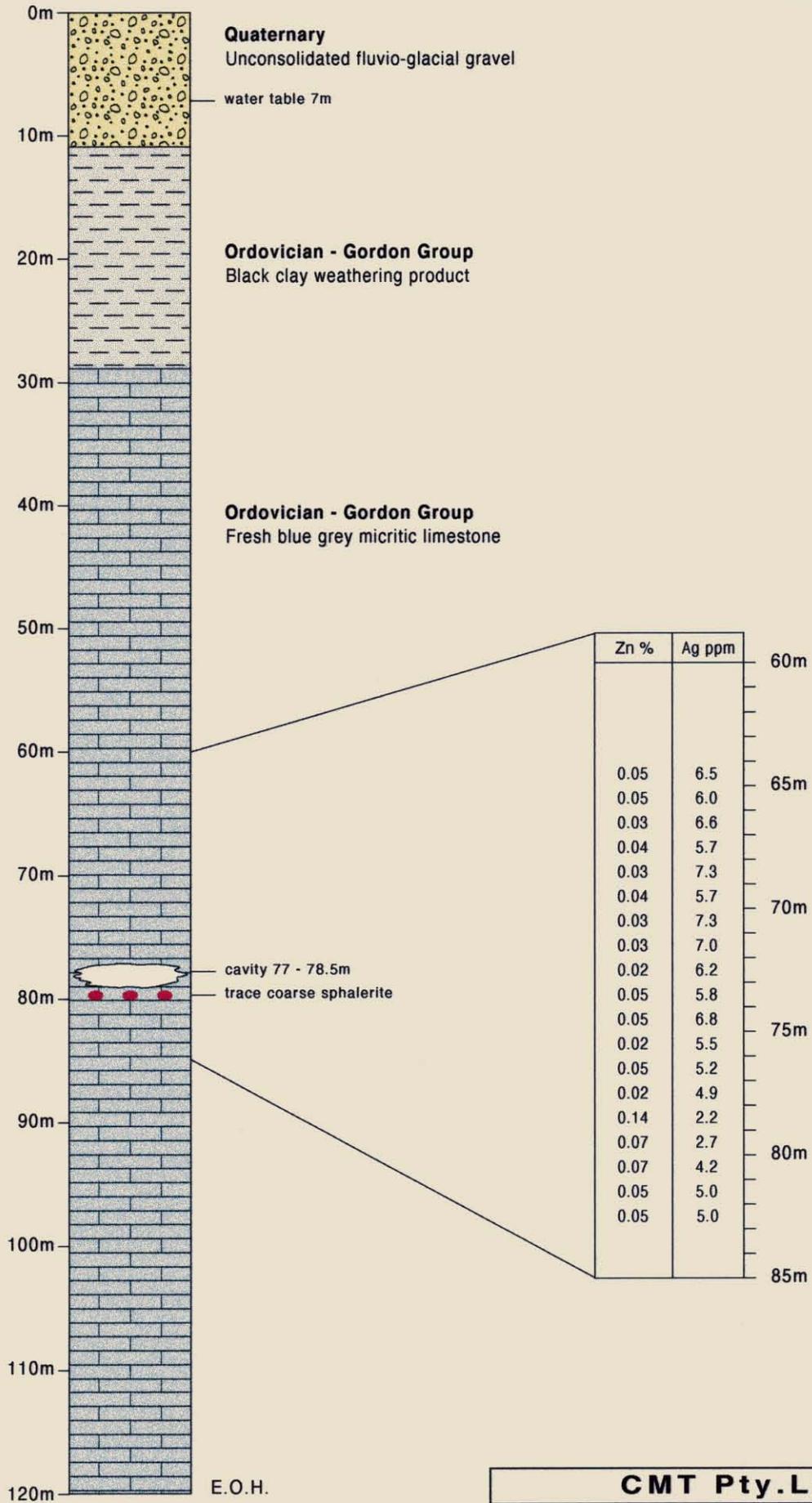
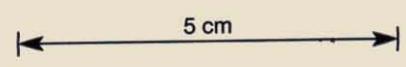


Figure 5

CMT Pty.Ltd.			
EL 52/94 Linda 98CZD-0003 Graphic Log			
Author: K.C.Morrison	Drafting: R.Carroll	Date: 20.9.98	Scale: 1:500



Lead Isotopes

A 2 cm specimen of galena-rich sulphide sampled from outcrop (384,050 E, 5,342,010 N) was sent to the University of Western Australia geochronology laboratory, via Dr Garry Davidson, CODES, University of Tasmania, for lead isotope analysis and interpretation.

The results (Appendix 1) show a typical Ordovician Gordon Group signature for Pb206/204 (18.413) and Pb208/204 values (38.469) are similar to the Gordon Group - hosted Grieves Prospect near Zeehan. One interpretation of the Grieves lead however is that it has been inherited from underlying Cambrian basement and redeposited by Ordovician fluids. The Pb207/204 ratio is anomalously high (15.700) and more consistent with the Devonian vein deposits in the Zeehan mineral field.

Overall the results are inconclusive but favour an Ordovician lead source with a Devonian tectonic overprint.

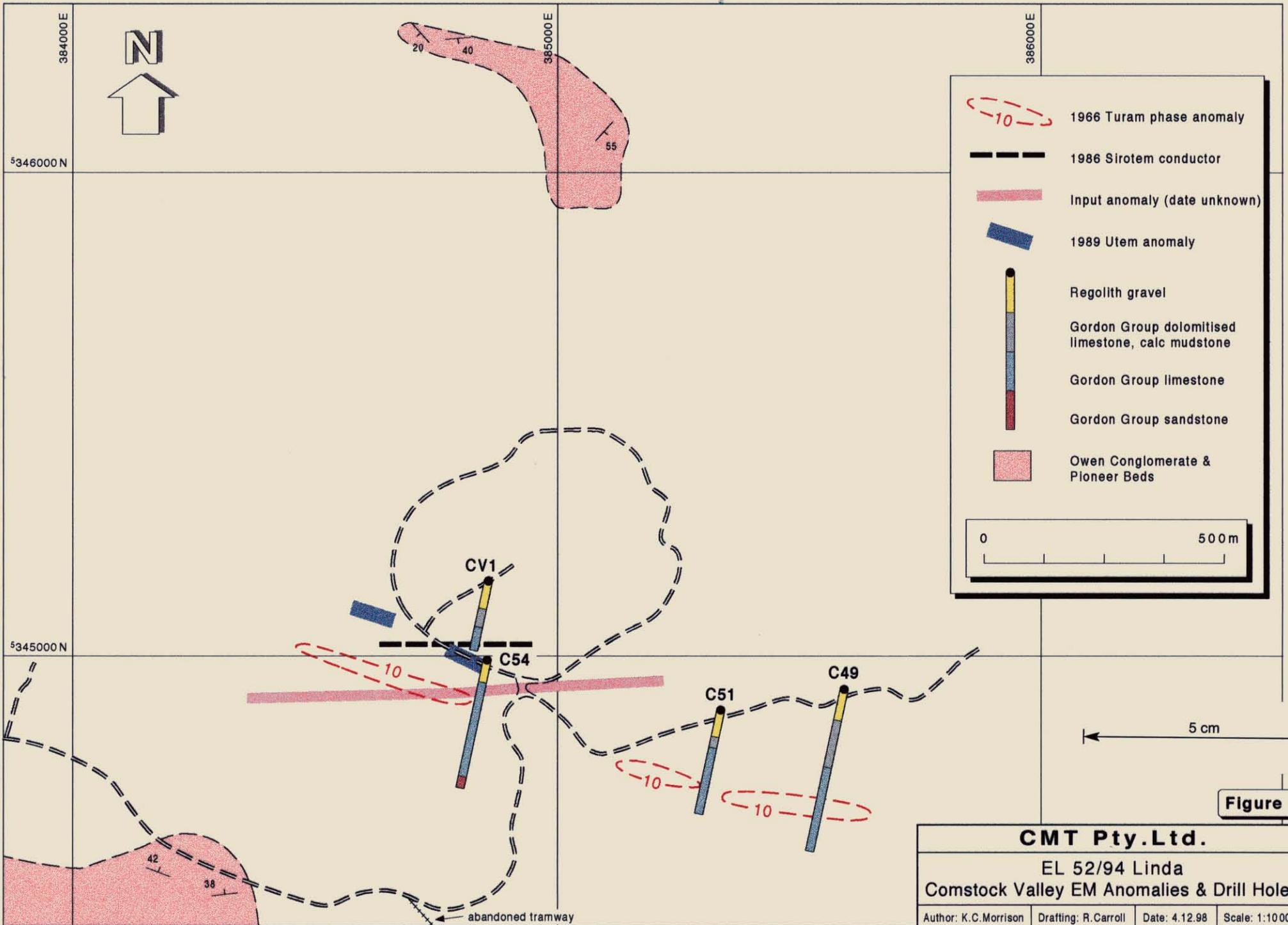
3) Comstock Valley**Background**

Grid based SP, EP and TURAM EM surveys were conducted by the Bureau of Mineral Resources for the MLMR Company from 1958 to 1966 (Williams, 1966, 1969). The work was designed to extend exploration from the known Mt Read Volcanics mineralisation in the Comstock-Tasman Crown area, into the western Comstock Valley where thick glacial gravels cover the target geology. Three DDHs (C49, C51 and C54) were drilled during 1966-67 on coincident IP and TURAM phase anomalies, confirming the presence of Gordon Limestone beneath the Quaternary cover in the western Comstock Valley (Figure 6).

Later Geological Survey mapping (Queenstown 1:25,000 sheet) shows lower Eldon Group sandstone (presumably underlain by Gordon Group) outcropping as windows through the Quaternary in the eastern Comstock Valley. Therefore an area of approximately 4 km² in EL 52/94, west of approximately AMG 386,500 E, can be considered prospective for limestone/shale-hosted zinc under gravel cover, as per the Chamounix prospect in Linda Valley.

Results of Previous Exploration

No significant mineralisation was encountered by the three MLMR Company holes. Selective sample intervals of core and drill return sludge were assayed for gold, base metals and pyrite. No significant zinc or gold values were achieved and a maximum pyrite assay of 12% was recorded at 178 metres from drill sludge in C49. Elevated copper values, up to a maximum of 0.23%, were obtained from orange brown clays and sandstone in the basal interval of C49. This lithology correlates with the lower Gordon Group sediments which host Copper Clays in Linda Valley.



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Figure 6

CMT Pty.Ltd.			
EL 52/94 Linda			
Comstock Valley EM Anomalies & Drill Holes			
Author: K.C.Morrison	Drafting: R.Carroll	Date: 4.12.98	Scale: 1:10000

No further exploration occurred until in 1989-90 BHP refurbished the Comstock grid and conducted moving loop and fixed loop EM surveys. A strong anomaly resulted (Figure 6) and a maximum glacial gravel thickness of 140 metres was interpreted in the valley centre (Wilde and Kerr, 1990).

CV1 was collared north of C54 and tested a combined UTEM/SIROTEM/TURAM conductor. CV1 was drilled to the south, as were the three earlier holes, and encountered a zone of carbonaceous impure limestone with up to 10 % pyrite veining at the anomaly position. The best assay result was 183-184 metres @ 0.26 % Zn and 1.5 ppm Ag. CMT relogging and petrographic examination confirms that the weak sulphide mineralisation occurs at the base of a dolomitised carbonaceous zone within the Gordon Limestone (Appendix 2).

All 4 drill holes had southerly azimuths and confirm north dipping Gordon Limestone in that part of Comstock Valley (Figure 6). CV1 drilled approximately 100 vertical metres of surficial gravels overlying relatively fresh (? ice eroded surface) Gordon Limestone. A down hole EM survey in CV1 gave no evidence of a nearby conductor and no further exploration was done by BHP on that target.

Drill core from the 4 holes was relogged to summary detail at the MRT Mornington core store and samples of sulphide/carbonate mineralisation from C49, C51 and CV1 were sent to Wendy Peace, University of Melbourne for petrographic examination (Appendix 2).

Thin section petrography and cathodoluminescence showed that the sulphide was a late stage phase in an alteration sequence comprising initial pervasive dolomitisation of organic rich micritic limestone, followed by brecciation and sulphide-carbonate-quartz veining and cementation.

The presence of Fe rich saddle dolomite rather than siderite is interpreted by Peace to indicate diagenetic formation, at temperatures ranging from 60-150°C. It is not clear whether the pervasive dolomitisation is a necessary precursor to sulphide accumulation but the paragenetic sequence suggests that the brecciation and introduction of sulphides is post lithification, as is the case with the Irish carbonate-hosted deposits.

The alteration mineralogy suggests that the hydrothermal fluids were probably not magmatically sourced but fluid inclusion temperature measurements are recommended to test that hypothesis.

Three main conclusions have resulted from the Comstock Valley review:

1. EM has effectively detected weakly developed stratiform sulphide mineralisation at the base of a zone of dolomitised carbonaceous limestone.
2. The 4 km² area deemed prospective for carbonate/shale hosted zinc in the western half of Comstock Valley has been thoroughly covered by electrical geophysics and

effectively drill tested by 4 holes. There is less incentive to explore the eastern half of Comstock Valley where the target rocks are covered by an unknown thickness of Eldon Group sediments in addition to glacial gravels. It is likely, however, that the stratabound EM phase anomaly (Figure 6) may extend further to the SE and under Eldon Group cover.

3. The Comstock Valley results enhance the potential to effectively explore the Chamounix prospect in Linda Valley. In contrast to Comstock Valley, outcropping zinc mineralisation has been found in Linda Valley, the glacial gravels are much thinner (20 metres vs 100 metres) and no gridding or modern ground geophysics have been done in the prospective part of Linda Valley. EM or IP, combined with detailed gravity, should detect a sediment-hosted massive sulphide body under relatively shallow gravel cover and should be applied in Linda Valley.

4) *McDowells*

Background

At the time EL 52/94 Linda was granted to CMT (13 January 1995), a small Mining Lease covered the abandoned McDowells Prospecting Association gold diggings on the north side of Linda Valley (Figure 2). 47M/73 was a 2 hectare ML held by P, K & B Smith and consequently that area was excluded from EL 52/94.

Preliminary enquiries with the Mineral Resources Tasmania Registrar of Mines indicated that 47M/73 was approaching the end of its 21 year term and, as the leasees had conducted no development or mining, the lease would automatically be absorbed into EL 52/94 during 1995.

The leasees however applied for a renewal to 47M/73 and tenaciously pursued the matter through the Warden's Court, before eventually being refused an extension. On 16 June 1998 the Registrar of Mines notified CMT that 47M/73 was cancelled and that CMT was free to explore that area as part of EL 52/94.

Exploration interest in the McDowells area by CMT centres on the fact that it is one of two old gold diggings located on the North Lyell Fault (The second site is the Watsons-Idaho alluvial gold diggings 1.5 km WNW from McDowells) and the observation that the position of the Mt Lyell mineral field appears related to the intersection of the Great Lyell and North Lyell Faults.

Early Prospecting and Mining

Unpublished quarterly reports on Progress of the Mineral Industry of Tasmania (MRT library, Rosny Park) describe the activities of McDowells Prospecting Association work on the prospect that occurred between 1911 and 1919 and was carried out by two men (a Mr Kaye and his offsider), with State Government financial help.

17 ounces of gold were recorded from McDowells in 1911, partly from shallow hard rock diggings and partly from creek gravels. From 1911 to 1917 two adits, 100 vertical feet apart, were driven into the hill for unknown distances and a rise was developed between the adits and a 5 head water wheel stamp battery erected on site. In 1917 part of the rise was stoped and crushed but the "stone was unpayable". No production or grade figures are quoted but mining stopped for the following year.

In 1919 the two man operation reopened and a 60 ton parcel of "ore" was stoped from the upper adit and crushed in the battery. 2.25 ounces of gold were produced, equating to a grade of approximately 1.1 g/t. The mine closed at that time.

Modern Exploration

In 1984 Goldfields Exploration Pty Ltd and the Mount Lyell Mining and Railway Company Ltd mapped the surface workings and drilled a 420 metre DDH angled towards the NE and under McDowells workings (Bird, 1985).

The prospect geology was interpreted as a stratabound goethitic-quartz breccia pipe on a middle Owen sandstone-conglomerate boundary, contained in a block which had slid 300 metres down slope from an original position on the North Lyell Fault and is contained within a hydrothermal crater.

G14/14A drilled 340 metres of ferruginous silt-clay, sandstone and brecciated silica and 80 metres of Owen Conglomerate. It is unclear from Bird whether the clay/sandstone lithology is Gordon Group, Eldon Group or Quaternary glacial sediments. Twelve composite (20 metre interval) samples were taken from the core and assayed for Cu, Pb, Zn, Ag, Ba and Au. No samples scored above level of detection for gold but elevated values of + 2000 ppm Pb and Zn were achieved between 200 - 260 metres (Table 1).

BHP mapped McDowells in August 1989. North of the North Lyell Fault Owen Conglomerate dips south at 50° and south of the fault, interlayered quartzitic sandstone and orange brown friable mudstone are mapped dipping steeply south (Wilde and Kerr, 1990). Six rock chip samples from the perimeter of the pit returned uniformly low metal values (Table 1).

Relogging of G14/14A confirmed the Goldfields down hole stratigraphy. Check assays at 25 m intervals returned similar results to Goldfields - ie gold below level of detection and a broad zone of elevated Zn and Pb (80 m @ >0.15% Zn+Pb) Mineragraphic examination showed that most of the zinc is present in hematite pseudomorphs and that detrital chromite (with up to 17% ZnO substitution) is a common accessory. The similarity of the ferruginous silt-clay-sandstone lithology to the Copper Clays lithology was also noted.

BHP concluded that the chromite content suggests a correlation to the Pioneer Beds.

Table 1 McDowells Drill Core Assays

Down Hole Interval (m)	Core recovery (%)	Lithology	Sample No.	CMT Assays (1998) Au ppb	BHP Assays (1990)							Goldfields Assays (1984)						
					depth(m)	Au ppb	Cu ppm	Pb	Zn	As	Ba	depth(m)	Cu ppm	Zn	Ag	Ba	Au	Pb
G14																		
11.2-21.4	49	bleached quartz sandstone	H1501	<10														
21.4-26.6	100	oxidised quartz sandstone, siltstone, clay	H1502	<10														
26.6-32.5	85	A/A	H1503	<10														
32.5-42.3	51	oxidised silt, siltstone, quartz sandstone	H1504	<10														
42.3-52.0	52	oxidised gritty quartz sandstone, siltstone, clay	H1505	<10														
52.0-59.1	70	oxidised siltstone, clay, quartz sandstone	H1506	<10														
59.1-68.7	52	A/A	H1507	<10														
68.7-77.85	55	bleached quartz sandstone, oxidised siltstone, clay	H1508	<10														
77.85-90.6	39	oxidised coarse quartz sandstone, clay siltstone	H1509	<10														
90.6-96.6	83	bleached quartz sandstone, oxidised siltstone, clay	H1510	<10														
96.6-102.65	83	A/A	H1511	<10														
102.65-110.7	62	oxidised siltstone, clay, coarse quartz sandstone	H1512	<10								93-120	8	83	-	220	-	12
110.7-115.2	100	A/A	H1513	<10														
115.2-120.25	100	coarse quartz sandstone, oxidised siltstone	H1514	<10														
120.25-125.3	100	A/A	H1515	<10														
125.3-130.5	96	coarse gritty sandstone/wacke, oxidised siltstone	H1516	<10														
130.5-133.2	100	coarse gritty quartz, lithic sandstone	H1517	<10														
G14A																		
128.5-138.5	50	oxidised siltstone, clay, coarse quartz sandstone	H1518	<10								120-140	11	82	-	210	-	39
138.5-144.7	81	gritty quartz sandstone, oxidised siltstone	H1519	<10														
144.7-152.7	62	A/A	H1520	<10														
152.7-161.6	56	oxidised siltstone, clay, quartz sandstone	H1521	<10								140-160	13	87	0.1	250	-	133
161.6-166.9	100	A/A	H1522	<10														
166.9-175.0	62	oxidised siltstone, quartz sandstone, breccia	H1523	<10														
175.0-183.4	59	oxidised siltstone, quartz sandstone	H1524	<10								160-180	18	119	0.1	290	-	265
183.4-187.8	100	A/A	H1525	<10														

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Down Hole Interval (m)	Core recovery (%)	Lithology	Sample No.	CMT Assays (1998)	BHP Assays (1990)							Goldfields Assays (1984)					
				Au ppb	depth(m)	Au ppb	Cu ppm	Pb	Zn	As	Ba	depth(m)	Cu ppm	Zn	Ag	Ba	Au
187.8-192.0	100	oxidised siltstone, silt, clay, breccia	H1526	<10													
192.0-196.6	100	A/A	H1527	<10													
196.6-204.9	100	oxidised siltstone, claystone	H1528	<10	200	10	20	65	140	20	420	180-200	20	108	0.1	290	- 240
204.9-219.4	48	oxidised siltstone, claystone	H1529	<10													
219.4-232.0	40	A/A	H1530	<10	225	10	25	520	900	35	140	200-220	23	1030	0.3	380	- 730
232.0-239	100	A/A	H1531	<10								220-240	27	1000	0.2	320	- 1950
239-249.5	67	A/A	H1532	<10													
249.5-256.9	100	A/A	H1533	<10	250	14	55	1850	1300	60	300	240-260	22	280	0.2	230	- 1600
256.9-265.7	80	A/A	H1534	<10													
265.7-272.9	100	A/A	H1535	<10													
272.9-282.8	71	A/A	H1536	<10	275	11	20	160	1450	20	320	260-280	22	700	0.3	330	- 360
282.8-292.4	73	oxidised siltstone, claystone, sandstone breccia	H1537	<10													
292.4-301.7	75	A/A	H1538	<10								280-300	23	650	0.2	290	- 335
301.7-309.6	89	A/A	H1539	<10	300	16	45	560	1400	50	290						
309.6-316	100	oxidised siltstone, claystone, minor quartz sandstone	H1540	<10													
316-322.8	100	oxidised siltstone, gritty quartz, lithic sandstone	H1541	<10								300-320	25	790	0.1	300	- 395
322.8-329.6	100	oxidised claystone, siltstone	H1542	<10	330	10	40	195	540	50	250	320-333	32	930	0.2	385	- 452
329.6-335.2	100	oxidised clay, sandstone breccia	H1543	<10	334	14	10	5	30	2	20						
335.2-337.5	100	oxidised silt, claystone	H1544	<10													
337.5-341.1	100	Owen conglomerate	H1545	<10													
341.1-347.8	100	A/A	H1546	<10													
347.8-353.6	100	A/A	H1547	<10	350	12	5	<5	20	<2	25						
353.6-361.4	90	A/A	H1548	<10													
361.4-371.7	68	A/A	H1549	<10													
371.7-380.4	80	A/A	H1550	<10	375	13	5	<5	29	<2	85						
380.4-393.6	53	A/A	H1551	<10													
393.6-406.3	100	Owen conglomerate, green/purple shale	H1552	<10	400	20	15	<5	40	<2	320						

(Goldfields log EOH = 420 m)

556019

CMT Exploration

Despite the negative results from the work of Goldfields and BHP it was considered that deficiencies existed in three areas of the previous work in respect of gold exploration.

- 1) The rock units mapped in outcrop and logged in drill core needed checking as some confusion exists in distinguishing between Pioneer Sandstone, Owen Sandstone, weathered Gordon Limestone and Quaternary periglacial sediments.
- 2) The surface rocks have not been thoroughly sampled. Systematic rock chip sampling of the various veins and fracture sets exposed around the open cut should be conducted.
- 3) The drill core needs continuous sampling and assaying for gold.

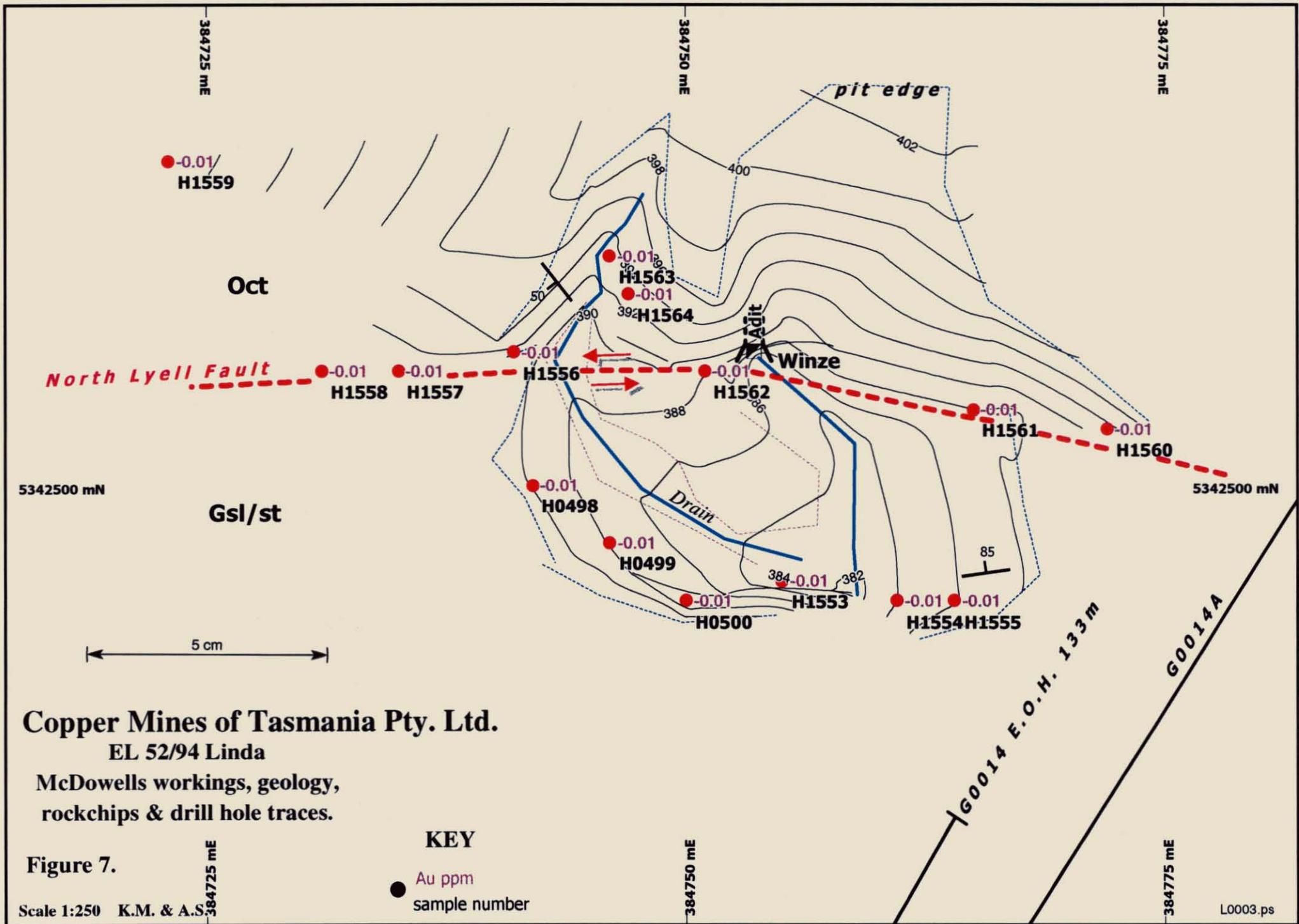
In August 1998 the prospect was mapped and sampled and the G14/14A core was relogged and entirely sampled for a gold assay check (Appendix 3).

Figure 7 shows the North Lyell Fault position exposed in the workings at the contact between Owen Conglomerate north of the fault and a decomposed heavily ferruginous siltstone and sandstone lower Gordon Group lithology (possible Pioneer Beds correlate) to the south. No limestone was observed in the area.

Fifteen rock chip samples were taken from quartz veining in the Owen Conglomerate and as channels across the ferruginous siltstone. Figure 7 shows that all samples returned < 0.1 ppm gold and from 0.2 to 2.6 ppm silver, results consistent with the BHP sampling.

The trace of the North Lyell Fault from surface to the down hole intersection in G14A (Figure 8) indicates reverse movement. This suggests at least two generations of post Gordon Group movement in the North Lyell structure, assuming that the Gordon Group in Linda Valley was preserved initially by graben style normal faulting. A later compressional event has reversed the sense of movement on the North Lyell Fault, synchronous with the tight folding of the Owen Group and Pioneer Beds on Gormanston, Pioneer and Linda Spurs and the pervasive D₂ cleavage in the Lyell Schist. This is consistent with the syn D₂ southerly thrusting of the Firewood Siding Fault (west of the Mt Lyell field) and the reactivated reverse movement on the westerly end of the North Lyell Fault (in the North Lyell corridor area) described by Berry (1990).

G14A was drilled under McDowells workings, intersecting a 337.5 m downhole width of ferruginous siltstone, clay, coarse quartz sandstone and granule wacke in the footwall sequence to the North Lyell Fault (Figure 8, Appendix 3). The rocks show textural evidence of dissolution brecciation and decomposition and are highly bioturbated, suggesting a substantial original carbonate content. 82.5 metres of lower Owen Group conglomerate and minor green and red shale were drilled in the fault hangingwall sequence. Laminated shales near the bottom of the hole show bedding structures indicating right way up and bedding-core axis angles of 80-90° indicating a southerly dip.



SSI - Mine Geology & Exploration Departments - Copper M

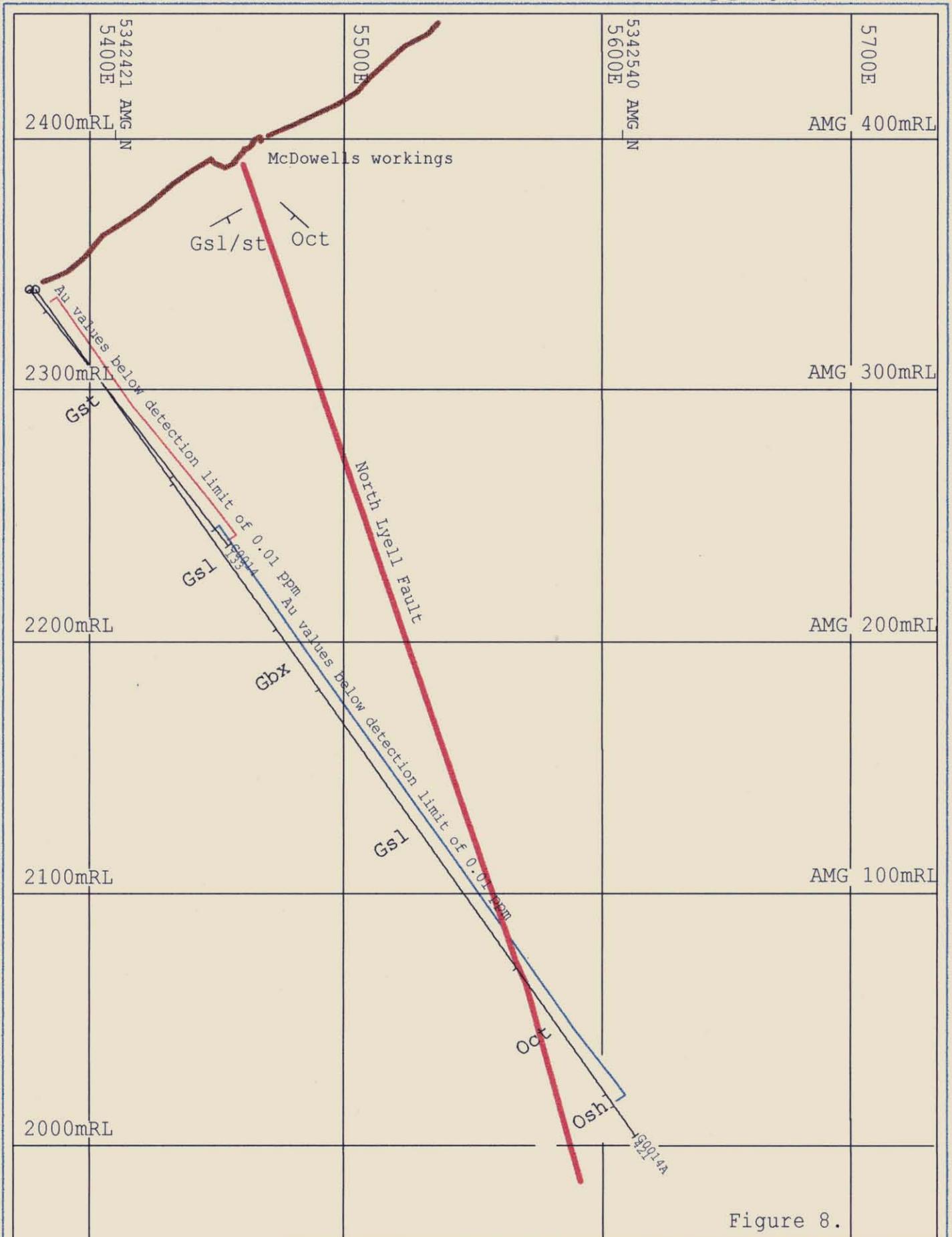


Figure 8.

COPPER MINES OF TASMANIA
 EL 52/94 - Linda
 McDowells Section G0014A
 Gold Assays



Drawn AJS	Date 21-Oct-98
Checked	Designed K.M.
Approved	Revision
Scale 1:2000	DRG. NO.

5400E

5 cm

The overlying conglomerates are essentially undeformed, silicified and hematitic with a slight colour bleaching being the only visible contrast with the outcrop. The Owen rocks drilled in G14A were interpreted as belonging to the Lower Owen, stratigraphically above the basal coarse conglomerates (K. Corbett, pers. comm., 1998).

52 samples were taken from the core and assayed for gold only. No sample scored above detection level (Figure 8, Table 1).

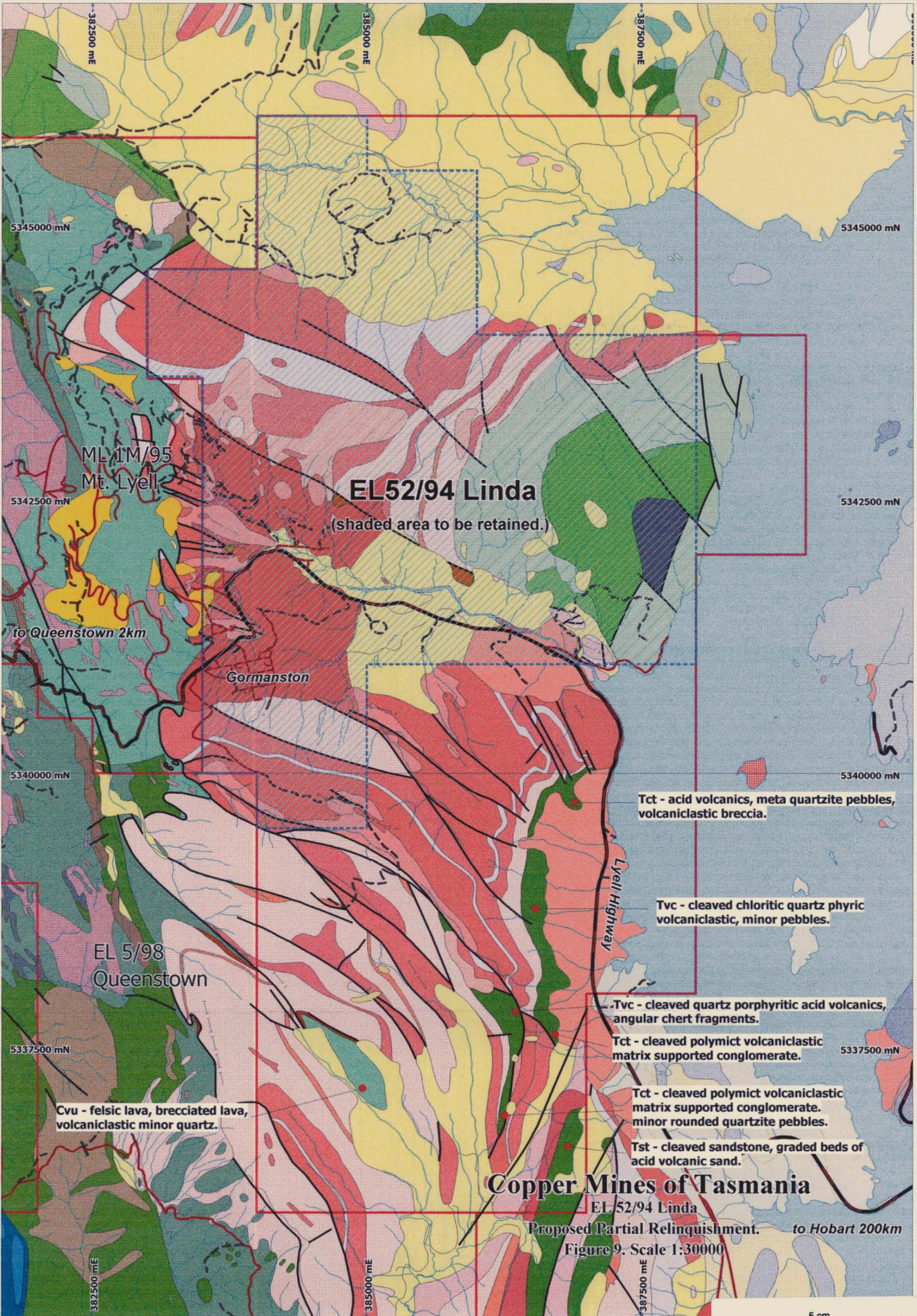
Table 1 compares the MLMR, BHP and CMT assay data from the drill core and shows that apart from the 80 metre interval of elevated Zn + Pb values in part of the Gordon Group sequence, there is no evidence of metal enrichment in the structural wall rocks or the North Lyell Fault. As the Zn + Pb enrichment is considered a supergene iron hydroxide scavenging process, no further work on McDowells is warranted.

PARTIAL RELINQUISHMENT

Approximately 50% of EL 52/94 is being relinquished at the end of Licence Year 4. The area to be relinquished is shown on Figure 9 and the area to be retained is bounded by the following AMG co-ordinates.

Area to be Retained

NW corner	384,000 E, 5,346,000 N
East to	385,000 E
South to	5,345,500 N
East to	386,000 E
South to	5,344,000 N
East to	388,000 E
South to	5,341,000 N
West to	385,000 E
South to	5,339,500 N
West to	384,000 E
North to	5,340,000 N
West to	383,500 E
North to	5,343,600 N
West to	383,000 E
North to	5,344,600 N
East to	384,000 E
North to	5,346,000 N



ML 1M/95
Mt. Lyell

EL 52/94 Linda
(shaded area to be retained.)

EL 5/98
Queenstown

Cvu - felsic lava, brecciated lava,
volcaniclastic minor quartz.

Tct - acid volcanics, meta quartzite pebbles,
volcaniclastic breccia.

Tvc - cleaved chloritic quartz phyrlic
volcaniclastic, minor pebbles.

Tvc - cleaved quartz porphyritic acid volcanics,
angular chert fragments.

Tct - cleaved polymict volcaniclastic
matrix supported conglomerate.

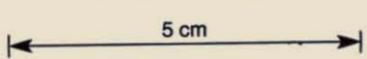
Tct - cleaved polymict volcaniclastic
matrix supported conglomerate.
minor rounded quartzite pebbles.

Tst - cleaved sandstone, graded beds of
acid volcanic sand.

Copper Mines of Tasmania

EL 52/94 Linda
Proposed Partial Relinquishment. to Hobart 200km

Figure 9. Scale 1:30000



Little exploration has been conducted on the relinquished ground. Field reconnaissance on the undifferentiated Tyndall Group rocks along the eastern side of Mt Owen and the inlier of Central Volcanic Complex felsic volcanics south of the Mt Owen summit produced the outcrop descriptions recorded on Figure 9.

Samples from the only outcropping Central Volcanics Complex rocks in the area were collected and petrographically examined by Dr K Corbett in June 1997. Three thin sections show textures ranging from feldspar + minor quartz phyric lavas to brecciated lavas to felsic volcanoclastics. The rocks show minor quartz and sericite alteration but no evidence of hydrothermal overprint (K. D. Corbett, internal company correspondence, 1998).

Several large scale structural corridors defined by the EPA Maptec study traverse the Owen Conglomerate inside the area to be relinquished. As no evidence exists that these features are reactivated Middle Cambrian faults associated with volcanism, they cannot be ranked as exploration targets.

No evidence of hydrothermal alteration in the volcanics, no known prospects or exploration leads and the widespread Owen Conglomerate cover combine to downgrade this half of the EL in terms of CMT exploration aims.

Copies of the aeromagnetic data acquired by the 1995 UTS survey over EL 52/94 and the subsequent interpretation of structure by ERA Maptec are held by Mineral Resources Tasmania. That information can be released to Open File domain for the portion of EL 52/94 being relinquished.

YEAR 5 WORK PROGRAM

Year 5 exploration will concentrate on three areas; Chamounix Zinc, Burbury Volcanics/North Lyell Fault and Gormanston.

Given the success of IP in detecting weak sulphide mineralisation in Gordon Limestone in the Comstock Valley, a program of grid based IP and close spaced gravity is planned to test the unexplained Chamounix CSAMT anomaly in Linda Valley.

Further mapping and sampling is required on the Burbury Volcanics prospect to confirm drilling targets in the area of existing outcrop, soil and stream sediment anomalies.

A review of previous drilling and interpretation of the subsurface geology in the Gormanston area is in progress. A zone of alteration/mineralisation is known from previous MLMR Company work, close to the 1M95-EL 52/94 boundary and the potential for extending this prospect into the EL will be determined in Year 5.

REFERENCES & BIBLIOGRAPHY

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- Bird, M., 1984. Linda Valley Exploration, June Quarter 1983-84 and Drilling Recommendations. Unpub Rep, Goldfields Exploration Pty Ltd. (T1984-007)
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- Morrison, K.C., Wills, K.J.A., and Cordery, G.R., 1995. CMT Pty Ltd EL 52/94 Annual Report Year 1, 3 Volumes. (T1995-024)
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- Wilde, A. R. and Kerr, T. L., 1990. Exploration Licence 102/87 Report for the Year ended 21 April 1990. Unpub Rep., BHP Co Ltd. (T1990-032)
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- Williams, J. P., 1969. Comstock and Cape Horn areas, Queenstown, Tasmania - Drilling results, Bore logging and geophysical interpretation. BMR Record 1969/121. (T1969-006)
- Wills, K.J.A., 1995. Open Cut Potential of the Copper Clays Area, Mount Lyell, Tasmania. (T1995-050)

556027

APPENDIX 1

CHAMOUNIX ZINC DATA & LEAD ISOTOPE REPORT

CMT Drill Hole Log



Collar Details

Hole ID	98CZD0003	reg_north	5341535	date_drilled	06/04/98
work_north	5581.830	reg_east	385287.1	hole_type	DD
work_east	5312.460	reg_rl	261.468	locality	Drilled into GSAMT Anom. Sth Lyell Highway. Steel cased to 12m.
work_rl	2261.468	max_depth	120.3		

Down Hole Survey Details

depth	dip	work azim	reg azim
0	-90	0	
120.3	-87.5	229.5	

CMT Drill Hole Log - Summary Geology



hole_id	depth_from	depth_to	lith_code	litho_description	alt_code_1	alt_style_1	min_code_1	min_pc_1	min_code_2	min_pc_2
98CZD0003	0	12	Rgv	unconsol mainly Oct derived						
	12	23	Gcl	wet contam by Rgv small samples minor chert						
	23	28	Gcl	wet cl wd ls						
	28	31	Gls	wd fh micrite						
	31	39.5	Gls	fh micrite						
	39.5	42	Gst	calc st ch cl small samples						
	42	56	Gls	fh micrite small wet samples						
	56	60	Gsh	calc sh cavities minor qv trace py			py	2		
	60	77	Gls	fh micrite minor calcite trace py			py	2		
	77	78.5		heavy water flow trace cg zs fg py at base cavity			py	2	zs	1
	78.5	83	Gls	fh micrite minor calcite trace qv fg py, RC refusal @ 83m			py	2		
	83	87.6	Gls	Bioturbated pelletal micrite. fs, zs bleb @83.31, calcite veins CA 30°			zs	-1		
	87.6	89.1	Gls	bx micrite trace calcite spar sf bleb 87.85			sf	-1		
	89.1	92.6	Gls	bioturb fs micrite minor bx zones						
	92.6	96.95	Gls	algal mud rich sed structures show right way up apparent dip 20°						
	96.95	98.7	Gls	massive micrite minor fs bioturb						
98.7	99.1	Gls	mud pellet ct							
99.1	99.9	Gls	massive micrite minor undulose algal mat							

hole_id	depth_from	depth_to	lith_code	lith_description	alt_code_1	alt_style_1	min_code_1	min_pc_1	min_code_2	min_pc_2
98CZD0003	99.9	107.6	Gls	algal mud rich micrite minor fs bioturb bx calcite veins CA 30°						
	107.6	113.8	Gls	micrite with common stylolites at low angle to bedding						
	113.8	120.3	Gls	micrite minor bioclast ct common algal layering calcite vein CA 30°						

CMT Drill Hole Log - Summary Assay Results



hole_id	From	To	samp_id	sample_type	Cu %	Au ppm	Ag ppm	Pb ppm	Zn ppm
98CZD0003	64	65	EXPA7129	DRILLCHIP			6.5	50	500
	65	66	EXPA7130	DRILLCHIP			6	50	400
	66	67	EXPA7131	DRILLCHIP			6.6	30	300
	67	68	EXPA7132	DRILLCHIP			5.7	40	400
	68	69	EXPA7133	DRILLCHIP			7.3	30	300
	69	70	EXPA7134	DRILLCHIP			5.7	40	400
	70	71	EXPA7135	DRILLCHIP			7.3	40	300
	71	72	EXPA7136	DRILLCHIP			7	40	300
	72	73	EXPA7137	DRILLCHIP			6.2	40	200
	73	74	EXPA7138	DRILLCHIP			5.8	50	500
	74	75	EXPA7139	DRILLCHIP			6.8	50	500
	75	76	EXPA7140	DRILLCHIP			5.5	50	200
	76	77	EXPA7141	DRILLCHIP			5.2	50	500
	77	78	EXPA7142	DRILLCHIP			4.9	50	200
	78	79	EXPA7143	DRILLCHIP			2.2	120	1400
	79	80	EXPA7144	DRILLCHIP			2.7	80	700
	80	81	EXPA7145	DRILLCHIP			4.2	70	700
	81	82	EXPA7146	DRILLCHIP			5	60	500
	82	83	EXPA7147	DRILLCHIP			5	60	500

CONDUCTIVITY DATA 98CZD0003

dataset	hole_id	sample_id	sample_type	depth_from	depth_to	micrS/cm
CZ	98CZD0003	EXPA7129	drillchipslurry	64	65	720
CZ	98CZD0003	7130	drillchipslurry	65	66	701
CZ	98CZD0003	7148	drillchipslurry	30	31	360
CZ	98CZD0003	7149	drillchipslurry	31	32	285
CZ	98CZD0003	7150	drillcoreslurry	119.9	120	431
CZ	98CZD0003	E5835	groundwater	12	12	384
CZ	98CZD0003	E5836	groundwater	78	78	341

556032

CMT Drill Hole Log - Summary Geotechnical Log

hole_id	depth_from	depth_to	recov_m	gt100mm_m	recovery_pc	rqd_pc	fractures
98CZD0003	83	86.8	3.6	3.1			
	86.8	89.9	3.1	2.9			
	89.9	93	3.1	2.8			
	93	96.1	3.1	2.55			
	96.1	99.2	3.1	2.8			
	99.2	102.3	3.1	2.7			
	102.3	105.4	3.1	2.7			
	105.4	108.5	3.1	1.9			
	108.5	111.6	3	3			
	111.6	114.6	3	2.6			
	114.6	117.6	3	2.7			
	117.6	120	2.4	2.15			

Report on Pb isotope composition of unknown galena from K. Morrison

15/1/98

Background

A single sample of coarse-grained galena crystals approximately 2cm in diameter was supplied to me by geologist Ken Morrison, with the aim of determining the age of Pb mineralisation using the Pb-isotope composition. The sample was analysed at the University of Western Australia under the supervision of geochronologist Dr Neal McNaughton.

Results

The sample was considered by Dr McNaughton to be only large enough for a single analysis, which yielded the Pb-isotope composition of:

$$\begin{aligned} 206/204 &= 18.413 \\ 207/204 &= 15.700 \\ 208/204 &= 38.469 \end{aligned}$$

95% cl is +/-0.15% in each ratio. The datum point is shown as "unknown" on the accompanying figures.

Without further analyses it is not possible to judge the isotopic heterogeneity of the galena population at the site. The following interpretation assumes that the composition provided is the average of a typical population ellipse with the dimensions ($^{206}\text{Pb}/^{204}\text{Pb} = 0.1$) by ($^{207}\text{Pb}/^{204}\text{Pb} = 0.2$).

Discussion

Pb isotope analysis can be useful for the determination of the relative age of mineralisation in terrains with a good isotope database. Tasmanian base-metal deposits have an excellent basic data base. It is generally possible to separate the definite Devonian from definite Cambrian hydrothermal systems in the Mt Read Volcanic Belt. However, as shown in the accompanying figures, although most Devonian data has a 206/204 composition of ~18.5–18.6, the Devonian Balfour systems have Cambrian Pb-isotope features of 206/204 ~18.3–18.4, and distinctively high 208/204 Pb ratios. This example illustrates that where the deposit hostrocks are not within the Mt read Volcanic Belt, spurious age-dates may arise. The Balfour deposits appear to be within a separate Pb-isotope province which includes the Arthur Lineament.

A second complication has arisen from recent detailed Pb-isotope analysis of the Zeehan Mineral Field by Dr Paul Kitto and honours student Michael Slater (Slater 1996). This work has shown that where Devonian replacement galena veins were deposited within Gordon Group limestone along a path away from the Heemskirk Granite, an isotopic zonation occurs, with the most radiogenic values occurring near to the granite, and less-radiogenic values characterising mineralisation that is some distance from the granite.

Thirdly, new data on the composition of primary Pb in the Gordon Group (Grieves Prospect, CRA) is available in sketch form, although the only published work with detailed analyses—an honours thesis by Darren Glover—remains confidential. The sketch data lies between the Cambrian and Devonian Pb populations, as would be expected if Ordovician fluids had interacted with Mt read Volcanic Belt crust, but appear, on limited data, to be slightly more radiogenic in 207/204Pb and 208/204 Pb composition (data is marked by two data points and a bar on the accompanying figures).

Slater (1996) interpreted the Zeehan field data as a combination of syn-Ordovician galena accumulations, and Devonian hydrothermal granite-derived Pb, which could account for the large spread of the Zeehan field data, but is unsatisfactory, in that

currently it is not known whether deposits in the Zeehan mineral field are both Ordovician and Devonian in age, or whether they are all Devonian with a heterogeneous Pb-isotope composition. In the heterogeneous Pb model, it is interpreted that granitic fluids exchanged lead with Cambrian and Ordovician basement as they moved away from their granite source during one fluid event in the Devonian. This uncertainty bears upon the interpretation of other galena localities in the Gordon Group, such as the unknown Morrison sample discussed here.

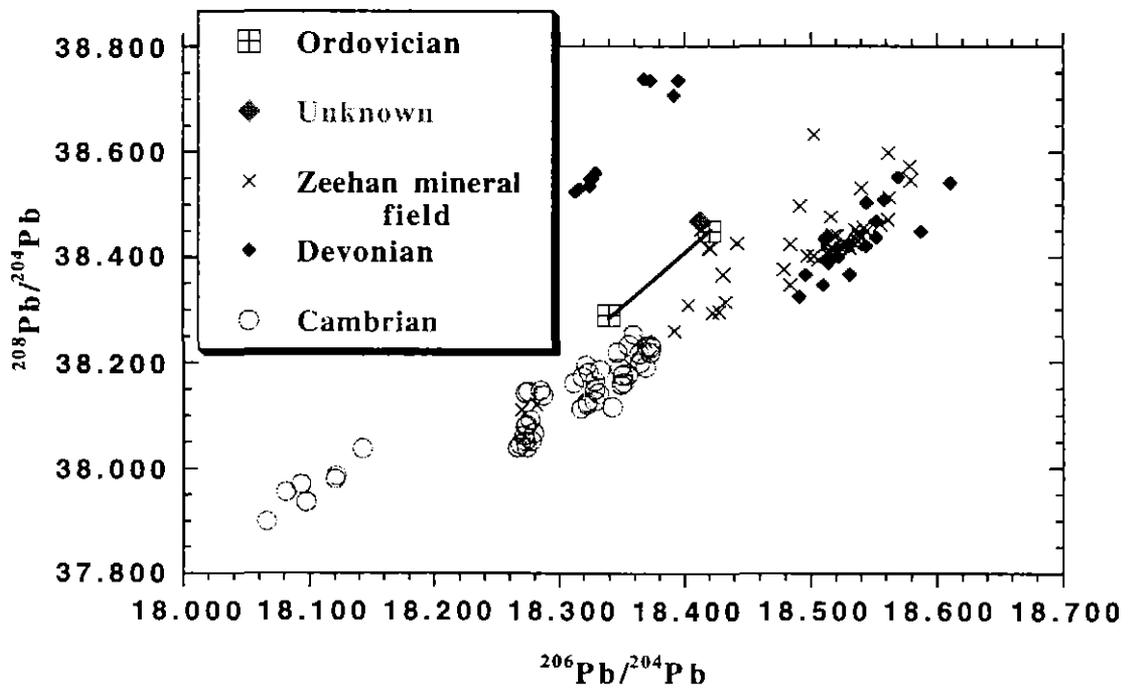
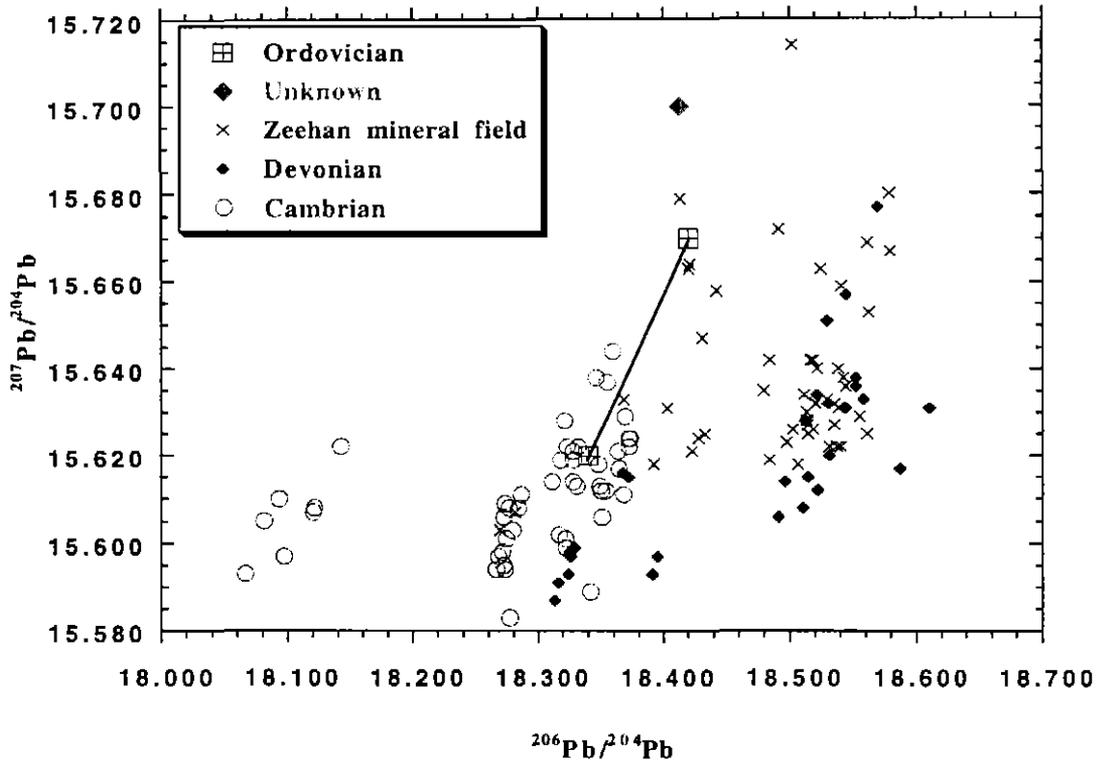
The Morrison sample has unusually high $^{207}/^{204}\text{Pb}$, although the $^{206}/^{204}\text{Pb}$ is consistent with the Ordovician age of the host Gordon Group. The sample also has $^{208}/^{204}\text{Pb}$ enrichment, which is similar to the Pb composition of CRA's Grieves Prospect.

Conclusion

The Morrison Sample has a Pb-isotope composition which is consistent in some respects with an Ordovician origin. However, the sample has unusually high $^{207}/^{204}\text{Pb}$, and in fact is one of the most $^{207}/^{204}\text{Pb}$ enriched galena samples known in Tasmania. In this respect it is similar to other small Devonian Pb-Zn occurrences in the Zeehan Minerals Field. On balance, the data is most consistent with an Ordovician age for the galena, but is not conclusive. Further samples of this population would help constrain this interpretation, by indicating whether the sample site had more affinity to Ordovician Pb or to the heterogeneous Pb population of the Zeehan Mineral Field.

References

- Slater M.J. (1996) Geology and geochemistry of the Zeehan Mineral field.
Unpublished Honours thesis, University of Tasmania



APPENDIX 2

COMSTOCK VALLEY DATA & PETROGRAPHY REPORT

CMT Drill Hole Log



Collar Details

Hole ID	C0049	reg_north	5344944	date_drilled	27/10/66
work_north	8150.150	reg_east	385577.6	hole_type	DD
work_east	7574.636	reg_rl	294.89	locality	COMSTOCK VALLEY
work_rl	2294.890	max_depth	445.1604		

Down Hole Survey Details

depth	dip	work azim	reg azim
0	-39.5	224.8	188.296944331702
42.82	-39.5	224.8	188.296944331702



CMT Drill Hole Log - Summary Geology

hole_id	depth_from	depth_to	lith_code	litho_description	alt_code_1	alt_style_1	min_code_1	min_pc_1	min_code_2	min_pc_2
C0049	0	79	Rgl	polymict gravel, boulders, heavy core loss PQ						
	79	109	Gls	fresh impure bioturb fossil lmst, abund stylolitic, carb zones, common wh calcite veins HQ						
	109	214.9	Gls-dol	interbedded dk gy dolomitic micrite, calc carb mdst, dol st, carb flasers, laminae, bedding CA 80, minor py, calcite alt @ 157 NQ 175						
	214.9	371.6	Gls	fresh gy micritic lmst, abund carb laminae, stylolitic zones, flasers, mud pellet zones, common wh calcite veining						
	371.6	445	Gls	ye bn slt, clay, interbedded with cream coarse qtz st, polymict sed breccia, heavily oxid, part silicified to chalcedony (?Pioneer Beds), top contact enriched in calcite veining, silica - possible fault contact						

556039

CMT Drill Hole Log - Summary Assay Results



hole_id	From	To	samp_id	sample_type	Cu %	Au ppm	Ag ppm	Pb ppm	Zn ppm
C0049	0	174.34		NOREC					
	174.345	177.92		NOREC		0.017			
	177.927	179.52		NOREC	0.01	0.017		-997000	200
	181.660	188.97		NOREC		0.008			
	189.966	191.10		NOREC	0.02			-997000	200
	195.986	203.30		NOREC		-0.008			
	208.102	211.83		SLUD	0.108			-997000	100
	214.884	226.16		NOREC		-0.008			
	226.161	240.18		NOREC		-0.008			
	240.182	248.10		NOREC		0.067			
	248.107	263.04		NOREC		-0.008			
	263.042	273.40		NOREC		-0.008			
	273.405	290.77		NOREC		-0.05			
	290.779	302.66		NOREC		-0.05			
	302.666	316.38		NOREC		0.017			
	316.382	331.62		NOREC		-0.008			
	331.622	341.37		NOREC		0.017			
	341.376	357.22		NOREC		-0.008			
	376.732	383.13		NOREC	0.135			-500	100
	389.229	392.58		NOREC		0.017			
	392.582	395.32		NOREC	0.05	0.017		-500	100
	413.918	414.37		NOREC	0.23	0.017		-500	300
	414.375	429.76		NOREC		0.017			
	429.768	445.00		NOREC		0.017			

CMT Drill Hole Log



Collar Details

Hole ID	C0051	reg_north	5344893	date_drilled	24/03/67
work_north	8260.588	reg_east	385323.2	hole_type	DD
work_east	7339.684	reg_rl	310.29	locality	COMSTOCK VALLEY
work_rl	2310.290	max_depth	244.14		

Down Hole Survey Details

depth	dip	work azimuth	reg azimuth
0	-28.2	179.179999576579	142.676943908281
244.14	-28.2	179.179999576579	142.676943908281



CMT Drill Hole Log - Summary Geology

hole_id	depth_from	depth_to	lith_code	litho_description	alt_code_1	alt_style_1	min_code_1	min_pc_1	min_code_2	min_pc_2
C0051	0	29.6	Rgl	<i>unconsol polymict gravel, boulders, massive core loss</i>						
	29.6	32	Rgl	<i>cream laminated varved slt</i>						
	32	68	Rgl	<i>unconsol polymict gravel, boulders, minor limonitic coarse qtz sand, heavy core loss</i>						
	68	85.4	Gls-dol	<i>bk carb dolomitic lmst, calc mdst, bioturb, minor qtz sand, py-carbonate developed at base of sequence 76-85. NQ 68.6</i>						
	85.4	244.2	Gls	<i>dk gy micritic lmst, minor carb mdst, bedding CA 80-90, abund wh calcite veins, fossils, stylolites, bioturb mud breccia</i>						

CMT Drill Hole Log - Summary Assay Results



hole_id	From	To	samp_id	sample_type	Cu %	Au ppm	Ag ppm	Pb ppm	Zn ppm
C0051	0	77.266		NOREC					
	77.2668	78.028		NOREC	0.016			-200	60
	78.0288	93.268		NOREC					
	93.2688	94.030		NOREC	0.043			-200	50
	94.0308	124.35		NOREC					
	124.358	125.88		NOREC	0.06			-200	40
	125.882	244.14		NOREC					

CMT Drill Hole Log



Collar Details

Hole ID	C0054	req_north	5345010	date_drilled	06/06/67
work_north	8637.050	req_east	384848.2	hole_type	DD
work_east	7027.216	req_rl	335.95	locality	COMSTOCK VALLEY
work_rl	2335.950	max_depth	420.01		

Down Hole Survey Details

depth	dip	work azim	req azim
0	-51.3	178.559999576579	142.056943908281
420.01	-51.3	178.559999576579	142.056943908281



CMT Drill Hole Log - Summary Geology

hole_id	depth_from	depth_to	lith_code	litho_description	alt_code_1	alt_style_1	min_code_1	min_pc_1	min_code_2	min_pc_2
C0054	0	72.5	Rgl	polymict gravel boulders - massive core loss PQ-HQ						
	72.5	198.2	Gls	fresh micritic lmst, erosional top contact, fossil zones, algal mud pellet zones, minor calcite veins, bedding CA 50-60						
	198.2	335	Gls	NQ fresh massive micrite, BQ @ 229.8, bedding CA 70-80						
	335	402.3	Gls	part oxid lmst						
	402.3	420.1	Gst	ye bn qtz st, lithic granule ct (?Pioneer Beds)						

CMT Drill Hole Log - Summary Assay Results



hole_id	From	To	samp_id	sample_type	Cu %	Au ppm	Ag ppm	Pb ppm	Zn ppm
C0054	0	162.15		NOREC					
	162.153	167.94		NOREC		-0.008			
	167.944	173.73		NOREC					
	173.736	175.26		NOREC		0.025			
	175.26	176.78		NOREC		0.017			
	176.784	420.01		NOREC					

CMT Drill Hole Log



Collar Details

Hole ID	CV0001	reg_north	5346175	date_drilled	16/01/90
work_north	9573.190	reg_east	384850	hole_type	DD
work_east	7722.270	reg_rl	300	locality	COMSTOCK VALLEY
work_rl	2300.000	max_depth	316		

Down Hole Survey Details

depth	dip	work azim	reg azim
0	-60	217	
316	-60	217	

GMT Drill Hole Log - Summary Geology



hole_id	depth_from	depth_to	lith_code	litho_description	alt_code_1	alt_style_1	min_code_1	min_pc_1	min_code_2	min_pc_2
CV0001	0	88.5	Rgl	polymict gravel, boulders, clay, silt, heavy core loss						
	88.5	112	Rgl	gy bn varved silt, minor dropstones, bedding CA 60						
	112	118.5	Rgl	polymict pebble, boulder gravel, basal sequence						
	118.5	205	Gls-dol	dk gy bk bioturb dolomitic lmst, carb mdst, stylolites calcite fossil frags bedding CA 60-70 minor zones qtz st, mud pebble ct, BQ 134.8, zones of py carbonate towards base of sequence, @ 181.5 - 184.5, 193.4 - 198.2, 201.8 - 203.5						
	205	259	Gls	dk gy micritic lmst, common zones carb calc mdst, mud pellet beds, minor dolomitic lmst, py - carbonate zones @ 226.5 - 228.2, 231 - 231.4, bedding CA 45-60						
	259	316	Gls	fresh gy micritic lmst, carb zones, algal mud, pellet rich zones						

556049

Petrographic examination and report on sulphide-bearing
samples from the Gordon Limestone near Queenstown,
Tasmania

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Five representative thin sections were produced from the samples provided. Brief descriptions of these follow:

#494

The host rock is fine (~.1-.2 mm), buff-coloured (grey in hand specimen) anhedral to subhedral dolomite. The dolomite is replacive - a few 'ghosts' of preexisting textures are visible in this sample. The sample is cut by a few pyrite-bearing veins, and a small cavity or vug, which also contains pyrite. Paragenetically, the pyrite appears to have precipitated first, followed by saddle dolomite, and then quartz. Although in places the quartz is present between the host dolomite and pyrite, it can also be seen coating the edges of the fractured pyrite, and so has occurred after the pyrite and dolomite. Edges of the replacive dolomite are often defined by dark material - probably insoluble organic material present in the original limestone.

#495

A dolomite breccia, with pyrite, quartz, and dolomite cements. The host rock, now brecciated, has been replaced by fine, anhedral to subhedral dolomite, which is grey in hand specimen, but colourless to pale buff in thin section (a distinctive feature of dolomite). Very little in the way of relict textures are visible in the replacement dolomite. A few moldic pores are present, which are filled by slightly coarser dolomite. The paragenetic sequence of the breccia cements is pyrite - saddle dolomite - quartz. The quartz is fibrous in appearance where it is lining veins, but it also occurs as more equidimensional crystals where it is filling the remaining space in the centre of interclast porosity.

#496

A dolomite breccia. Clasts are cemented by pyrite, saddle dolomite, and lesser quartz and calcite. Much of the quartz is fibrous in nature. The initial cement is pyrite, followed by dolomite, then quartz and calcite. The dolomite in the clasts are fine buff-coloured, anhedral to euhedral rhombs. Most of the more euhedral rhombs are filling moldic porosity. Some calcite is present at the centre of some of these molds. Some are obviously fossil molds (e.g. a small [<5 mm] bivalve), but most are of indeterminate origin. The breccia clasts are angular to subangular. A few clasts contain veins which are truncated at the clast edges. These earlier veins are filled with anhedral to euhedral dolomite which is colourless (white in hand specimen), not buff (or grey in hand specimen) like the replacement dolomite.

#497A

The host rock is fine, buff-coloured anhedral to subhedral dolomite, which is cut by several veins. The earliest veins, which include the largest vein present (~2-3 cm thick), are

lined by pyrite which is also partially replacing the host rock at the edges of the vein. These veins are filled mainly by coarse (crystals in the centre of the large vein are up to ~1 cm) saddle dolomite. Minor quartz is present in the very centre of the vein. The slightly later veins, which cross-cut the earlier set, contain no pyrite, and feature more quartz than the earlier set of veins, as well as dolomite and calcite. In hand specimen, a single galena crystal was observed within one of these veins.

#497B

The host rock consists of fine to very fine (maximum ~1 mm) buff anhedral to euhedral dolomite. The sample is cut by several dolomite veins. The veins are lined initially by pyrite (this is absent in some veins), followed by medium to coarsely crystalline saddle dolomite. Some finer quartz is filling the spaces between the saddle dolomite. As well as occurring as a cement, the pyrite is also partially replacing the fine replacement dolomite along the vein edges. Fine stylolites cross-cut the sample - these cut across the veins, and often deviate around the pyrite, and so appear to follow vein edges. However, their cross-cutting nature indicates that they have formed later than veining and sulphide precipitation. Dolomite along some (but not all) stylolites shows discolouration / alteration to a dull, 'fuzzy' grey.

General observations

The original host rock has obviously been replaced by fine grained dolomite. The presence of only a few relict textures, mainly in the form of moldic porosity, may indicate that the original limestone lacked bioclasts, and so was micritic in nature. The host rock was fairly 'clean' - i.e. no detrital quartz is present, which would not have been affected by dolomitisation.

Dolomite replacement has occurred prior to brecciation and pyrite precipitation, which is indicated by dolomite clasts containing truncated veins. The paragenetic sequence of events is therefore:

- 1) Dolomitisation of the host limestone
- 2) Brecciation and sulphide cementation

The paragenetic order of the cements is: pyrite - saddle dolomite - ?galena? - quartz and calcite.

Saddle dolomite

All of the samples contain crystals of saddle dolomite. Also referred to as 'pearl-spar' or 'baroque dolomite', saddle dolomite is recognised by its sweeping extinction under cross-polars. The sweeping extinction is due to the 'saddle' shape of the crystal, believed to be caused by distortion of the crystal lattice (Radke & Mathis, 1980). Some crystals will be

visibly curved. Of importance to this study, saddle dolomite is commonly associated with hydrocarbons, epigenetic base-metal mineralisation, and sulphate-rich carbonates. As noted by Radke & Mathis (1980), diagenetic formation is implied by its presence, and it is indicative of elevated temperatures (approximately 60 - 150°C). Saddle dolomite (to ankerite) is common within the Irish carbonate-hosted deposits (personal observations) and Mississippi Valley-type (MVT) deposits. Saddle siderite was documented associated with mineralisation at Oceana (Peace, 1995), both as replacement of the host rock and as space-filling cement.

Cathodoluminescence

From an examination of the samples using cathodoluminescence (CL), it would appear that it is replacement and saddle dolomite which is present, and not siderite, as was the case at the Oceana deposit. Due to the very high Fe content, which quenches luminescence, siderite is expected to be completely non-luminescent in CL (as was the case at Oceana). The replacement dolomite is generally very dull to non-luminescent, but some rhombs do feature luminescent zoning, a feature fairly typical of diagenetic dolomite. The saddle dolomite is almost completely non-luminescent, suggesting quenching due to high iron content. Many crystals feature a thin bright red band near the rim. Saddle dolomite from the Navan Zn-Pb deposit in Ireland, as well as surrounding country rock, feature a very similar CL signature. This suggests that similar fluid chemistry fluctuations have occurred at Navan and in the samples examined.

Comparisons to the Oceana (IRCH) and Navan (Irish-type) deposits

The Oceana Pb-Zn deposit is believed to be an example of an intrusion-related carbonate-hosted (IRCH) deposit (Peace, 1995). This type of deposit is also often referred to as a 'manto' deposit (e.g. Megaw *et al.*, 1988; Thompson & Arehart, 1990). Briefly, mineralisation at Oceana is interpreted as related to the intrusion of the Heemskirk Granite in the Late Devonian - Early Carboniferous. Timing evidence indicates that the previously proposed syngenetic Irish-style model is not justified for this deposit. Alteration of the host rock around the sulphide mineralisation to siderite, as well as fitting within the sideritic alteration zone of the Zeehan Mineral Field surrounding the Heemskirk Granite, indicates that syngenetic mineralisation is unlikely. Siderite alteration was observed to cross-cut earlier calcite veining. Mineralisation lining fractures, and clearly overlying siderite cements indicate a later origin. Fluid inclusion temperatures indicate a mineralisation temperature lower than the regional maximum of ~300°C indicated by conodont colour alteration, which indicates that sulphide mineralisation occurred after the regional maximum was attained.

The commonly held perception of Irish-style mineralisation as syngenetic and exhalative is incorrect. Although some authors prefer the term 'syndiagenetic' when

describing these deposits (e.g. Andrew & Poustie, 1986), the evidence now points to a post-depositional origin (e.g. Shearley *et al.*, 1986; Anderson, 1990; Peace, current work). Navan, at over 70 million tonnes the largest of the Irish deposits, displays textures far more in common with epigenetic, Mississippi Valley-type (MVT) mineralisation than it does with Sedex. Mineralisation at Navan is clearly post-lithification, as evidenced by textures such as crackle breccias in 5 lens (the lowest ore lens) and mineralised dissolution cavities up to several metres in diameter in the U-lens (the uppermost ore lens). Hitzman (1998) argues that Sedex and MVT deposits are in fact end-members of a continuous series of sediment-hosted deposits, with the Irish deposits falling somewhere between the two. In common with many MVT deposits, sulphide replacement of the host rock is the dominant style of mineralisation (Shearley *et al.*, 1986; Peace, current work). Another common feature is the presence of sulphides filling primary porosity.

Comments on the samples studied / relevance to further exploration

It is possible that dolomitisation of the host rock could be a guide to the presence of sulphide mineralisation. However, dolomitisation of limestone is a common result of normal burial diagenesis of limestones. It must also be noted that many MVT deposits (e.g. the Lennard Shelf deposits, WA; Pine Point, Canada; and the Southeast Missouri deposits in the US), as well as the Irish deposits (e.g. Navan and Lisheen) have experienced regional or large scale dolomitisation prior to sulphide mineralisation. This may be because the dolomitised horizons act as a trap or focus for the mineralising fluids, or, as suggested by Wallace (1996), that epigenetic Pb-Zn mineralisation is an integral part of the diagenetic and burial history of carbonate sequences. Even carbonates which contain no economically significant Pb-Zn deposits often feature minor Pb-Zn mineralisation, for example the Buchan district in Victoria. In Ireland, the Upper Dark Limestone or 'Calp' which overlies most of the Irish midlands (and is supposedly later than the economic Pb-Zn deposits) has been observed to contain Zn-Pb bearing veins.

If exploration is being undertaken in order to find an Irish (or MVT) deposit, it is recommended that an understanding of the diagenetic history of the sediments (in this case, the Gordon Limestone) be obtained. By understanding the burial and diagenetic history of the sequence, the chances of exploration success are improved. As mentioned earlier, sulphide mineralisation is preceded by dolomitisation. Therefore, the presence of dolomitisation can be an indicator of potential mineralisation. Secondly, by understanding the cementation history, an understanding of the porosity and permeability available at the time of mineralisation can be obtained. For example, a unit shown to have been completely cemented early in the burial history is unlikely to be mineralised, as little or no porosity and/or permeability existed to allow the passage of the mineralising fluids.

Such studies are relatively simple and cheap to obtain using cathodoluminescence. CL

techniques simply build on basic petrographic understanding, and samples require minimal preparation. Polished thin sections are all that is required.

Exploration for IRCH or 'manto' style deposits is, of course, influenced by the need to have a magmatic source for the mineralising fluids. The distance from a magmatic intrusion at which mineralisation may still occur is related to the size of the intrusion; the larger the diameter of the intrusion, the larger the zone of potential mineralisation (Jaeger, 1968). Replacement is again the dominant style of mineralisation, as well as vein / fracture fill. While skarn deposits are typical close to the intrusion, 'manto' style deposits are the expected style of mineralisation in carbonates further away from the deposit.

The presence of saddle dolomite following pyrite mineralisation in the sample indicates that hydrothermal fluids have indeed been present. However, as saddle dolomite is not indicative of a specific deposit type, having been found in MVT, Irish and 'manto' style deposits, more information is needed. The evidence will more than likely be found in units that have not been completely dolomitised. The contact between altered and unaltered host rock may be sharper and more distinct for an intrusion-related deposit than an Irish or MVT deposit, but this is not always true. Alteration around the Oceana deposit was very distinct - earlier veins were truncated at the alteration contact, and a thin bleached / discoloured zone was present. At Navan and Lisheen, dissolutional alteration features are noted, mainly the so-called Black Matrix Breccias (BMB) at Lisheen (similar textures also exist at Navan). The BMB surrounds the ore, and is literally brecciated host dolomite with a black dolomitic matrix. At Navan, this texture is believed to be the result of dissolution by hydrothermal fluids associated with mineralisation.

The relative timing of the sulphides may also help to determine the style of mineralisation. Intrusion-related mineralisation within the Gordon Limestone would be related to the Late Devonian - Early Carboniferous granitic intrusions. MVT/Irish-style mineralisation could well be earlier. As well as CL analysis, fluid inclusion studies can be of use. As well as providing mineralisation temperatures, fluid inclusions can be employed to determine the relative timing of mineralisation. By comparing fluid inclusion temperatures to the regional temperature (easily obtained from analysis of the conodont colour alteration index [CAI - see Epstein *et al.*, 1977]), the relative timing can be determined. Simply, both MVT and Irish mineralisation typically occur at temperatures lower than 200°C, and often less than 150°C. Intrusion-related deposits are generally hotter than 200°C, and are often greater than 300°C. If the regional temperature is similar to that at Oceana (~300°C), which seems likely, inclusions formed prior to this maximum heating event in the Late Devonian - Early Carboniferous which were initially less than 200°C would be stretched, giving temperatures similar to that of the regional temperature. On the other hand, fluid inclusions within mineralisation occurring after the regional peak would preserve their original temperatures,

and show no evidence of stretching.

Summary

The samples examined have been altered from the original limestone to dolomite. Following dolomitisation the host rock has experienced fracturing/brecciation, with the fractures being lined by pyrite - saddle dolomite - quartz and calcite. Traces of galena were also observed.

On the evidence available, it is impossible to accurately determine whether this pyrite mineralisation is related to Irish-style / MVT or intrusion-related mineralisation. Such interpretations need to be made by looking at these samples in the context of the surrounding lithologies. For example; is there an intrusive body in the area which could have acted as a source for intrusion-related mineralisation? What is the nature of the alteration contact? If the sulphides are related to Irish/MVT mineralisation, was there porosity and permeability available? In the nearby unaltered limestones, are there sulphides filling primary porosity?

The presence of saddle dolomite, which is commonly associated with epigenetic base metal mineralisation, is an encouraging sign. It is hoped that the questions raised here may help to serve as a guide to determining the origins of the sulphide mineralisation.

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APPENDIX 3

Mc DOWELLS DATA

CMT Drill Hole Log



Collar Details

Hole ID	G0014A	reg_north	5342408	date_drilled	11/01/84
work_north	6619.927	reg_east	384722.9	hole_type	DD
work_east	5378.610	reg_rl	340	locality	MCDOWELLS
work_rl	2340.000	max_depth	421		

Down Hole Survey Details

depth	dip	work azimuth	reg azimuth
0	-53	69.0030550153236	32.5
421	-53	69.0030550153236	32.5

CMT Drill Hole Log



Collar Details

Hole ID	G0014	reg_north	5342408	date_drilled	10/09/84
work_north	6621.712	reg_east	384719.9	hole_type	DD
work_east	5376.198	reg_rl	340	locality	MCDOWELLS
work_rl	2340.000	max_depth	133		

Down Hole Survey Details

depth	dip	work_azim	reg_azim
0	-50	66.5030550153236	30
133	-50	66.5030550153236	30

CMT Drill Hole Log - Summary Geology



hole_id	depth_from	depth_to	lith_code	litho_description	alt_code_1	alt_style_1	min_code_1	min_pc_1	min_code_2	min_pc_2
G0014	0	11.2								
	11.2	19	Gst	<i>organic stained bioturb fossilif qtz st. brecciated by calc dissolution HQ core</i>						
	19	96.6	Gst	<i>limon bioturb fossilif qtz st. gritty wacke dissolution breccia, heavy core loss</i>						

CMT Drill Hole Log - Summary Geology



hole_id	depth_from	depth_to	lith_code	litho_description	alt_code_1	alt_style_1	min_code_1	min_pc_1	min_code_2	min_pc_2
G0014A	96.6	169	Gsl	oxid decomp bioturb sltst. sl interbeds						
	169	199	Gbx	st cl sl dissolution breccia, heavy core loss. NQ core @ 192.3						
	199	337.5	Gsl	unconsol oxid sltst, cl, qtz sl. fossilif. decomp. NLF @ 337.5						
	337.5	400.3	Oct	polymict mainly quartzite coarse pebble matrix supported conglomerate, non sheared silica hematite enriched BQ core @368.4						
	400.3	406	Osh	laminated oxid/ red ?lower Owen sh interbedded with hematit fg qtz sl. bedding CA 80-90° south facing laminae						
	406	421		NO CORE						

CMT Surface Geochemistry - Rock Chip Sampling



DataSet	samp_id	reg_north	reg_east	reg_rl	major_code	minor_code	colour	litho_description	Cu_pc	Cu_ppm	Au_ppm	Au_ppb	Ag_ppm	Pb_ppm	Zn_ppm
MD	H0498	5342500	384742	389.7	Gsl			ferrug sl-channel			-0.01		1.5		
	H0499	5342497	384746	387.8	Gsl			ferrug sl-channel			-0.01		1		
	H0500	5342494	384750	387.4	Gsl			ferrug sl-channel			-0.01		1.6		
	H1553	5342495	384755	384.3	Gst			ferrug st-channel			-0.01		1.5		
	H1554	5342494	384761	383.9	Gsl			ferrug sl-channel			-0.01		1.7		
	H1555	5342494	384764	385.6	Gst			ferrug st-channel			-0.01		2.6		
	H1556	5342507	384741	392.3	Oct	qv					-0.01		0.6		
	H1557	5342506	384735	391	Oct	qv					-0.01		0.7		
	H1558	5342506	384731	389.6	Ocl	qv					-0.01		0.3		
	H1559	5342517	384723	386.4	Oct	qv					-0.01		0.2		
	H1560	5342503	384772	390.8	Oct	qv					-0.01		0.3		
	H1561	5342504	384765	387.7	Oct	qv					-0.01		0.2		
	H1562	5342506	384751	387.3	Ocl	qv					-0.01		0.3		
	H1563	5342512	384746	393.7	Oct	qv					-0.01		0.4		
	H1564	5342510	384747	392.6	Oct	qv					-0.01		0.3		

CMT Drill Hole Log - Summary Assay Results

hole_id	From	To	samp_id	sample_type	Cu %	Au ppm	Ag ppm	Pb ppm	Zn ppm
G0014	11.2	21.4	H1501	DRILLCORE	-0.01				
	21.4	26.6	H1502	DRILLCORE	-0.01				
	26.6	32.5	H1503	DRILLCORE	-0.01				
	32.5	42.3	H1504	DRILLCORE	-0.01				
	42.3	52	H1505	DRILLCORE	-0.01				
	52	59.1	H1506	DRILLCORE	-0.01				
	59.1	68.7	H1507	DRILLCORE	-0.01				
	68.7	77.85	H1508	DRILLCORE	-0.01				
	77.85	90.6	H1509	DRILLCORE	-0.01				
	90.6	96.6	H1510	DRILLCORE	-0.01				
	96.6	102.65	H1511	DRILLCORE	-0.01				
	102.65	110.7	H1512	DRILLCORE	-0.01				
	110.7	115.2	H1513	DRILLCORE	-0.01				
	115.2	120.25	H1514	DRILLCORE	-0.01				
	120.25	125.3	H1515	DRILLCORE	-0.01				
	125.3	130.5	H1516	DRILLCORE	-0.01				
	130.5	132.2	H1517	DRILLCORE	-0.01				

CMT Drill Hole Log - Summary Assay Results



hole_id	From	To	samp_id	sample_type	Cu %	Au ppm	Ag ppm	Pb ppm	Zn ppm
G0014A	93	120	14057	DRILLCORE					
	128.5	138.5	H1518	DRILLCORE		-0.01			
	138.5	144.7	H1519	DRILLCORE		-0.01			
	144.7	152.7	H1520	DRILLCORE		-0.01			
	152.7	161.6	H1521	DRILLCORE		-0.01			
	161.6	166.9	H1522	DRILLCORE		-0.01			
	166.9	175	H1523	DRILLCORE		-0.01			
	175	183.4	H1524	DRILLCORE		-0.01			
	183.4	187.8	H1525	DRILLCORE		-0.01			
	187.8	192	H1526	DRILLCORE		-0.01			
	192	196.6	H1527	DRILLCORE		-0.01			
	196.6	204.9	H1528	DRILLCORE		-0.01			
	204.9	219.4	H1529	DRILLCORE		-0.01			
	219.4	232	H1530	DRILLCORE		-0.01			
	232	239	H1531	DRILLCORE		-0.01			
	239	249.5	H1532	DRILLCORE		-0.01			
	249.5	256.9	H1533	DRILLCORE		-0.01			
	256.9	265.7	H1534	DRILLCORE		-0.01			
	265.7	272.9	H1535	DRILLCORE		-0.01			
	272.9	282.8	H1536	DRILLCORE		-0.01			
	282.8	292.4	H1537	DRILLCORE		-0.01			
	292.4	301.7	H1538	DRILLCORE		-0.01			
	301.7	309.6	H1539	DRILLCORE		-0.01			
	309.6	316	H1540	DRILLCORE		-0.01			
	316	322.8	H1541	DRILLCORE		-0.01			
	322.8	329.6	H1542	DRILLCORE		-0.01			
	329.6	335.2	H1543	DRILLCORE		-0.01			
	335.2	337.5	H1544	DRILLCORE		-0.01			
	337.5	341.1	H1545	DRILLCORE		-0.01			
	341.1	347.8	H1546	DRILLCORE		-0.01			
	347.8	353.6	H1547	DRILLCORE		-0.01			
	353.6	361.4	H1548	DRILLCORE		-0.01			
	361.4	371.7	H1549	DRILLCORE		-0.01			
	371.7	380.4	H1550	DRILLCORE		-0.01			
	380.4	393.6	H1551	DRILLCORE		-0.01			
	393.6	406	H1552	DRILLCORE		-0.01			