

CR30910A



EDC041892CA

**CONFIDENTIAL**

**PLUTONIC OPERATIONS LIMITED  
(A.C.N. 004 680 997)**

**ANNUAL REPORT  
FOR PERIOD ENDING 5<sup>TH</sup> MARCH 1999  
EPM 8693 - TWIN HILLS**

**Volume 1 of 8**

Distribution

1. Homestake - Townsville
2. Homestake - Perth
3. Department of Mines & Energy
4. KPMG - Sydney

Technical Report No. 685

Author: D. Hewitt

Date: May, 1999

1:250,000 Sheet - Mt Coolon SF55-7

Clermont SF55-11

1:100,000 Sheet - Gunjulla 8354

Frankfield 8353

CR30910A

## TABLE OF CONTENTS (Cont'd)

SUMMARY	Page No. (i)
1.0 INTRODUCTION	1
2.0 LOCATION AND ACCESS	1
3.0 TENURE	1
4.0 REGIONAL GEOLOGY	2
5.0 PREVIOUS EXPLORATION	3
6.0 WORK COMPLETED	3
6.1 Reconnaissance Rock Chip Sampling	4
6.2 Soil Sampling	4
6.3 Resource Calculations - July, 1998	5
6.4 Gradient Array Resistivity and Chargeability Surveys	6
6.5 Airborne Magnetic and Radiometric Surveys	7
6.6 309 Deposit Drill Programs	7
6.7 Lone Sister Prospect Drilling	13
6.8 309 South Prospect Drilling	14
6.9 Regional RC Percussion Drill Program	14
6.10 Metallurgical Drilling Program	15
6.11 Metallurgical Testwork	16
6.12 Drillhole Surveying	18
6.13 Twin Hills Resource Estimate – January, 1999	19
6.14 Structural Interpretation of the 309 Deposit	19
7.0 CONCLUSIONS AND RECOMMENDATIONS	22
8.0 REFERENCES	23

## TABLE OF CONTENTS

## LIST OF VOLUMES

<b>Volume 1</b>	<b>Text</b>
Volume 2	Appendices 1 – 2
Volume 3	Appendices 3 – 5
Volume 4	Appendices 6 – 8
Volume 5	Appendices 9 – 12
Volume 6	Plans 1 – 13
Volume 7	Plans 14 – 25
Volume 8	Plans 26 – 37

**TABLE OF CONTENTS (Cont'd)****LIST OF APPENDICES**

Appendix 1	309 Deposit Drill Holes 98TRC(D)732–750 Assay Results
Appendix 2	Lone Sister Drill Holes 98LRCD130-135 Assay Results
Appendix 3	Regional Drill Holes 98THRC001-022 Assay Results
Appendix 4	Soil (BCL) Sample Ledgers and Assay Results
Appendix 5	Rock Chip Sample Ledgers and Assay Results
Appendix 6	309 Deposit Drill Holes 98TRC(D)732–750 Drill Logs
Appendix 7	Lone Sister Drill Holes 98LRCD130-135 Drill Logs
Appendix 8	Regional Drill Holes 98THRC001-022 Drill Logs
Appendix 9	Polygonal Resource Estimate July 1998 Update Report Global Mining Services
Appendix 10	Polygonal Resource Estimate December 1998 Update Report Global Mining Services
Appendix 11	Structural Controls on Gold Mineralisation Final Report Stephen King, Solid Geology (CD for Mines Department only)
Appendix 12	Preliminary Metallurgical Testwork Report, Ammtec Ltd.

## TABLE OF CONTENTS (Cont'd)

## LIST OF PLANS

No.	Title	Scale	Drawing No.
1	309 Drillhole Location Plan	1:500	112/TH/08-202
2	Lone Sister Drillhole Location Plan	1:1,000	112/TH/08-203
3	Regional Drillhole Location Plan	1:10,000	112/TH/08-204
	<b>309 Sections</b>		
4	SEC9920N with Au Results	1:500	112/TH/08-231
5	SEC9960N with Au Results	1:500	112/TH/08-228
6	SEC10000N with Au Results	1:500	112/TH/08-205
7	SEC10010N with Au Results	1:500	112/TH/08-206
8	SEC10020N with Au Results	1:500	112/TH/08-207
9	SEC10030N with Au Results	1:500	112/TH/08-208
10	SEC10040N with Au Results	1:500	112/TH/08-209
11	SEC10060N with Au Results	1:500	112/TH/08-210
12	SEC10080N with Au Results	1:500	112/TH/08-211
13	SEC10100N with Au Results	1:500	112/TH/08-212
14	SEC10120N with Au Results	1:500	112/TH/08-213
15	SEC10140N with Au Results	1:500	112/TH/08-214
16	SEC10160N with Au Results	1:500	112/TH/08-215
17	SEC10180N with Au Results	1:500	112/TH/08-216
18	SEC10200N with Au Results	1:500	112/TH/08-217
19	SEC10240N with Au Results	1:500	112/TH/08-218
	<b>Lone Sister Sections</b>		
20	SEC21000N with Au Results	1:500	112/TH/08-219
21	SEC21040N with Au Results	1:500	112/TH/08-220
22	SEC21080N with Au Results	1:500	112/TH/08-221
23	SEC21120N with Au Results	1:500	112/TH/08-222
24	SEC21160N with Au Results	1:500	112/TH/08-223
25	SEC21200N with Au Results	1:500	112/TH/08-224
26	SEC21240N with Au Results	1:500	112/TH/08-225
27	SEC21280N with Au Results	1:500	112/TH/08-226
28	SEC21320N with Au Results	1:500	112/TH/08-227
	<b>309 South Sections</b>		
29	SEC9300N with Au Results	1:500	112/TH/08-229
30	SEC9800N with Au Results	1:500	112/TH/08-230
	<b>Geophysics</b>		
31	Airborne Magnetic/Radiometric Data Total Magnetic Field	1:10,000	112/TH/03-045
32	Gradient Array Chargeability/Resistivity Apparent Resistivity Contours	1:10,000	112/TH/03-046
33	Gradient Array Chargeability/Resistivity Chargeability Contours	1:10,000	112/TH/03-047
34	Radiometric Survey Uranium Count	1:10,000	112/TH/03-048
35	Radiometric Survey Thorium Count	1:10,000	112/TH/03-049
36	Radiometric Survey Potassium Count	1:10,000	112/TH/03-050
37	Radiometric Survey Total Count	1:10,000	112/TH/03-051

## TABLE OF CONTENTS (Cont'd)

### LIST OF TABLES

No.	Title
1	Global Mining Services – Resource Estimate July 1998
2	1998 Drillhole Locations
3	Significant Au Assay Results – 1998 Drillholes
4	AMMTEC Gravity Leach and Cyanide Leach Recoveries
5	AMMTEC CIL Recoveries
6	Surveyed Drillhole Locations
7	Global Mining Services – Resource Estimate January 1999

### LIST OF FIGURES

No.	Title	Scale	Drawing No.
1	Location and Tenement Map	1:250,000	112/TH/01-004
2	Location and Sub-block Details	1:250,000	112/TH/01-002
3	Regional Geology	1:250,000	112/TH/02-023
4	309 Deposit Drill Hole Location Plan	-	-
5	Lone Sister Prospect Geology and Drilling	-	-
6	309 Deposit – Section 10000N Simplified Geology	-	-
7	309 Deposit – Section 10120N Simplified Geology	-	-
8	Lone Sister Prospect – Section 21280N Simplified Geology	-	-

## SUMMARY

During the twelve month period to March 1999, the following programs have been undertaken within EPM 8693, Twin Hills:-

- Rock chip sampling and infill soil sampling over previously defined soil anomalies, as well as over resistivity/structural and airborne magnetic targets.
- 41 arrays of Gradient Array IP/Resistivity, to complete coverage over the remainder of the tenement. Both the soil sampling and resistivity surveys have identified additional target areas for regional drill testing.
- A detailed airborne magnetic and radiometric survey was flown over the EPM, totalling 1,200 line kilometres. This data has been integrated with existing data sets to outline additional targets for testing.
- A program of RC and diamond drilling was completed at the 309 and Lone Sister deposits including two HQ holes at each deposit to collect samples for further metallurgical test work. Assay results indicate that the 309 Deposit is still open in all directions with further drilling required at both deposits.
- A total of 6,889m of RC and 2,034m of diamond drilling were completed. 24 RC holes tested selected regional resistivity, magnetic, structural, or geochemical features.
- Best result from the regional drill program was 1m @ 10.1ppm Au in quartz/sulphide vein material.
- Follow up drilling of weakly anomalous regional holes, as well as additional targets, is planned for 1999.
- A revised polygonal resource estimate for the 309 Deposit and Lone Sister Prospect was carried out by Global Mining Services; incorporating the results of the 1998 drill programs.

Portions of the 309 Deposit have been categorised as Inferred Mineral Resources, based on density of drilling and 10m spaced drill sections.

The new mineral resource is tabled below.

## Twin Hills Deposit – Polygonal Resource Estimate – January 1999

### INDICATED MINERAL RESOURCE

	Tonnes	g/t Au Cut	Ounces (Cut)
Anomaly 309 Sections 1000 – 10040	606,973	5.79	112,967
Anomaly 309 Transitional on Sections 10080 – 10120	306,895	1.39	13,726
<b>TOTAL</b>	<b>913,868</b>	<b>4.31</b>	<b>126,693</b>

### INFERRED MINERAL RESOURCE

	Tonnes	g/t Au Cut	Ounces (Cut)
Lone Sister	5,841,002	1.84	346,048
Anomaly 309	1,544,528	1.88	93,488
<b>TOTAL</b>	<b>7,385,529</b>	<b>1.85</b>	<b>439,536</b>

<b>TOTAL MINERAL RESOURCE</b>	<b>8,299,398</b>	<b>2.12</b>	<b>566,229</b>
-------------------------------	------------------	-------------	----------------

- Drilling at the 309 Deposit and Lone Sister during 1998 has increased the resource base by 57,000oz. Au.
- A metallurgical test program on ½HQ drill core from the 309 and Lone Sister deposits was carried out by AMMTEC in Perth.

Gravity separation and cyanide leach testwork gave recoveries for 309 Deposit primary material between 33-89% and for Lone Sister primary material between 74-94%.

Leaching in the presence of activated carbon gave significant improvements in recoveries, with poor recovery material from the 309 Deposit (33% from carbon rich zones), improving to 90-92%.

A structural interpretation of the 309 Deposit was carried out by Solid Geology Pty Ltd.

Based on core relogging and magnetic and resistivity data, a revised interpretation of vein geometrics, faults and ore controls was produced.



## 1.0 INTRODUCTION

Exploration Permit for Minerals (EPM) 8693 was granted to Metana Minerals (now Gold Mines of Australia Ltd) (70%) and Plutonic Operations Limited (30%) on the 6<sup>th</sup> March 1992. Under the terms of a letter of agreement dated 3<sup>rd</sup> April 1991, Plutonic Operations Limited has since earned 51% equity in EPM 8693 by solely funding exploration expenditure. Gold Mines of Australia Ltd (GMA) since 1<sup>st</sup> August 1996 has elected not to contribute to joint venture expenditure until such time as its interest is diluted to a 35% interest.

EPM 8693 was originally granted over an area of 94 sub-blocks, subsequently reducing to an area of 16 sub-blocks.

The EPM covers a small part of the Devonian to Carboniferous aged Drummond Basin, Central Queensland, in which epithermal gold mineralisation is hosted by volcanic and sedimentary units near the base of the Drummond Basin sequence.

This report describes exploration activities conducted within EPM 8693 for the twelve month period to the 5<sup>th</sup> March 1999.

## 2.0 LOCATION AND ACCESS

EPM 8693 is located approximately 120km northwest of Clermont, along the Gregory Development Road, in Central Queensland. The EPM extends onto two 1:250,000 map sheets. These being the western common corner of the Mt Coolon SF55-7 and Clermont SF55-11 map sheets. The location of the EPM is shown in Figure 1.

Access within the EPM can be made along station tracks, fencelines and powerlines. Thick brigalow, gidgee scrub, and extensive areas of pulled but uncleared scrub make movement off the tracks difficult.

## 3.0 TENURE

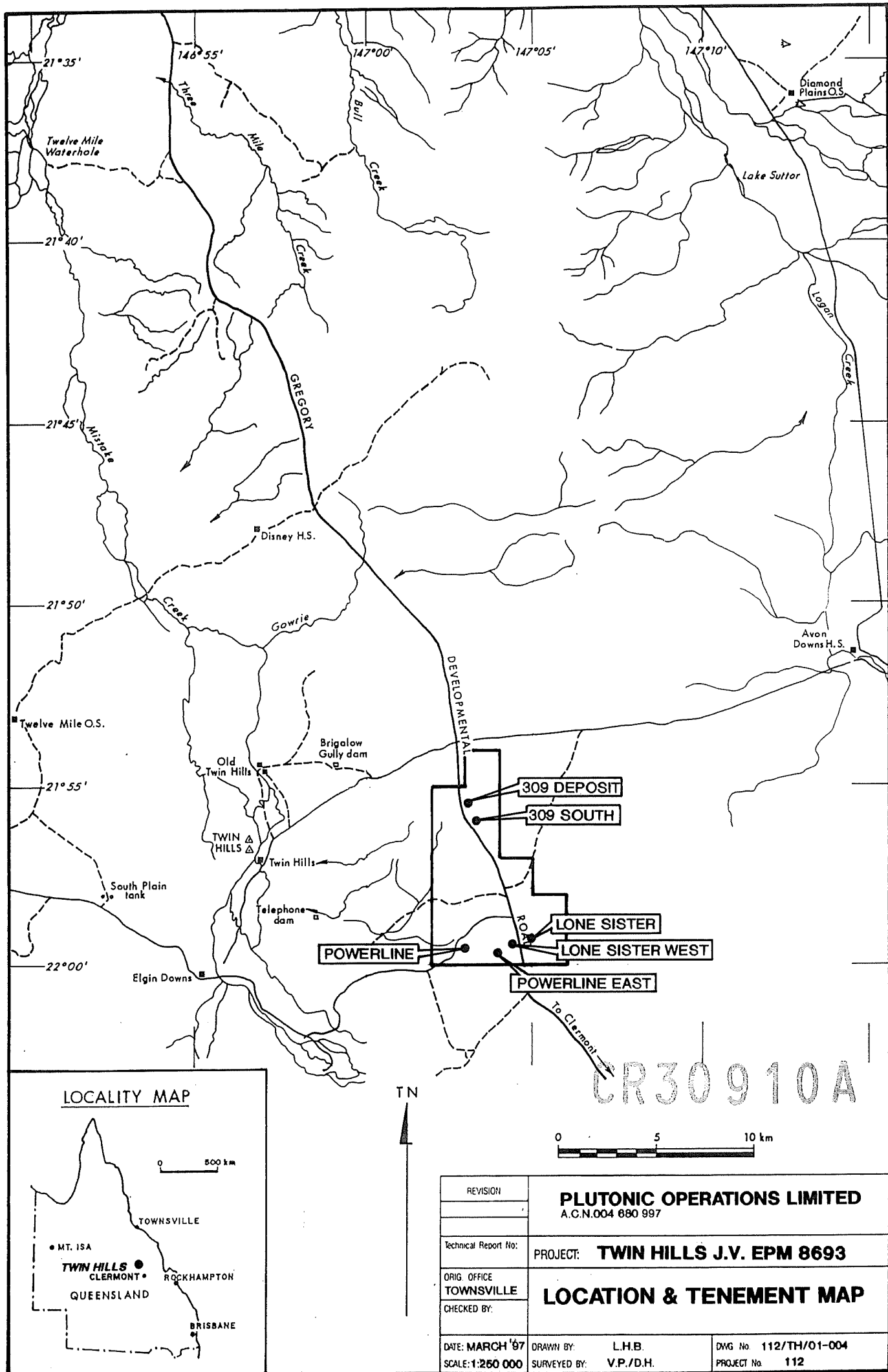
The current equity interest of EPM 8693 stands at Plutonic Operations (63%), GMA (37%), with Plutonic earning a 65% interest.

EPM 8693 covers an area of 16 sub-blocks, which was renewed on the 6<sup>th</sup> March, 1999 for a term of one year (Figure 2).

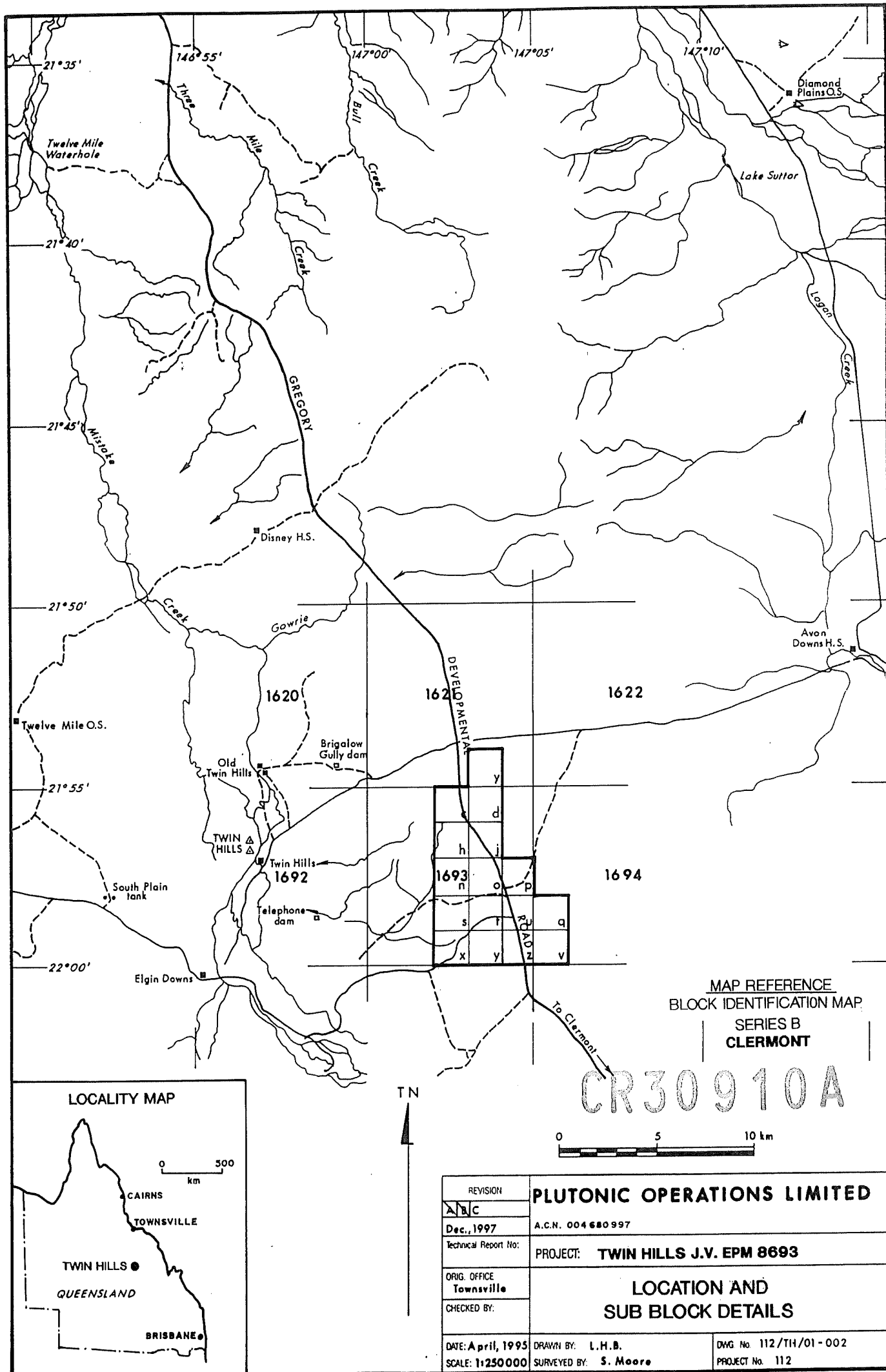
### Block Identification Map Series B - Clermont

Block	Sub-blocks
1621	y
1693	c, d, h, j, n, o, p, s, t, u, x, y, z
1694	q, v

Number of sub-blocks = 16



**FIGURE 1**



**FIGURE 2**

## 4.0 REGIONAL GEOLOGY

EPM 8693 is located near the centre of the intercratonic Drummond Basin of Upper Devonian to Lower Carboniferous age, and lies west of Palaeozoic age rocks of the Anakie Inlier (Figure 3).

The regional geology of the Drummond Basin is described in BMR Bulletin No. 132, Geology of the Drummond Basin, Queensland by F. Olgers, (1972).

This description is supplemented by GSQ mapping of the Gunjulla 1:100,000 Sheet Area, which has been published as a preliminary plan.

A polyphase granite, tenuously correlated with the Lower Devonian Retreat Granite crops out in the southern part of the EPM. Recent RAB drilling appears to show a discordant contact between the granite and units of the Silver Hills Volcanics implying a possible younger age for the granite.

The lowest recognised units of the Drummond Basin within the EPM consist of a sequence of thinly bedded carbonaceous arenites and argillic sediments, with minor volcanoclastics and acid volcanic tuffs. Locally the sediments contain the coalified remains of vascular plants. The unit is correlated with St. Anns Formation.

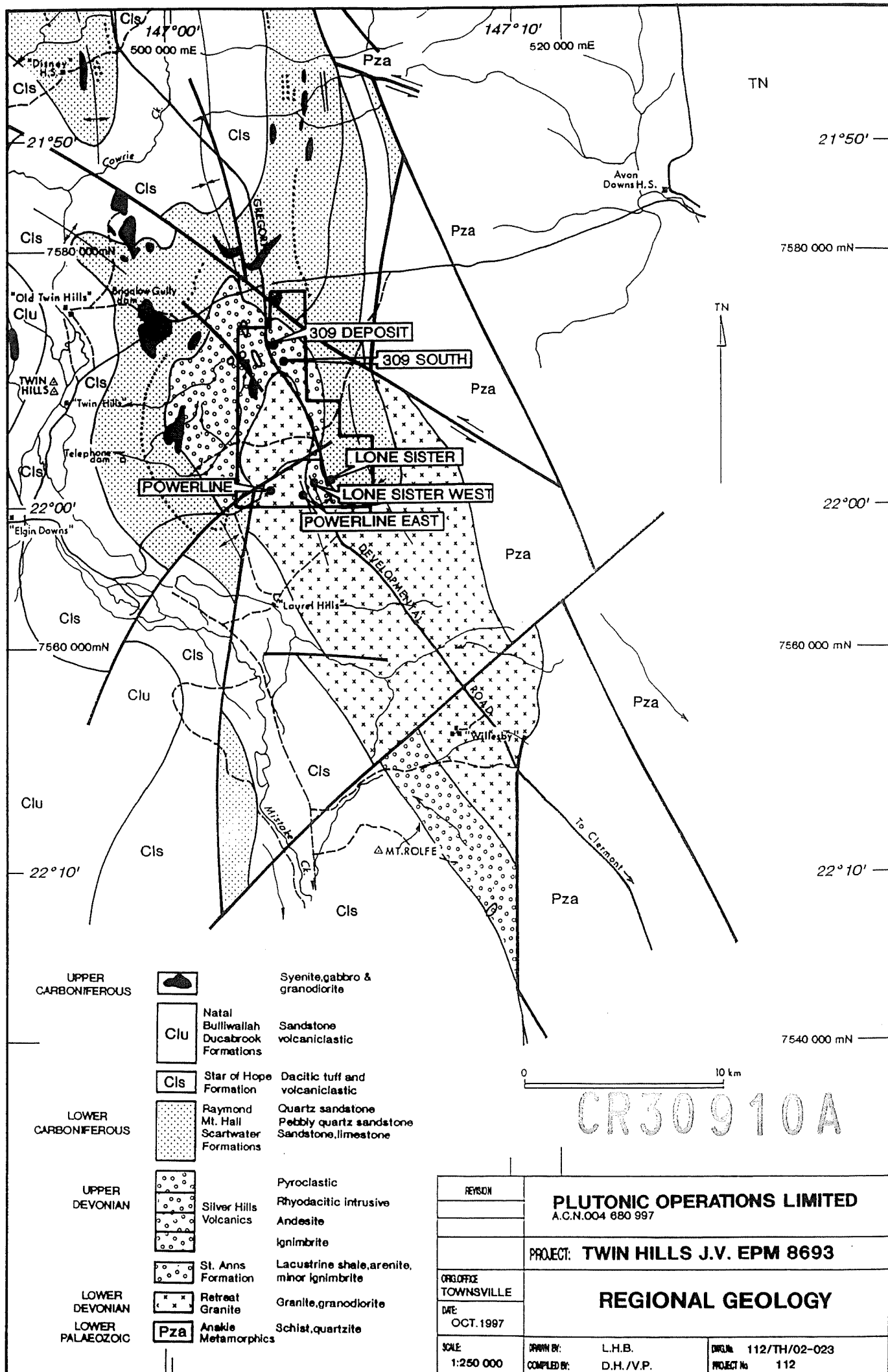
Overlying units of the St. Anns Formation are a sequence of volcanic rocks, correlated with the Silver Hills Volcanics which consists of ash to lapilli size ignimbritic and airfall acid tuffs with minor sandstones, and siltstone, then a clast rich lithic ignimbrite with fragments from ash to boulder size, then andesitic flows and pyroclastics, which have been intruded by flow banded rhyodacite and associated late stage rhyodacitic pyroclastics.

The Silver Hills Volcanics are overlain by sandstones and conglomerates of the Raymond Formation and Mt. Hall Formation.

Fluviatile sediments of the Tertiary Sutor Formation and Quaternary alluvium and gilgai soils provide extensive cover over the older rock units.

Widespread deep lateritic weathering of Tertiary and older rocks extends to depths of up to 100m below the surface.

Epithermal gold mineralisation at Lone Sister is hosted by contact and internal breccias within a flow banded rhyodacite. At Anomaly 309 gold mineralisation occurs as free gold and electrum associated with chalcedonic quartz veining hosted by a fragmental unit interpreted as an eruption breccia, or mass debris flow unit probably deposited within a local graben setting. Features indicative of boiling zone, hydrothermal over pressuring, fluidisation, and strong silica-pyrite alteration are associated with mineralisation at each prospect.



**FIGURE 3**

## 5.0 PREVIOUS EXPLORATION

Prior to granting of EPM 8693, mineral exploration was carried out by Steine Mining Co., Western Mining Corporation, Metana Minerals NL, and Plutonic Operations Limited. Authority to Prospect (ATP) 1481M, held by Steine Mining Co. from 1975 - 1976 was explored for gypsum by means of geological reconnaissance mapping, costeaning, and auger drilling, without discovery of a commercially viable deposit. ATP 4280M, held by Western Mining Corporation from 1986 - 1987 was explored for gold by means of reconnaissance geological mapping, together with stream sediment, soil and rock geochemical surveys. Results were not considered encouraging and the ATP was relinquished.

Mining Lease Application (MLA) 2615, held by Metana Minerals NL from 1987-1991, was explored for gold by regional and detailed geological mapping, soil and rock geochemical surveys, and extensive RAB, RC and diamond core drilling to outline patchy shallow gold mineralisation, and significant width/grade deep gold mineralisation. MLA 2615 was relinquished after formation of a Joint Venture with Plutonic Operations Limited; the area covered by the MLA being included in EPM 5169. This EPM was subsequently amalgamated with EPM 4814 to form EPM 8693. Details of exploration undertaken on EPM 8693, including soil geochemistry, airborne GEOTEM and magnetic surveys, reverse circulation and diamond drilling are covered in previous Annual Reports submitted to the Department of Mines and Energy.

## 6.0 WORK COMPLETED

During the twelve month period, the following work programs were carried out within EPM 8693, Twin Hills.

- Reconnaissance rock chip sampling.
- Orientation soil sampling, followed by infill soil sampling over the tenement area.
- Resource calculations on the 309 Deposit and Lone Sister prospect.
- Gradient array resistivity and chargeability surveys over the whole tenement area.
- Detailed airborne magnetics and radiometric surveys by UTS Geophysics over the tenement area.
- RC percussion and NQ diamond drilling at both the 309 Deposit and Lone Sister.
- Regional RC percussion drilling to test selected resistivity, magnetic structural and geochemical targets.
- HQ diamond core drilling at the 309 Deposit and Lone Sister to obtain further samples for metallurgical testwork.
- Detailed metallurgical testwork on samples from the 309 Deposit and Lone Sister by AMMTEC, Perth.
- Revised resource calculations by Global Mining Services, Perth on the 309 Deposit and Lone Sister, after the completion of additional drilling.
- Relogging and structural interpretation of ore controls for the 309 Deposit by Solid Geology Pty Ltd, Brisbane.

## 6.1 Reconnaissance Rock Chip Sampling (Appendix 5)

46 rock chip samples were collected as float and outcrop samples through the tenement as ground follow up to resistivity and soil geochemistry anomalies. The samples are described in Appendix 5, with locations recorded as AMG coordinates (AGD84 Datum).

Samples were assayed by Australian Laboratory Services (ALS) in Townsville for Cu, Pb, Zn, Ag, As, Bi, Hg, Mo, Sb by ICP Method IC588, and Au by Fire Assay (PM209). Weak but anomalous As, Mo and Sb geochemistry was returned from the LS7 area (midway between the 309 prospect and Lone Sister) and from the 309 South area. The maximum Au geochemistry of 0.6ppm came from quartz and FeOx veined weathered granodiorite from the Powerline prospect. A sample of weathered conglomerates west of 309 (QT58001) also returned elevated Au geochemistry of 0.45ppm Au.

## 6.2 Soil Sampling (Appendix 4)

158 orientation soil samples, consisting of –20 mesh and –1mm fraction, were collected over the 309 South prospect, LS7 resistivity/magnetic anomaly and the Powerline prospect.

The sample material consisted of thin sandy soils to black gilgai clays.

Both fire assay and regoleach for 14 elements were performed by ALS, Townsville. Results of the sampling programs indicated that –1mm BCL sampling over the three test areas produced similar values to previous sampling.

Regoleach sampling over the same locations produced lower order anomalies, and also a number of low order erratic geochemistry responses.

Results from the 14 element scan indicates lower order but discernable Mo, Bi, Se and Cu geochemistry may be associated with the zones of Au geochemistry.

An additional 1,000 –1mm BCL soil samples were collected through the tenement area to infill on broad sample spacing (200m x 400m) over resistivity and magnetic targets.

Over previous soil geochemistry zones, sampling was closed in to 40m sample spacing on lines 100m apart.

Results of this infill sampling have identified low order but regionally anomalous Au BCL values between 5ppb and 20ppb, with a number of the soil zones coincident with resistors west of the Lone Sister prospect.

All infill soil geochemistry, as well as previous soil geochemistry surveys, have been combined into a located soil geochemistry database.

### 6.3 Resource Calculations – July, 1998 (Appendix 9)

Prior to the commencement of the 1998 drilling programs within EPM 8693, the current resources for the 309 Deposit and Lone Sister were recalculated – incorporating NQ core drilling during 1997 for the 309 Deposit. New sectional blocks were produced, with geological controls; primarily the distribution of 2% chalcedonic veining at 309 and the intrusive rhyodacite at Lone Sister, influencing the ore block geometry.

For both the 309 Deposit and Lone Sister, a lower grade cut-off of 0.5g/t Au was used to outline the Global Resource.

Where high grade zones showed continuity, blocks with >3g/t Au were outlined separately.

Grade blocks were projected midway between sections and generally midway between drillholes unless geology and assay grade showed continuity.

A complete report on blocking parameters, methodology and sectional summaries by Global Mining Services is included as Appendix 9.

A summary of both the 309 Deposit and Lone Sister cut and uncut resource figures is shown below as Table 1.

CR30910A

**Table 1: Global Mining Services – Resource Estimate July 1998**

Table 1: Global Mining Services – Resource Estimate July 1998					
	Tonnes	Grade Uncut (g/t)	Grade Cut (g/t)	Total Ozs. Uncut	Total Ozs. Cut
<b>309 Deposit Resources</b>					
High Grade Zone	282,018	40.64	13.67	368,474	123,952
Low Grade Zone	1,552,207	1.33	1.09	66,195	54,567
<b>Total Resource</b>	<b>1,834,224</b>	<b>7.37</b>	<b>3.03</b>	<b>434,669</b>	<b>178,519</b>
Low Grade Zone	High cut of 7g/t Au applied to 1m composite data				
High Grade Zone	High cut of 10g/t Au applied to 1m composites in polygons containing composites <15g/t Au				
High Grade Zone	High cut of 300g/t Au applied to 1m composites in polygons containing composites >15g/t Au				
<b>Lone Sister Deposit Resources</b>					
High Grade Zone	1,206,955	7.41	5.15	287,717	199,761
Low Grade Zone	3,942,425	1.19	1.03	151,366	131,085
<b>Total Resource</b>	<b>5,149,380</b>	<b>2.65</b>	<b>2.00</b>	<b>439,083</b>	<b>330,846</b>
Low Grade Zone	High cut of 5g/t Au applied to 1m composite data				
High Grade Zone	High cut of 50g/t Au applied to 1m composite data				
<b>Twin Hills Combined Resource</b>					
309 Deposit				434,669	178,519
Lone Sister				439,083	330,846
<b>Total Resource</b>				<b>873,752</b>	<b>509,365</b>



## 6.4 Gradient Array Resistivity and Chargeability Surveys

Scintrex Pty Ltd were contracted to carry out resistivity and chargeability gradient array surveys over the remainder of the Twin Hills tenement.

A total of 41 blocks were surveyed, with each block approximately 1.2km x 1.0km. Data within each block was recorded at 100m line spacing (E-W) with receiving dipoles spaced at 40m.

Data was recorded using a Scintrex TSQ4 (10Kw) transmitter and a Scintrex IPR-12 receiver.

All data was merged and levelled by Scintrex, Perth. Existing data over the 309 Deposit, 309 South and Lone Sister prospects was also merged with the current survey data.

Data was supplied in final format as ASCII and gridded Geosoft data.

The data is included as Plans 31 and 32 as apparent resistivity and chargeability contours.

The following features can be seen from the resistivity data:-

- Both the 309 Deposit and Lone Sister are coincident with prominent resistivity highs, and are aligned along a prominent NNW-SSE resistivity trend, coincident with a regional magnetic structure.
- Within the EPM, two main resistivity domains are present;
  - (a) Within the central and southern area, a broad NE trending zone of elevated resistivity is coincident with interpreted granite/granodiorite from drilling. A number of NE, N-S and NW trending faults or discontinuities appear to disrupt this resistivity zone;
  - (b) In the northern part of the tenement, strong N-S resistors are coincident with areas of Silver Hills Volcanics and sediments in outcrop.
- Distinct to the two main resistivity zones are a number of N-S trending resistors, which correlate reasonably well with magnetic and soil geochemistry anomalies, and are inferred as zones of silicification.

In a number of cases, the shapes and positions of resistivity highs, appear to be influenced by surface weathering.

The chargeability data (Plan 32) is severely affected by varying depths of conductive cover material.

A number of strong chargeability anomalies are coincident with resistivity zones and are programmed for drill testing to test for strong clay/sulphide alteration associated with silicification.

## **6.5 Airborne Magnetic and Radiometric Surveys (Plans 30, 33-36)**

A detailed aeromagnetic survey totalling 1,200 line kilometres to cover EPM 8693 was carried out by UTS Geophysics in August, 1998.

Survey specifications were as follows:-

Flight Height	30m approximately
Line Spacing	50m
Recording Interval	5m
Survey Direction	090°-270°

Magnetic data was collected using a Scintrex cesium vapour CS-2 magnetometer.

Radiometric data, consisting of uranium, total count, thorium and potassium channels were also recorded.

Elevation data in the form of a DTM was also acquired.

The airborne magnetic and radiometric data has been supplied by UTS Geophysics as point located data and ER Mapper gridded data.

Overall the detailed airborne magnetic data has provided better definition of regional structural trends and magnetic responses over known mineralised zones at 309 and Lone Sister.

Reduced to the Pole data has highlighted the following responses:-

- Magnetic high smooth signatures are interpreted as granitic rocks at depth.
- Magnetic low, flat signatures in the SE of the tenement relate to sediments of the Silver Hills Volcanics.
- Strong magnetic lows within the 309 and Lone Sister areas are interpreted as magnetic destruction zones, possibly formed by mineralising fluids. A similar response is present over the 309 South prospect.
- A long linear magnetic low extends from south of the 309 Deposit in a SSE direction, this is interpreted as a magnetic destruction corridor associated with faulting.

The airborne magnetic and radiometric data has been combined with the resistivity and soil geochemistry to outline target areas for regional follow up.

## **6.6 309 Deposit Drill Programs**

A program of 13 reverse circulation (RC) percussion and RC percussion-NQ diamond core drillholes were completed at the 309 Deposit; to follow up on previously drilled intersections, and to test for extensions to known mineralisation to the north, south and east under areas of shallow percussion drilling.

In total 2,418m of RC percussion and 1,122m of NQ diamond drilling was carried out.

Drillhole sampling was undertaken using a 75:25 riffle splitter for all RC percussion samples. RC percussion samples were generally sampled at 2m composites in weathered material, then 1m samples to end of percussion drilling.

All NQ core samples were measured, orientated, photographed, and cut, with ½ NQ core samples dispatched to the lab.

All Au assays were carried out using fire assay technique PM209 (ALS, Townsville).

Duplicate samples at 20m intervals were dispatched under a separate order to test sampling and assay procedures.

Drilling undertaken during the period is shown as Figure 4 and simplified sections (10000N and 10120N) as Figures 6 and 7.

Detailed drill logs are included as Appendix 6 and assay results in Appendix 1.

All drillholes are incorporated in drill sections 9920N to 10240N (Plans 4-19).

All lithologies intersected have been consistent with previous geology, with orange tan clays after weathered siltstones overlying conglomerate/mass flow debris unit. Underlying the conglomerate unit is a relatively unaltered and undeformed sequence of finely bedded siltstones and arenite. Overall, the stratigraphy is dome shaped, with possible plunges to the north and south.

Trachyte dykes, positioned above the mass flow debris unit were intersected in most holes drilled to the east, except for the two RC percussion holes on section 10240N. Local faulting may have offset the dykes, with further drilling required to determine any sense of offset.

Broad zones of chalcedonic quartz veining appear to envelope anomalous Au geochemistry, with better grades associated with multistage chalcedonic quartz veining in zones of intense silicification and pyrite alteration. Graphitic shears and clay puggy zones marginal to higher grade Au zones also suggest some fault control is present.

Significant zones assaying >1g/t Au were returned from drillholes 98TRCD738, 740 and 743 drilled from the east to west.

These drillholes intersected mineralisation under the eastern limb of the sinter and represent an additional zone of mineralisation, possibly related to the eastern extensions of the apparent doming of quartz veining in the centre of the deposit (Figure 6).

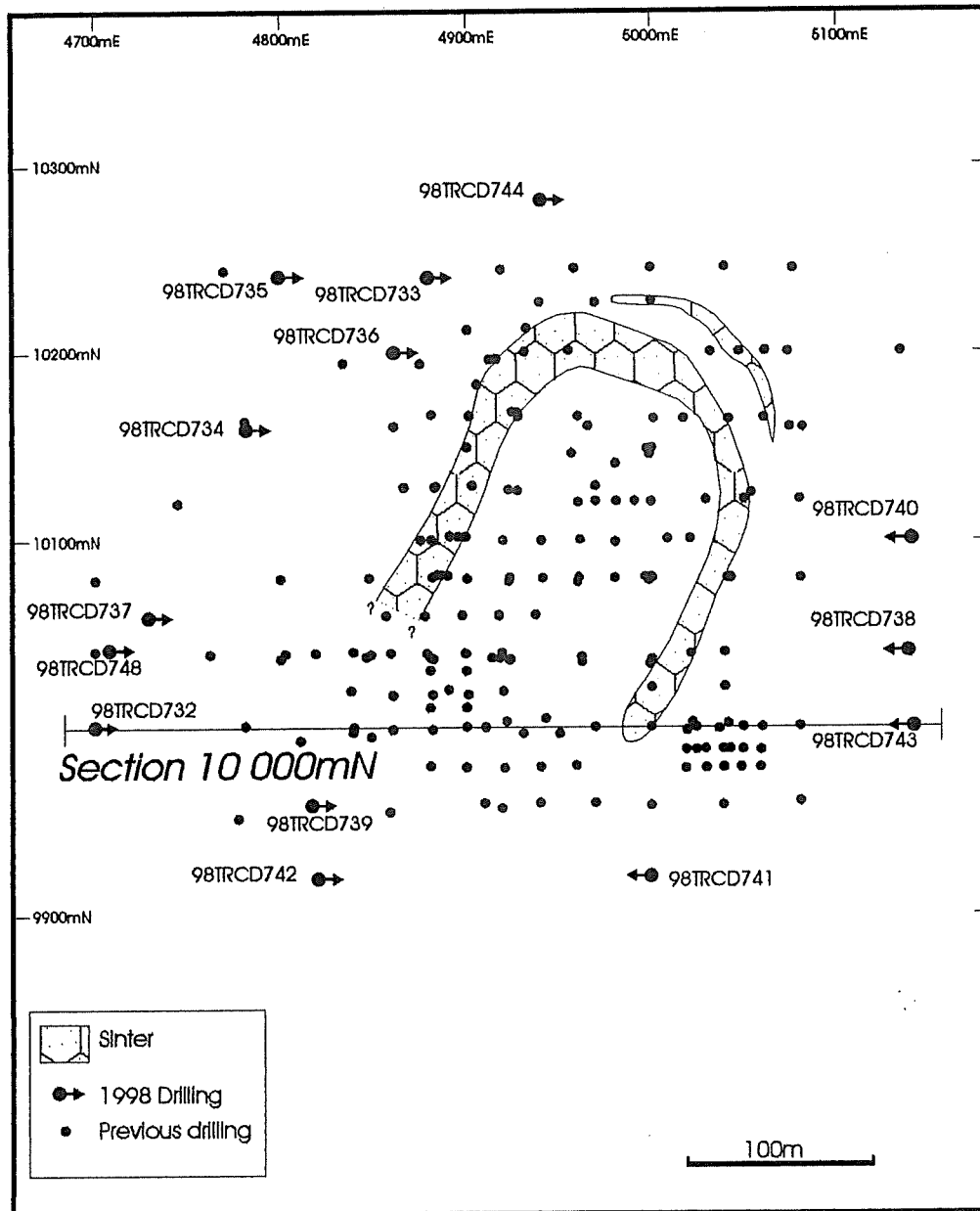
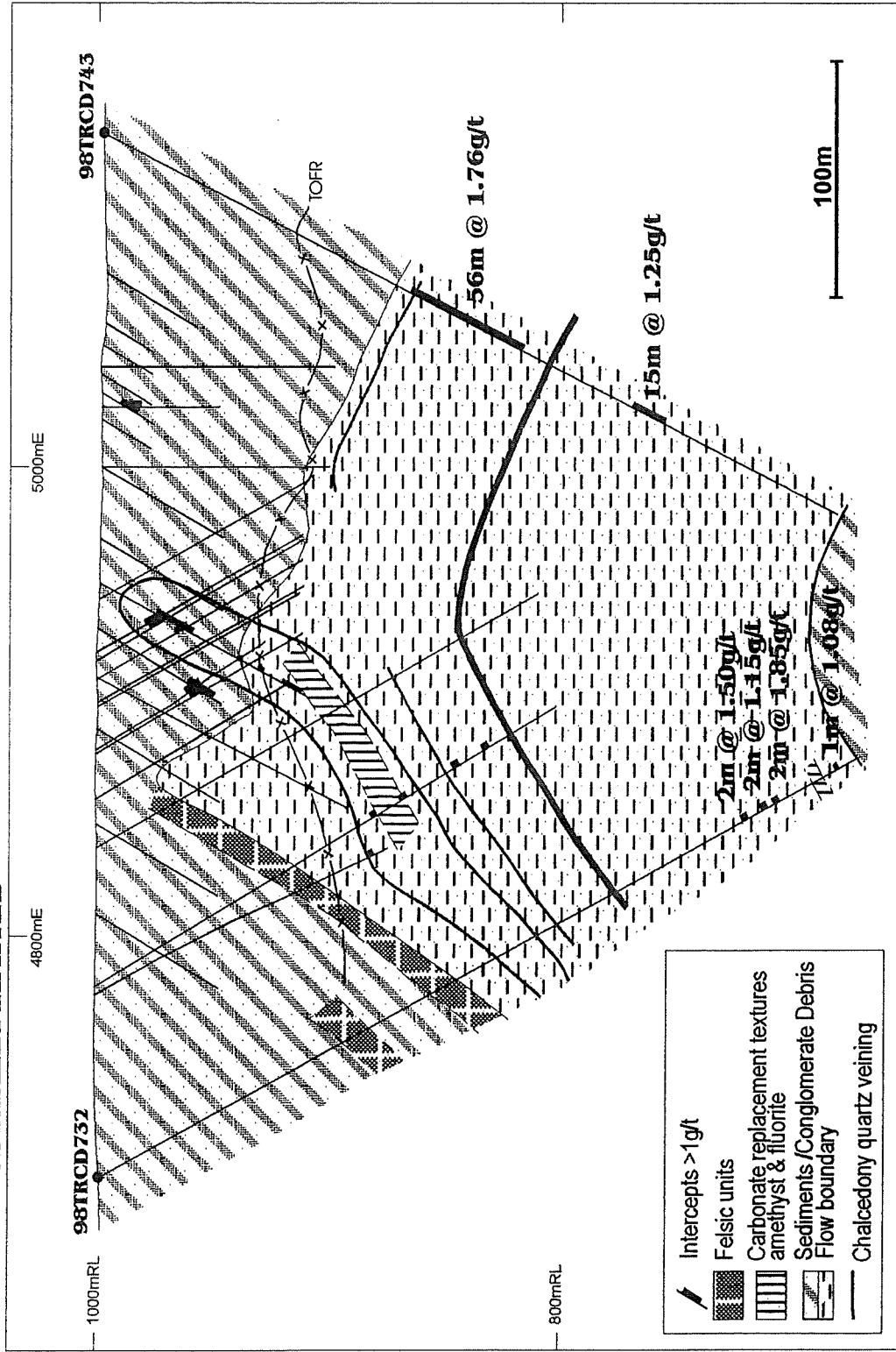
**GOLD OF AUSTRALIA LIMITED****TWIN HILLS J.V. - 309 DEPOSIT  
DRILL HOLE LOCATION PLAN**

FIGURE 4

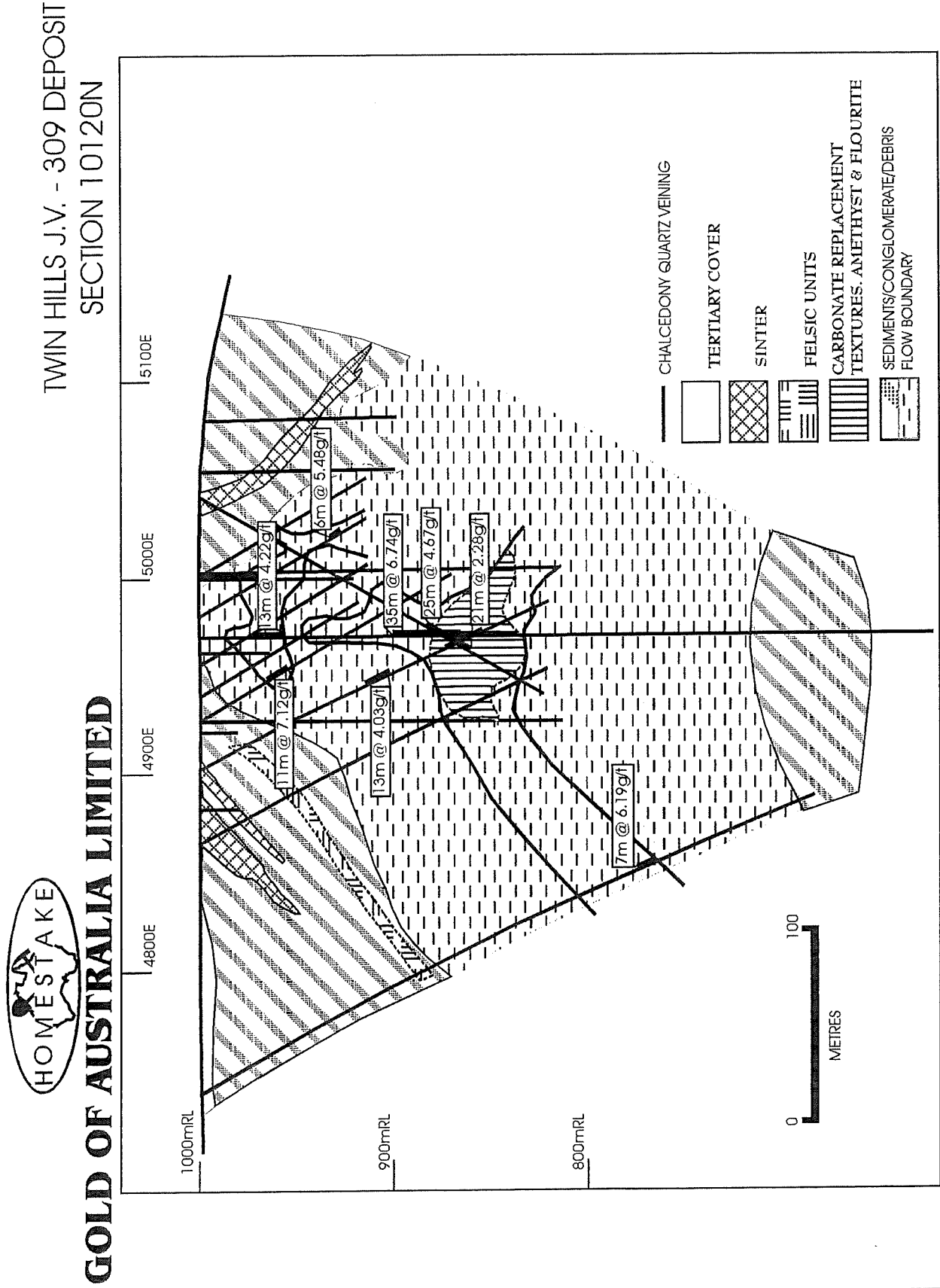


**GOLD OF AUSTRALIA LIMITED**

**TWIN HILLS J.V. - 309 DEPOSIT**  
**Section 10000mN**



**FIGURE 6**



Mineralisation in these holes is associated with irregular chalcedonic veining, with fluorite amethyst and carbonate replacement textures above the zone of >1g/t Au in holes 98TRCD738 and 740.

Drillholes 98TRCD739 (section 9960N) and 98TRCD741 (section 9920N), both to the south of the resource area, intersected significant zones >1g/t Au, confirming that mineralisation is still open to the south. Hole 98TRCD741 intersected 54m of intense silica flooding and brecciation.

All 309 deposit drillholes and azimuth data as well as surveyed coordinates and depths are summarised in Table 2.

Significant assay results are summarised in Table 3.

CR30910A

**Table 2: 1998 Drillhole Locations and Depths**

Prospect	Hole No	Northing	Easting	Az° (mag)	Incl. °	RC (m)	Diamond (m)	Total Depth (m)
<b>309 Deposit</b>	98TRCD732	9999.97	4699.96	091	-60	185.8	186.8	372.6
	98TRCD733	10240.83	4879.71	091	-60	270		270
	98TRCD734	10160.71	4781.04	091	-60	143.9	163.05	306.85
	98TRCD735	10241.47	4800.28	091	-60	249		249
	98TRCD736	10201.53	4862.02	091	-60	197.6	91	288.6
	98TRCD737	10059.50	4730.39	091	-60	167.9	132.7	300.6
	98TRCD738	10040.32	5140.75	271	-60	170.95	123.65	294.6
	98TRCD739	9960.87	4820.13	081	-60	168.6	93	261.6
	98TRCD740	10099.44	5141.69	271	-60	186	138.6	324.6
	98TRCD741	9919.95	4999.78	271	-60	168		306.6
	98TRCD742	9918.73	4820.63	091	-60	168		Not Completed
	98TRCD743	9999.25	5141.64	271	-60	162	192.6	354.6
	98TRCD744	10278.57	4940.62	091	-60	180		Not Completed
	*98TRC747	10041.50	4724.54	091	-60	149.75	21.45	171.2
	*98TRC748	10042.33	4714.78	091	-60	108	126.3	234.3
<b>309 South</b>	98TRC745	9800	5020	091	-60	240		240
	98TRC746	9800	4920	091	-60	234		234
	98TRC749	9300	5880	091	-60	204		204
	98TRC750	9300	5800	091	-60	197		197
<b>Regional</b>	98THRC001	7567943	505332	082	-60	225		225
	98THRC002	7567944	505231	082	-60	222		222
	98THRC003	7568042	505314	082	-60	216		216
	98 THRC004	7569350	5069005	082	-60	216		216
	98THRC005	7569550	05600	082	-60	192		216
	98THRC006	7569550	505500	082	-60	202		192
	98THRC007	7569550	5054005	082	-60	210		202
	98THRC008	7569650	07513	082	-60	210		210
	98THRC009	7569572	507642	082	-60	222		222
	98THRC010	7569550	507544	082	-60	210		210
	98THRC011	7572310	505580	082	-60	204		204
	98THRC012	7572290	506500	082	-60	211		211
	98THRC013	7572670	504097	082	-60	168		168
	98THRC014	7572570	503944	082	-60	198		198
	98THRC015	7570500	506050	082	-60	198		198
	98THRC016	7570500	505950	082	-60	198		198
	98THRC017	7572355	506520	082	-60	198		198
	98THRC018	7571050	507450	082	-60	198		198
	98THRC019	7571000	505650	082	-60	198		198
	98THRC020	7571005	505495	082	-60	198		198
	98THRC021	7571050	507550	082	-60	198		198
	98THRC022	7575600	505900	082	-60	198		198
<b>Lone Sister</b>  (*Met Holes)	98LRCD130	21039.6	10099.3	262	-60	150	254.55	404.55
	98LRCD131	21119.29	10099.30	262	-60	150	280.0	430.0
	98LRCD132	21278.63	10085.49	262	-60	150	264.6	414.6
	98LRCD133	21399.07	10020.21	262	-60	150	248.6	398.6
	*98LRCD134	21119.67	9879.49	082	-60	72	65.93	137.93
	*98LRCD135	21200.11	9831.33	082	-60	150	111.6	261.6

309 Deposit, 309 South and Lone Sister are reported as local grid co-ordinates.



CR30910A

**Table 3: Significant Au Assay Results – 1998 Drillholes**

Prospect	Hole No.	Northing	Easting	Az °	Incl °	From (m)	To (m)	Interval (m)	Au g/t
309 Deposit	98TRCD732	9999.97	4699.96	091	-60	314	316	2	1.50
						322	324	2	1.15
						327	329	2	1.85
						359	360	1	108.5
	98TRC733	10240.83	4879.71	091	-60	76 210	90 218	14 8	0.1 - 0.8 0.1 - 0.8
	98TRC734	10160.71	4781.04	091	-60	217	224	8	1.50
	98TRC735	10241.47	4800.28	091	-60	215	248	8	0.55
	98TRC736	10201.53	4862.02	091	-60	264	285	21	1.24
	98TRC737	10059.50	4730.39		-60	162	169	7	1.27
174						175	1	1.2	
187						189	2	1.41	
213						214	1	0.99	
232						233	1	1.35	
236						237	1	14.15	
243						244	1	3.71	
247						249	2	73.15	
								includes 1m @ 136.5	
291						292	1	1.53	
296						297	1	1.40	
	98TRCD738	10040.32	5140.75	091	-60	149	156	7	0.55
171						174	3	3.19	
180						184	4	2.79	
199						204	5	0.82	
211						212	1	2.94	
221						223	2	4.73	
226						227	1	8.29	
252						253	1	1.17	
	98TRCD739	9960.87	4820.13	091	-60	114	115	1	2.26
124						128	4	2.72	
149						152	3	0.97	
156						161	5	2.02	
190						191	1	7.32	
203						204	1	1.24	
207						211	4	1.27	
225						226	1	1.03	
	98TRCD740	10099.44	4999.78	271	-60	246	248	2	1.82
168						208	40	0.27	
208						210	2	13.1	
250						251	1	1.04	
	98TRCD741	9919.95	4999.78	271	-60	255	256	1	1.40
235						256	1	1.12	
238						239	1	1.25	
296						297	1	1.34	
Note Broad zone of 0.1 – 0.3ppm associated with silicified zone from 200-250m									
	98TRCD743	9999.25	5141.64	271	-60 incl. and and	144	200	56	1.76
176						183	7	2.74	
189						191	2	1.47	
194						200	6	1.27	
207						208	1	2.12	
252						267	15	1.30	

CR30910A

Table 3 Continued

Prospect	Hole No.	Northing	Easting	Az °	Incl °	From (m)	To (m)	Interval (m)	Au g/t
	98TRCD748 (Metallurgical Hole)	10042.33	4714.78	091	-60	172 180 193 223 227 234	174 188 195 224 229 236	2 8 2 1 2 2	23.23 2.55 2.77 0.96 7.02 1.05
309 South	98TRC745 98TRC746 98TRC749 98TRC750	9800 9800 9300 9300	5020 4920 5880 5800	091 091 091 091	-60 -60 -60 -60	No significant assays No significant assays No significant assays No significant assays			
Regional	98THRC001 98THRC002 98THRC003	7567943 7567944 7568042	505332 505231 505314	082 082 082	-60 -60 -60	No significant assays No significant assays No significant assays			
	98THRC004	7569350	506900	082	-60	10 50 60	16 54 64	6 4 4	0.87 0.66 0.41
	98THRC005 98THRC006 98THRC007 98THRC008 98THRC009 98THRC010 98THRC011	7569550 7569550 7569550 7569650 7569572 7569550 7572310	505600 505500 505400 507513 507642 507544 505580	082 082 082 082 082 082 082	-60 -60 -60 -60 -60 -60 -60	No significant assays No significant assays No significant assays No significant assays No significant assays No significant assays No significant assays			
	98THRC012	7572290	506500	082	-60	79 161 182	80 162 184	1 1 2	0.71 0.29 0.32
	98THRC013 98THRC014 98THRC015	7572670 7572570 7570500	504097 503944 506050	082 082 082	-60 -60 -60	No significant assays No significant assays No significant assays			
	98THRC016	7570500	505950	082	-60	154	155	1	10.1
	98THRC017 98THRC018 98THRC019 98THRC020 98THRC021 98THRC022	7572355 7571050 7571000 7571005 7571050 7575600	506520 507450 505650 505495 507550 505900	082 082 082 082 082 082	-60 -60 -60 -60 -60 -60	No significant assays No significant assays No significant assays No significant assays No significant assays No significant assays			
Lone Sister	98LRCD130	21039.6	10099.3	262	-60  incl.  incl.	156 187 190 222 222 226	158 197 192 228 224 228	2 10 3 6 2 1	1.31 0.97 2.21 1.37 2.53 1.42
	98LRCD131	21119.3	10101.53	271	-60 incl. and  incl.	259 261 289 317 319 394	300 263 290 328 320 395	41 2 1 11 1 1	0.53 1.39 1.11 0.4 1.12 3.89

CR30910A

Table 3 Continued

Prospect	Hole No.	Northing	Easting	Az °	Incl °	From (m)	To (m)	Interval (m)	Au g/t
	98LRCD132	21278.63	10085.49	262	-60 incl. and and and and and and and and incl. and and and and and incl. and and and and and and	150 160 167 185 209 229 238 245 254 327 337 354 364 368 373 385 389	263 161 180 186 212 230 239 246 262 397 340 357 366 369 374 385 391	113 1 13 1 3 1 1 1 8 70 3 3 2 1 1 1 2	0.72 2.69 1.53 1.07 1.33 1.1 1.11 1.09 1.83 0.63 2.51 1.03 1.53 1.28 1.39 1.51 2.24
	98LRCD133	21399.07	10020.21	262	-69	177	178	1	1.37
	98LRCD134 (Metallurgical Hole)	21119.67	9879.49	082	-60  incl. and and and and and	70 77 77 91 101 105 108 116	72 136 86 99 102 106 114 136	2 59 9 8 1 1 6 20	20.6 2.03 4.13 1.66 1.32 1.45 1.89 2.15
	98LRCD135 (Metallurgical Hole)	21200.11	9831.33	082	-60  incl.	231 247 247 260	233 253 249 261.6	2 6 2 1.6	2.73 8.40 20.1 1.82

### 6.7 Lone Sister Prospect Drilling

At the Lone Sister prospect, four pre-collared diamond holes, 98LRCD130-133, were completed for 600m RC percussion and 1,047.8m NQ diamond coring.

All drillholes were planned to test for extensions of silica/k'spar altered rhyodacite and marginal polymict and andesitic breccias, hosting Au mineralisation.

Drillhole locations are summarised as Figure 5, with simplified geology shown as Figure 8.

Drillhole coordinates and depths are summarised in Table 2, with significant zones of Au mineralisation listed as Table 3.

Detailed drill logs are included as Appendix 7, with assay data sheets as Appendix 2.

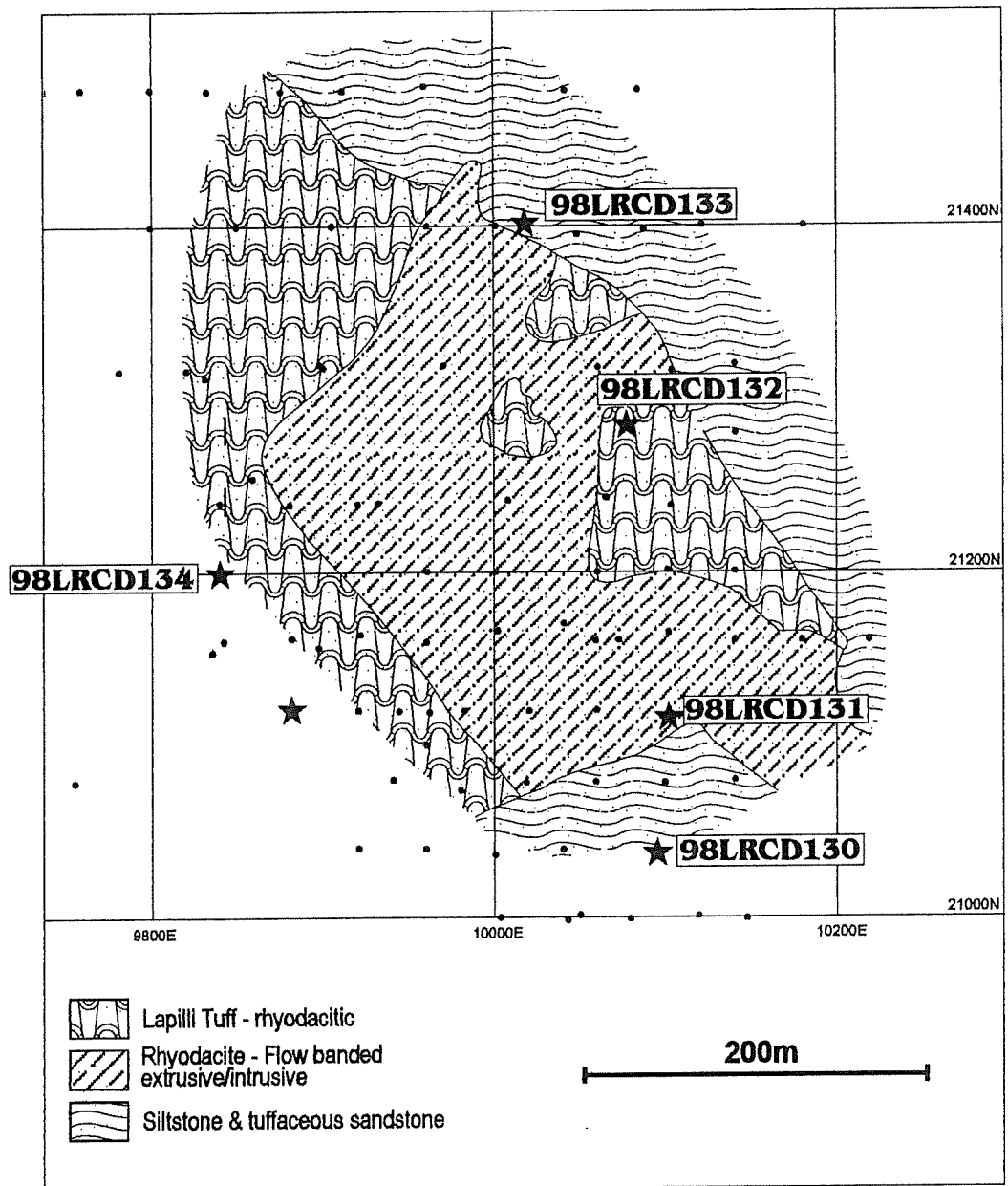
Sampling and assaying methods were as for the 309 Deposit.

All drillholes have been incorporated in Plans 20-28.



**GOLD OF AUSTRALIA LIMITED**

## TWIN HILLS J.V. - LONE SISTER DEPOSIT Geology & Drilling



**FIGURE 5**

**MAY 1999**



# GOLD OF AUSTRALIA LIMITED

TWIN HILLS  
LONE SISTER PROSPECT  
SECTION 21280N

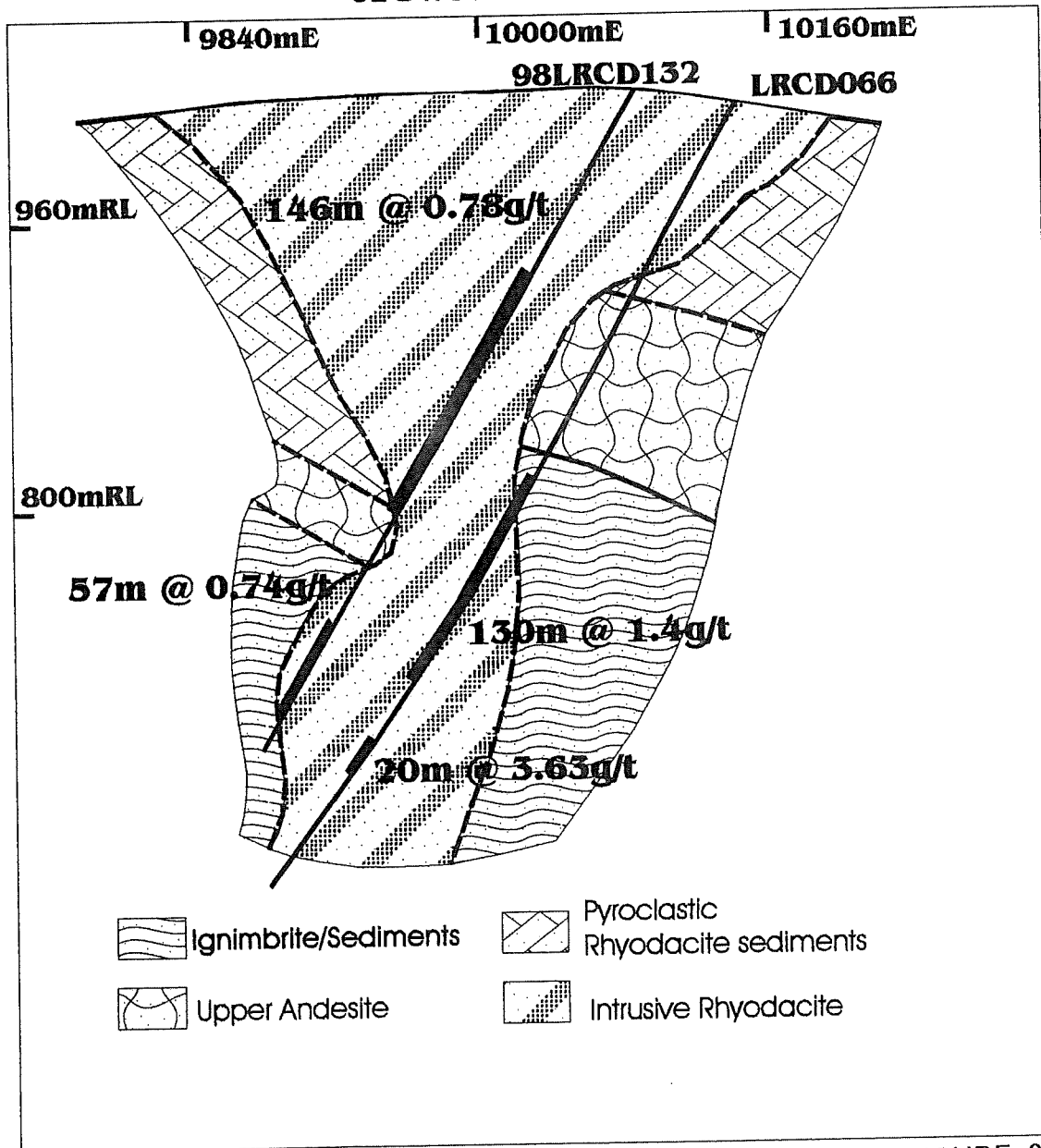


FIGURE 8

Drillholes 98LRCD130 and 131, drilled at the southern end of the Lone Sister prospect, intersected broad zones of silica/pyrite/k'spar altered rhyodacite. Broad zones up to 40m returned assay values of >0.5ppm Au, with narrow zones assaying >1g/t Au. Compared to previous drilling to the north, holes 98LRCD130 and 131 appeared to have less quartz cavity and vugh development and less marcasite alteration.

Drillhole 98LRCD132, within the central section of the Lone Sister prospect, returned 113m @ 0.7ppm Au and 70m @ 0.6ppm Au from altered rhyodacite. Best grades were associated with an increase in fine chalcedony and sulphide veining, with broad zones of silica/k'spar/pyrite and vughy quartz cavity development within the altered rhyodacite.

Drillhole 98LRCD133, drilled on section 21400N, intersected weak silica/k'spar alteration within the rhyodacite and returned only weak mineralisation.

## **6.8 309 South Prospect Drilling**

At the 309 South prospect, four RC percussion drillholes (98TRC745, 746 and 749, 750) were drilled to test the southern continuation of the main resistivity trend from the 309 Deposit (Appendices 1 and 6 for drillhole assays and descriptions, and Plans 29 and 30 for detailed drill logs).

All drillholes intersected similar lithologies to the 309 Deposit, consisting of weakly carbonaceous siltstones and weakly silicified conglomerates.

Weak chalcedonic quartz veining was noted in some intervals.

All drillholes returned Au assay values around detection.

## **6.9 Regional RC Percussion Drill Program**

22 RC percussion holes (98THRC001-022) were completed over regional targets to test zones of strong resistivity response, possible mineralised structures interpreted from magnetics and resistivity and Au soil geochemistry anomalies.

Regional drillholes are plotted as Plan 3, with assay results included as Appendix 3 and detailed drill logs as Appendix 8.

Drillhole locations and depths are summarised in Table 2 and significant assays in Table 3.

As with previous RC percussion drilling, all samples were collected using a 5½ inch face discharge hammer bit and riffle split through a 75:25 splitter.

Samples were generally 2m composites down to top of fresh rock and then 1m sampling. All samples were assayed for Au and Ag/As, with Au by fire assay (ALS PM209).

For most drillholes within the strong resistivity zone to the south, lithologies consisted of weakly altered (chlorite-epidote-pyrite) granodiorite and diorite, with zones of hornfelsed micaceous sediments.

At the LS7 area (drillhole 98THRC012), altered rhyolites were intersected above a possible contact with granodiorite.

Best results from the regional drill program were from 98THRC004, 012 and 016.

In hole 98THRC004, 6m @ 0.87ppm Au from 10m was returned from weakly Feox stained weathered granodiorite in the southern portion of the tenement.

Drillhole 98THRC012 returned a maximum of 0.71ppm Au from altered granodiorite in the LS7 area. Of significance is that the peak soil geochemistry and resistivity anomaly east of the drilling area remains untested, due to boggy ground conditions.

Drillhole 98THRC016 returned 1m @ 10.1ppm Au from a quartz-sulphide veined zone within a 13m interval of intense chlorite/fine pyrite alteration in granodiorite.

Further follow up drill testing of these target areas is planned for 1999.

## **6.10 Metallurgical Drilling Program**

Three HQ diamond core holes were drilled for metallurgical test samples.

Drillhole 98TRCD748 at the 309 Deposit and drillholes 98LRCD134 and 135 were drilled to collect further primary mineralised material for further metallurgical testwork.

As well as samples for metallurgical testwork, drillhole 98TRCD748 was planned to further test the continuation of high grade Au mineralisation from hole 97TRCD728 on section 10040N at the 309 Deposit.

HQ drill core was cut in half, with a ¼ core sample sent to ALS in Townsville for Au fire assay.

Based on the assay results, composite ½ HQ core samples were collected for metallurgical testwork at AMMTEC, Perth.

Detailed drill logs for the metallurgical drillholes are included in Appendices 6 and 7, with the metallurgical holes included on detailed drill sections.

Assay results for the metallurgical holes from Lone Sister, were consistent with previous drill results, with >2g/t Au reported from altered rhyodacite material (98LRCD134), and >5g/t Au results reported from the andesitic/polymict breccia, marginal to the altered rhyodacite (98LRCD135).

At the 309 Deposit, drillhole 98TRCD748 failed to intersect the bonanza grade in drillhole 97TRCD728 (~20m @ 317g/t Au), but intersected high grade material, further up hole, possibly related to faulting.

Drillhole 98TRCD747 was abandoned due to excessive dip and azimuth variation.

### 6.11 Metallurgical Testwork

Metallurgical testing of ½ HQ diamond core from the 309 Deposit and Lone Sister was carried out by AMMTEC in Perth. Full results are detailed in Appendix 12.

Gravity separation and cyanide leach testwork on eight composite samples (four from the 309 Deposit and four from Lone Sister), as well as three high grade samples are summarised in Table 4.

**Table 4: AMMTEC Gravity Leach and Cyanide Leach Recoveries**

Composite	Assay Head	Assay Av.	Grav/CN Rec %
1/309	4.6 / 6.2	5.4	57.97
2/309	2.98 / 2.52	2.75	33.06
3/309	2.3 / 2.18	2.24	43.42
4/309	12.2 / 8.38	10.29	78.7
9/309(HG A)	12.1 / 14.0	13.05	73.76
10/309(HG B)	36.6 / 35.6	36.1	89.22
5/ LS	8.16 / 7.02	7.59	86.06
6/ LS	1.35 / 1.43	1.39	74.18
7/ LS	2.44 / 2.12	2.28	81.14
8/ LS	2.24 / 2.08	2.16	77.43
11/ LS(HG)	26.0 / 26.4	26.2	94.86

The Metallurgical testwork results in conjunction with mineralogical examination has indicated fine gold locked in sulphides is present, particularly in the lower grade (2-3g/t Au) 309 Deposit samples.

The samples with low recovery from 309 (33-58%) also contain 0.2 – 0.27% carbon.

CIL cyanidation testwork was also carried out on two poor recovery samples from 309 Deposit and one bulk composite sample from Lone Sister.

Leaching in the presence of activated carbon has produced significant improvements in recovery, compared to gravity separation / cyanide leach testwork.

These results are in Table 5.



**Table 5: AMMTEC CIL Recoveries**

Sample	Head Assay (g/t Au)	Gravity Separation/ Cyanide Leach Rec.	CIL / Cyanide Leach Rec.
309 – Composite 1	4.80 / 6.20	58.56 %	92.62%
309 – Composite 2	2.98 / 2.52	31.50%	89.88%
Lone Sister – Composite 3 (LRCD134 71.3 - 136m)	2.30 / 4.09	Composite of previous samples Av~82%	89.59%

Metallurgical testwork also highlighted the following:

In addition to gold the Twin Hills gold ore composites contain significant concentrations of silver. The silver was identified by mineralogical examination to be present as electrum, argentian, native and as silver bearing minerals.

The 309 Deposit ore samples contain enough concentrations of organic carbon to cause preg-robbing if a direct cyanidation leaching (CIP mode) process route was to be utilised for processing the ore.

Comminution testwork results indicate relatively high Bond abrasion index values, in excess of 1.0. The Bond rod mill work index results were also high, being in excess of 28 kWh/t, whilst the Bond ball mill work index results were in excess of 24 kWh/T.

Direct cyanidation (CIP mode, i.e. no activated carbon added to the leach pulps) leach testwork results in conjunction with the 309 Deposit composites indicated variable gold extraction levels, being as low as 8.64% and as high as 86.09%. The Lone Sister Deposit composites had higher gold extraction levels, being as low as 77.82% and as high as 95.40%.

The 309 Deposit and Lone Sister ore samples contain significant concentrations of coarse/free gold which can be easily recovered using conventional gravity separation techniques.

Removing the gravity gold content of the 309 Deposit composites prior to cyanidation has resulted in higher gold extraction levels than were achieved via the direct cyanidation method. The Lone Sister composites, which contain no organic carbon, gave similar gold extraction levels from gravity separation/leach testwork as was achieved from direct cyanidation leach testwork.

Diagnostic gold analysis results indicate that a significant proportion of the gold content of the 309 Deposit and Lone Sister ore samples is present as sulphide inclusions. Diagnostic data also indicate that for the 309 Deposit there is significant gold locked up in silicate gangue as fine grains at the test grind size  $P_{80}$  of 75 microns. The 309 Deposit ore samples, however, contain high concentrations of organic carbon which may be preg-robbing, it is therefore highly likely that some of the gold reported as being silicate encapsulated is in fact reabsorbed by the organic carbon contact of the ore samples.

## 6.12 Drillhole Surveying

Using a Sokkisha Set 4 Theodolite all of the RC/diamond collars were picked up using local grid coordinates. These were then transformed to AMG so as to keep up with the practice of two grid systems for reporting (Table 6).

Existing base stations were used as control points and they have been tied into AMG by Brazier and Motti Surveyors.

At Hill 309 local height was derived from an arbitrary datum of 1000 RL adopted on the original 1000N 5000E grid peg. For the purpose of transforming heights to A.H.D subtract 743.38m from the grid RL.

At Lone Sister the height was derived from an arbitrary datum of 1011.50 RL which was the original height given to grid peg 2100N 10000E. For the purpose of transferring heights to A.H.D subtract 774.86m from the grid RL.

A.H.D heights were carried in from Main Roads Bench Marks and assigned to the above control points.

CR30910A

**Table 6: Surveyed Drillhole Coordinates**

Hole ID	Grid		RL	AMG		AHD RL
	Northing	Easting		Northing	Easting	
Hill 309						
98TRCD732	9999.97	4699.96	1000.13	7575409.25	505088.02	256.75
98TRCD733	10240.83	4879.71	999.67	7575617.50	505304.54	256.29
98TRCD734	10160.71	4781.04	999.31	7575554.56	505194.17	255.93
98TRCD735	10241.47	4800.28	999.79	7575631.08	505226.31	256.41
98TRCD736	10201.53	4862.02	1000.96	7575581.63	505280.69	257.58
98TRCD737	10059.50	4730.39	1000.07	7575463.00	505127.73	256.69
98TRCD738	10040.32	5140.75	995.07	7575377.22	505529.31	251.69
98TRCD739	9960.87	4820.13	999.83	7575351.11	505200.16	256.45
98TRCD740	10099.44	5141.69	994.96	7575435.37	505539.87	251.58
98TRCD741	9919.95	4999.78	997.61	7575281.48	505370.67	254.23
98TRCD742	9918.73	4820.63	999.46	7575309.46	505193.79	256.08
98TRCD743	9999.25	5141.64	995.04	7575336.57	505523.50	251.66
98TRCD744	10278.57	4940.62	997.88	7575644.80	505370.76	254.50
98TRCD745						
98TRCD746						
98TRCD747	10041.50	4724.54	1000.11	7575446.20	505119.03	256.73
98TRCD748	10042.33	4714.78	1000.08	7575448.61	505109.54	256.70
Lone Sister						
98LRCD130	21039.66	10099.30	1012.49	7567919.75	508410.47	237.63
98LRCD131	21119.29	10101.53	1017.76	7567999.27	508414.42	242.90
98LRCD132	21278.63	10085.49	1022.08	7568158.84	508401.83	247.22
98LRCD133	21399.07	10020.21	1019.90	7568280.60	508339.20	245.04
98LRCD134	21119.67	9879.49	1013.97	7568004.44	508192.55	239.11
98LRCD135	21200.11	9831.33	1014.44	7568085.86	508146.17	239.58

### 6.13 Twin Hills Resource Estimate – January 1999

Following the completion of further drilling at the 309 Deposit and Lone Sister prospects, the resource figures were recalculated to include the additional drilling. This work was undertaken by Global Mining Services in Perth.

CR30910A

The revised figures are listed below as Table 7.

**Table 7: Global Mining Services – Resource Estimate January 1999**

<b>INDICATED MINERAL RESOURCE</b>			
	<b>Tonnes</b>	<b>g/t Au Cut</b>	<b>Ounces (Cut)</b>
Anomaly 309 Sections 1000 – 10040	606,973	5.79	112,967
Anomaly 309 Transitional on Sections 10080 – 10120	306,895	1.39	13,726
<b>TOTAL</b>	<b>913,868</b>	<b>4.31</b>	<b>126,693</b>
<b>INFERRED MINERAL RESOURCE</b>			
	<b>Tonnes</b>	<b>g/t Au Cut</b>	<b>Ounces (Cut)</b>
Lone Sister	5,841,002	1.84	346,048
Anomaly 309	1,544,528	1.88	93,488
<b>TOTAL</b>	<b>7,385,529</b>	<b>1.85</b>	<b>439,536</b>
<b>TOTAL MINERAL RESOURCE</b>	<b>8,299,398</b>	<b>2.12</b>	<b>566,229</b>

Portions of the 309 Deposit have been categorised as Indicated and Inferred Mineral Resources, based on density of drilling and 10m spacing of drill sections.

The wide spacing of drill sections at Lone Sister and spacing of drill holes precluded any categorisation for the Lone Sister prospect.

Overall, 1998 drilling at the 309 Deposit and Lone Sister increased the cut resource figure by around 57,000oz. Au.

A detailed report outlining blocking parameters and methodology is included as Appendix 10. All updated resource blocks and sectional resource summaries are incorporated in Plans 4-19 for 309 and Plans 20-28 for the Lone Sister prospect.

### 6.14 Structural Interpretation of the 309 Deposit

Solid Geology Pty Ltd were contracted to carry out a structural interpretation of the 309 Deposit.

The main aims of the study were to:-

- Identify the timing and trends of mineralised structures.
- Identify any additional high grade targets.
- Outline regional targets based on structural interpretation.
- Confirm the preferred drilling direction.

Regional data sets consisting of previous reports, magnetics, resistivity were provided.

All diamond drill core for the 309 Deposit was relogged during the study.

Final products from the study were provided in MapInfo format, with the text as hard copy (Appendix 11).

The 309 Deposit is hosted in a domed shaped package of conglomerates/debris flow sediments and finer laminated sediments. The doming appears to be elongated to the NNE-SSW and dips in all directions at a moderate angle.

The apparent doming of the chalcedonic quartz vein zone appears to be still valid, with veining distribution partially controlled by more permeable conglomeratic units, that are more susceptible to open spaced fill.

On a detailed scale, the vein geometrics are still complex, with a mixture of irregular space fill veining and flat and steep vein sets controlled by faulting.

Both silicification, stylolite dissolution zones and increase in grade appear to be related to the position of fault zones, hosting regular vein sets and partly overprinting space fill veining.

Conclusions from the Solid Geology Report are listed below.

The structural controls on the 309 deposit cannot yet be unambiguously interpreted. Laing (1989) noted that the vein system in the holes available at that time was not systematic and that the system might become more systematic as feeder structures were intersected in subsequent drilling. Unfortunately it appears that he was looking at one of the more systematic parts of the ore system as it is currently known (vein zone D in section 10120N). No large, obvious feeder system has been located. This makes it difficult to understand the controls on the deposit at a local scale. However, this study has constrained the possible geometries at regional and local scales and can be used to direct further work.

### ***Regional Scale***

Initially it seemed that the NNW trending Development Road Fault as seen in magnetics was a relatively simple NNW trending structure. However, in detail it actually comprises a series of more NW trending segments. It clearly must have a strong influence on the control of mineralisation at the 309 deposit. What is not clear is whether the deposit is controlled by splays from sinistral shearing on NNW to NW trends or dextral shearing on ENE to NE trends. Examples of both are known from the Drummond Basin. At this stage target areas should be considered from both models.

In the vicinity of the 309 deposit the ENE margin to the interpreted local intrusion just to the SE of the known deposit must have a strong bearing on mineralisation. The mineralisation is most likely to have fed from this structure or from its intersection with the NNW trending fault which clearly truncates the resistivity high associated with the deposit. The area of this intersection should be investigated further in

- Lithological variation obviously plays an important role in mineralisation. Some units are preferentially silica flooded and have acted as mineralising pathways fed from steeply dipping faults. There is also evidence of shearing parallel to bedding from the development of planar late veins on lithology boundaries.

The true geometry of the deposit will not be revealed until some holes at a high angle to the current drill pattern have been drilled. Such holes could for example be used to test the N-S continuity of vein zone B by attempting to drill along its strike. This might resolve whether it is a continuous zone or is comprised of veins locally developed around structures at a high angle to the zone. A hole down the south plunge of the high grade mineralisation between faults F2 and F3 would confirm the continuity of this zone.

In the south of the area (south of section 10060N) it would seem that holes directed NNE or SSW would better define the structure. These could be used to test the possible ENE strike of the high grade zone in 10040N.

There is no diamond core available for mineralisation at high levels in the deposit. This should be addressed.

In terms of better constraining the geology, clast logging of the debris flows could be used to link geology between sections by noting the composition, size, shape and distribution of clasts.

The sections and level plans in this study can be used to plan the next phase of drilling which, if it includes holes at high angles to the current drilling direction, especially in the south, have a better opportunity to constrain the controls on the deposit. The E-W drilling orientation seems to be sufficient to define the mineralised zones to the north of section 10040N.

During 1999, suggestions and observations put forward by Solid Geology will be incorporated on existing 309 drill sections, prior to further drilling.

## **7.0 CONCLUSIONS AND RECOMMENDATIONS**

Based on work undertaken during 1998, further programs are planned to expand the resource base at the 309 Deposit and Lone Sister.

The structural study by Solid Geology will be incorporated with existing plans to outline possible extensions to the high grade vein zones at 309 and to identify possible higher grade vectors to the south for drill testing.

The use of integrated resistivity/magnetic and soil geochemistry images has identified a number of regional drill targets for follow up drill testing.

Further structural studies are planned for the Lone Sister deposit to outline specific controls on higher grade zones.

## **8.0 REFERENCES**

PIETSCH, G., 1997 - Annual Report for Period Ending 5<sup>th</sup> March 1997, EPM 8693 Twin Hills, Plutonic Operations Limited. Technical Report No. 552.

PIKOULAS, V.; WYNN, L; 1998 – Annual Report for Period Ending 5th March 1998, EPM 8693 Twin Hills, Plutonic Operations Limited. Technical Report No. 584.

VANDERHOR, F., 1989 - Structural Orientation Data from Drillcore, Twin Hills, North Queensland. Internal Report to Metana Minerals N.L.