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EXPLORATION LICENCE 8882
GREENBUSH

FIRST ANNUAL REPORT
29 August 2001 - 28 August 2002

LICENSEE:
GIANTS REEF EXPLORATION PTY LTD
A.C.N. 009 200 346

AUTHORS:
P G SIMPSON
S C RUSSELL

December 2002

DISTRIBUTION:		
Central Land Council	☐	
BHP Billiton	☐	*SE53-14*
Department of Business, Industry and Resource Development	☐	*TENNANT CREEK 1:250 000*
Giants Reef Exploration Pty Ltd	☐	*5658*
Giants Reef Mining Limited	☐	*KELLY 1:100 000*

SUMMARY

Exploration Licence 8882 *Greenbush*, is located between 45 kilometres south west of Tennant Creek, on the Kelly 1:100 000 scale map sheet. The Licence was granted to Giants Reef Exploration Pty Ltd (Giants Reef) on 29 August 2001 for a period of 6 years.

Exploration Licence 8882 is in the Bluebush Project Area, which also includes EL 8883, EL 9309, EL 9904 and EL 10402. The Bluebush Project Area is one of four such Project Areas flanking the Tennant Creek mineral field being explored under the terms of Giant Reef's Alliance with Billiton Exploration Australia Pty Ltd. Under the Alliance, Billiton acquired approximately 7% equity in Giants Reef, in return for funding the exploration being conducted by Giants Reef. During 2001, Billiton's parent company merged with BHP to form BHP Billiton.

This report records the exploration work done on EL 8882 during its first year of tenure, from 29 August 2002 to 28 August 2002.

Targets are very large base metals deposits or base metals/precious metals deposits.

EL 8882 is subject to a Deed for Exploration signed on 10 August 2001 between the Native Title holders of the region, represented by the Central Land Council, and Giants Reef.

A great deal of exploration was carried out on EL 8882 and surrounding tenements leading up to and during the first year, with a majority of work being done on EL 8882. The work included reconnaissance, ground water sampling and analysis, obtaining clearances from the local Native Title holders to conduct field activities, analysis and modelling of aeromagnetic data, a detailed helicopter-borne gravity survey followed up by ground traverses, shallow RC drilling of residual gravity and magnetic targets, assaying, petrographic studies, and assessment of the results.

Studies and modelling of the aeromagnetic data located and defined a large number of magnetic sources and structures within EL 8882. In conjunction with the new gravity survey data, the magnetics interpretation contributed to the process of shallow RC drill site selection.

The detailed helicopter-borne gravity survey over the Bluebush gravity anomaly re-shaped the anomaly and decisions on where to conduct the shallow RC drilling were largely based on selecting residual anomalies from this new gravity information.

Low order copper anomalism identified in holes BBRC006 and BBRC020 may just possibly suggest other, perhaps more intense, mineralisation somewhere in the vicinity of these two holes however this is purely conjectural and substantial drilling would be required to confirm this.

Ground waters sampled throughout the Bluebush gravity anomaly area and Explorer's 15 and 81 are initially seen as inconclusive however a detailed assessment of the data has not been completed.

Petrography and the overall geochemistry of RC chip specimens collected from EL 8882 suggested that most lithologies intersected represented mafic intrusions and felsic volcanics from an intraplate extensional environment.

The geological and geophysical knowledge of the region has been greatly improved from work completed this year, and there remains some scope for developing further exploration programs in this area.

Expenditure for the year on EL 8882 totalled $219,194 well exceeding the covenant of $42,000.

CONTENTS

FIGURES

APPENDIX

1. INTRODUCTION

Exploration Licence 8882, *Greenbush* is in the Bluebush Project Area, one of a number of areas flanking the Tennant Creek mineral field which are being explored under the terms of Giant Reef's Alliance with Billiton Exploration Australia Pty Ltd. During 2001, Billiton's parent company merged with BHP to form BHP Billiton.

The majority of the Bluebush Project Area is within EL 8882 and EL 8883, but adjacent smaller EL's 9309 and 10402 also cover a portion of the Bluebush regional gravity anomaly and are therefore included in the Project Area (see Figure 1).

This report records the exploration work done on EL 8882 during its first year of tenure, from 29 August 2001 to 28 August 2002.

2. LOCATION

Exploration Licence 8882 is located 45 kilometres south west of Tennant Creek, on the Kelly 1:100 000 scale map sheet.

There are several access routes into the large area covered by this Licence, but the principal one at present is the dirt road that leaves the Stuart Highway about 6km south of Tennant Creek town and heads west, passing through EL 8883, to the Kunayungku community which is within EL 8882. From along this road, a number of station tracks can be followed north and south to most parts of the area.

Figure 1 shows the Exploration Licence and surrounding tenements.

3. TENURE

EL 8882 covering 152 blocks (489km^2) was granted to Giants Reef Exploration Pty Ltd on 29 August 2001, for a period of 6 years.

This Exploration Licence (and a number of others) comes under an Alliance signed between Billiton Exploration Australia Pty Ltd (Billiton) and Giants Reef, whereby Billiton acquired approximately 7% equity in Giants Reef, in return for providing funding for the exploration, by Giants Reef, of four project areas in the Tennant Creek region.

Exploration Licence 8882 is within Aboriginal Freehold Land (Karlantijpa South Aboriginal Land) and therefor is subject to a Deed for Exploration signed on 10th August 2001, between the Native Title holders of the region, represented by the Central Land Council (CLC), and Giants Reef Exploration Pty Ltd.

Figure 2 shows the Licence area held in the first year.

4. GEOLOGY

4.1 Regional Geology

Papers contained in AusIMM Monograph 14 (Geology of the Mineral Deposits of Australia and Papua New Guinea), Volume 1, pp 829-861 provide a good introduction to the regional geology and styles of gold-copper mineralisation of the area to the north of EL 8882.

A more recent reference is the geological map with explanatory notes on the Tennant Creek 1:250,000 sheet released by Northern Territory Geological Survey in 1998, which includes a revised stratigraphy.

4.2 Local Geology

Virtually all of the Exploration Licence is sand-covered, with a few minor areas of calcrete and some very isolated basement exposures. In the central and southern areas of the Licence, Cambrian and later sediments of the western fringe of the Wiso Basin form a concealed layer up to several tens of metres thick, lying on the older basement. Aquifers in this sequence are the source of the Tennant Creek town water supply.

The basement geology for most of the area is poorly understood. The drilling to date, including numerous Government test water bores and previous company exploration holes, revealed a variety of amphibolite-grade metamorphics, granites, intermediate, mafic intrusions and volcanics, throughout the area. In the northern part of neighbouring EL 8883, dating of igneous and metamorphic drill cores have given early or lower Proterozoic ages. Many linear magnetic structures, which in some cases appear to be fault boundaries of identifiable lithological blocks, can be seen in the 1999 AGSO 200m line-spaced aeromagnetics over the region.

The eastern area of EL 8882 lies over a prominent and extensive regional gravity anomaly, which rises to a 19-milligal peak in this area. This is referred to as the “Bluebush gravity anomaly” and is the focus of Giants Reef’’s exploration in the Bluebush Project Area.

5. WORK DONE DURING YEAR 1

5.1 Magnetic Interpretation

Giants Reef’s consultant geophysicist Frank Lindeman, of Lindeman Geophysics Pty Ltd, Melbourne, carried out an interpretation of the 1999 AGSO aeromagnetic data covering the regional Bluebush gravity anomaly. He produced magnetic models of numerous magnetic sources in the area and defined many magnetic structures visible in the data. Later, this work contributed to the process of drill site selection after the gravity survey (Section 5.3) was completed.

5.2 Clearances from Native Title holders

Under the terms of Giants Reef’s Deed for Exploration with the Native Titleholders of the region, it was necessary to obtain site clearances from the Native Title holders before the field party for the planned gravity survey (Section 5.3) could enter the area. Assisted by the CLC, field visits were made to the survey area, and the necessary clearances were given. One proviso was that the survey field party would stay away from salt lakes, clay pans and other natural depressions, which have special significance for the local people. During the gravity survey, this condition did not present any real difficulties for the field operations.

Once the results of the gravity survey had been received and drill targets were chosen, a further site clearance was obtained in the same manner for the construction of tracks and drill pads.

5.3 Gravity Survey

A detailed helicopter-borne gravity survey was carried out in late 2001 over the Bluebush gravity anomaly. The survey collected data over several EL’s including EL 8882. The whole survey, on a nominal grid spacing of 1km x 1km, totalled 648 stations.

The gravity survey was carried out by Daishsat Pty Ltd of Murray Bridge, South Australia, using a Bell 47 G5 helicopter (VH-TZW) hired from Heli-Muster Pty Ltd at Victoria River Downs, NT.

Two Scintrex CG-3 gravity meters were used for the gravity data acquisition. Each loop started and ended at the Tennant Creek airport gravity base station. Four GPS receivers (two Leica GPS’s and two Ashtech Z12’s) were used for horizontal and vertical GPS control.

One point (station 1) was set up on top of one of the Giants Reef transportable office buildings in Tennant Creek, and the other point (station 2) was a short star picket in the paddock between Giants Reef’s yard and the Tennant Creek airport.

Navigation in the field between stations was done using Garmin GPS II instruments. Generally, the reading points were within 100m of their planned round-number co-ordinates, although inevitably some stations had to be read further away from the intended locations due to ground features such as mulga thickets preventing helicopter landings at the optimal positions.

Within EL 8882, there were 318 helicopter-reading stations, plus approximately 70 ground stations that were read later using a Toyota 4WD truck. The ground stations were read at 200m intervals along three north-south profile traverses over three selected residual anomalies. Giants Reef's consultant geophysicist Frank Lindeman was on hand in Tennant Creek to supervise the survey on a day-by-day basis.

The high resolution gravity survey over the Bluebush gravity anomaly re-shaped the anomaly. A decision was made to drill several shallow reverse circulation holes (less than 100m) based largely on residual anomalies derived by Lindeman Geophysics Pty Ltd from the new information. This data used in conjunction with the aeromagnetic data, assisted in fifteen (15) initial sites selected for drill testing.

The information gained from the gravity survey over EL 8882 and adjacent EL's has been put into the public domain, as part of the NTGS/AGSO gravity database covering all of the Tennant Creek 1:250,000 sheet and parts of some of the adjoining 1:250,000 sheets that was released in late 2001.

Figure 3 Dave Daish from Daishsat Pty Ltd of Murray Bridge, South Australia collecting gravity readings along a north-south profile traverse in EL 8882.

5.4 Drilling

Fifteen (15) sites were selected for shallow vertical drill holes in EL 8882. Six (6) repeat or re-drill holes were necessary due to difficult drilling conditions resulting in 21 holes drilled for the first year (Figure 1).

The total amount of reverse circulation drilling, including the repeat drill holes at several sites came to 1,595 metres. Two drilling contractors were used throughout the program. Johannsen Drilling Pty Ltd, Port Lincoln, South Australia drilled holes BBRC004-BBRC009 and BBRC011-BBRC018 for 551 metres. Gomex Drilling, Dry Creek, South Australia completed holes BBRC020-BBRC029 for 1,044 metres and completing the program.

Samples collected during the drilling were riffle split in metre intervals. A total of 273 1-metre split and 221 3-metre speared composite samples were collected and sent to AMDEL for analysis. All samples were assayed for Au by AMDEL method FA3, and for Cu, Bi, Fe, Ag, As, Cd, Co, Mn, Mo, Ni, Pb, Zn, Cr, P, Sb, and V, by AMDEL method IC2E. No significant geochemical anomalies were observed in the results however low order base metal anomalism was present in a couple of the holes.

Although most of the drill holes were targeting residual gravity anomalies, several had coincident magnetic anomalies. Consultant Geophysicist Frank Lindeman of Lindeman Geophysics Pty Ltd, Melbourne recommended measuring the magnetic susceptibility of all drill chips, which subsequently has been carried out and recorded on all drill chip logs using a Kappameter KT-5 Magnetic Susceptibility Meter (Appendix 2).

Geological logging was completed on site, using a Hewlett Packard 200LX palmtop computer and downloaded in the evenings. Downloaded geology data was then validated and printed out as separate log sheets and then loaded into a Micromine database, along with collar, survey and assay data (Appendix 1).

Drilling statistics are as follows:

Hole ID	Drill Date	Easting	Northing	Tenement	Azimuth	Depth	Drill Co
BBRC-004	23/07/02	377501	7820101	EL 8882	Vertical	53	Johannsen
BBRC-005	26/07/02	368002	7820008	EL 8882	Vertical	40	Johannsen
BBRC-006	27/07/02	368001	7819004	EL 8882	Vertical	76	Johannsen
BBRC-007	29/07/02	372198	7824503	EL 8882	Vertical	60	Johannsen
BBRC-008	29/07/02	372197	7825002	EL 8882	Vertical	39	Johannsen
BBRC-009	29/07/02	370896	7824905	EL 8882	Vertical	17	Johannsen
BBRC-011	1/08/02	378505	7812501	EL 8882	Vertical	38	Johannsen
BBRC-012	2/08/02	377000	7805500	EL 8882	Vertical	66	Johannsen
BBRC-013	3/08/02	378150	7805506	EL 8882	Vertical	67	Johannsen
BBRC-014	4/08/02	378995	7805159	EL 8882	Vertical	60	Johannsen
BBRC-018	708/02	379821	7805107	EL 8882	Vertical	35	Johannsen
BBRC-020	7/09/02	367996	7819001	EL 8882	Vertical	160	GOMEX
BBRC-021	8/09/02	367987	7820018	EL 8882	Vertical	112	GOMEX
BBRC-022	9/09/02	372190	7825012	EL 8882	Vertical	64	GOMEX
BBRC-023	9/09/02	370899	7824900	EL 8882	Vertical	90	GOMEX
BBRC-024	10/09/02	367000	7825004	EL 8882	Vertical	94	GOMEX
BBRC-025	10/09/02	366579	7825203	EL 8882	Vertical	112	GOMEX
BBRC-026	11/09/02	378521	7812495	EL 8882	Vertical	88	GOMEX
BBRC-027	11/09/02	378510	7811850	EL 8882	Vertical	94	GOMEX
BBRC-028	12/09/02	378511	7810402	EL 8882	Vertical	82	GOMEX
BBRC-029	13/09/02	379832	7805096	EL 8882	Vertical	148	GOMEX

5.4.1 Copper

BBRC006

Two 3-metre speared composite samples from the bottom six metres of BBRC006 (Figure 1) from 70-76m showed anomalous copper (800 and 410 ppm Cu respectively) and phosphorus (1.54% and 0.805%). A second set of 1-metre assay samples were collected from the bags in the field, and this time the bottom seven metres (69m to 76m EOH) averaged 923 ppm Cu with a maximum of 2000 ppm Cu in the last metre.

A second RC hole was drilled on the same pad as BBRC006 (BBRC020), however this hole showed only two metres from 67m @ 1025 ppm Cu. Again this was accompanied by anomalous phosphorus (64-68m averaging 3% P) in pale brown fine grained limonitic and dolomitic sediments. No elevated copper assays were returned from below this zone.

5.5 Petrography

During and after the drilling described in Section 5.4, several RC chip basement samples were sent for petrographic study to Ian Pontifex and Associates Pty Ltd, Adelaide, for rock identification and description.

Appendix 3 contains 3 Mineralogical Reports (MR 8256, MR 8271, MR 8274) by Pontifex and Associates containing thin and polished section descriptions.

From the petrography and the overall geochemistry, it is interpreted that the basement rocks examined in EL 8882 are from an intraplate, extensional environment.

Lithologies identified by Pontifex and Associates are typical of intraplate, extensional environments consisting of felsic volcanic and mafic lava flows with interbedded sediments and numerous coarse heterogenous granodiorite-monzogranite.

5.6 Groundwater Geochemistry

Groundwater samples were collected from eleven (11) exploration RC drill holes that were drilled during the reporting period within EL 8882. Other samples were collected at the same time (August 2002) from adjoining Exploration Licence 8883.

The sampling was aimed at finding indications of mineralisation in the and around the regional Bluebush gravity anomaly as well as the two discrete magnetic features in the north of the EL known as Explorer's 15 and 81.

The sampling and analytical techniques used have been developed over many years by CSIRO, in particular by Senior Principal Research Scientist Angela Giblin, who visited Giants Reef's Tennant Creek offices to discuss the project in 2000. Giants Reef's fieldwork was conducted under her guidance.

Sampling involved collection of readings at each sample site for ambient and sample temperature, acidity, conductivity, water depth, sample depth, GPS location and remarks on water quality. Cyanide and activated carbon satchels were added to each sample bottle and the bottles were sent to the CSIRO's laboratory at North Ryde, NSW for sensitive analytical work.

Detailed analysis of the groundwater geochemistry results will be presented in next years Annual Report. The location data, analytical results and CSIRO report are presented in Appendix 4.

6. REHABILITATION

All RC drill hole sites within EL 8882 were rehabilitated one month after the completion of the drilling program and prior to the wet season. This rehabilitation work included the collection and removal of all "drilling rubbish" and loose plastic sample bags, cutting of the PVC collar pipe and cement "flower pot" plugging of each hole. A stir picket with an aluminium tag next to each collar identifies the hole and number.

The topsoil and dead bushes have been raked back over the drill sites to encourage natural re-growth. The access tracks to these sites have been left as they are, for future visitors to use. A recent inspection of several rehabilitated drill pads revealed a small amount of regrowth however it is anticipated that the 2-3 month wet season should assist in natural re-vegetation. Numerous photographs were taken during the initial clearing of the drill sites, during drilling of the RC holes and rehabilitation of the sites after drilling. These photographs will assist Giants Reef in monitoring the rate of drill site rehabilitation in the EL 8882 area.

7. CONCLUSIONS

A great deal of exploration was carried out on EL 8882 and surrounding tenements leading up to and during the first year of tenure, with a majority of work being done on EL 8882. The work included reconnaissance, rock sampling, geochemical analysis of old drill cores, ground water sampling and analysis, obtaining clearances from the local Native Title holders to conduct field activities, analysis and modelling of aeromagnetic data, a detailed helicopter-borne gravity survey followed up by ground traverses, shallow RC drilling of residual gravity and magnetic targets, assaying and petrographic studies, and assessment of the results.

Studies and modelling of the aeromagnetic data located and defined a large number of magnetic sources and structures within EL 8882. In conjunction with the new gravity survey data, the magnetics interpretation contributed to the process of shallow RC drill site selection.

The detailed helicopter-borne gravity survey over the Bluebush gravity anomaly re-shaped the anomaly and decisions on where to conduct the shallow RC drilling were largely based on selecting residual anomalies from this new gravity information.

Low order copper anomalism identified in holes BBRC006 and BBRC020 may possibly suggest other, perhaps more intense copper mineralisation somewhere in the vicinity of these two holes. This however is purely conjectural and substantial drilling would be required to confirm this.

Ground waters sampled throughout the Bluebush gravity anomaly area and Explorer's 15 and 81 are initially seen as inconclusive however a detailed assessment of the data has not been completed.

Under the terms of the Deed for Exploration signed between Giants Reef and the traditional owners of the area, clearances were obtained before the gravity survey, and later on for the drilling. One proviso was that field parties should stay away from salt lakes, clay pans and other natural depressions, which have special significance for the local people. These conditions were strictly adhered to and did not in any way restrict exploration by Giants Reef.

Petrography and the overall geochemistry of RC chip specimens collected from EL 8882 suggested that most lithologies intersected represented mafic intrusions and felsic volcanics from an intraplate extensional environment.

The geological and geophysical knowledge of the region has been greatly improved from work completed this year, and there remains some scope for developing further exploration programs in this area.

8. EXPENDITURE

The proposed expenditure for the first year of tenure was $42,000. Actual expenditure was as follows:

		$
1.	Geology	18,440
2.	Geophysics	58,083
3.	Geochemistry	4,832
4.	Surveying	954
5.	Data integration	1,629
6.	Analytical	45
7.	Drilling	96,277
8.	Tenure maintenance	7,092
9.	Administration and Overheads	28,974
10.	Rehabilitation	2,868
	TOTAL	$219,194

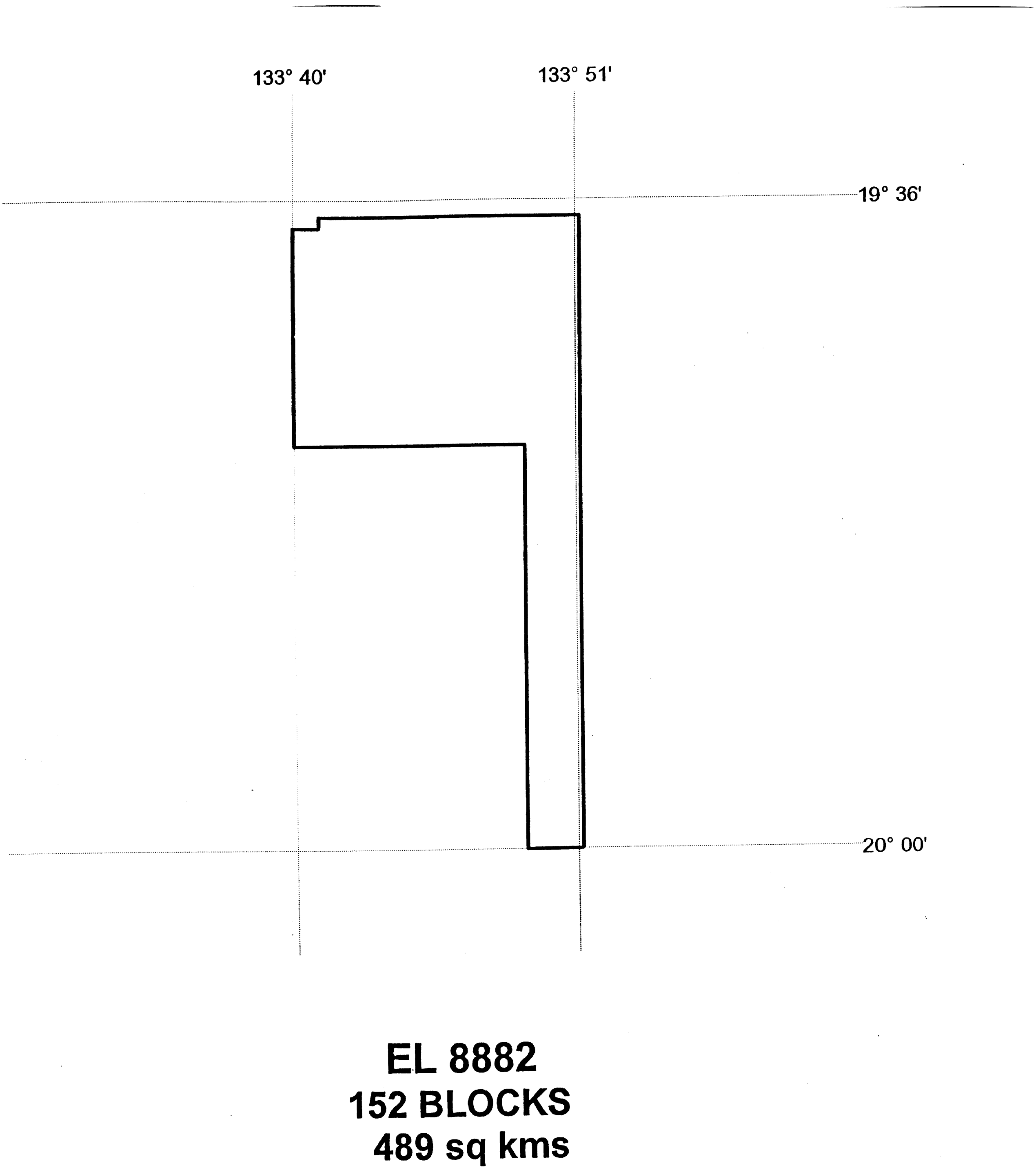
9. PROPOSED PROGRAMME AND EXPENDITURE FOR NEXT YEAR

		$
1.	Geology	5,000
2.	Geophysics	2,000
3.	Geochemistry	2,000
4.	Surveying	500
5.	Data integration	500
6.	Analytical	150
7.	Drilling	5,000
8.	Tenure maintenance	2,500
9.	Administration and Overheads	2,000
10.	Rehabilitation	500
	TOTAL	$20,150

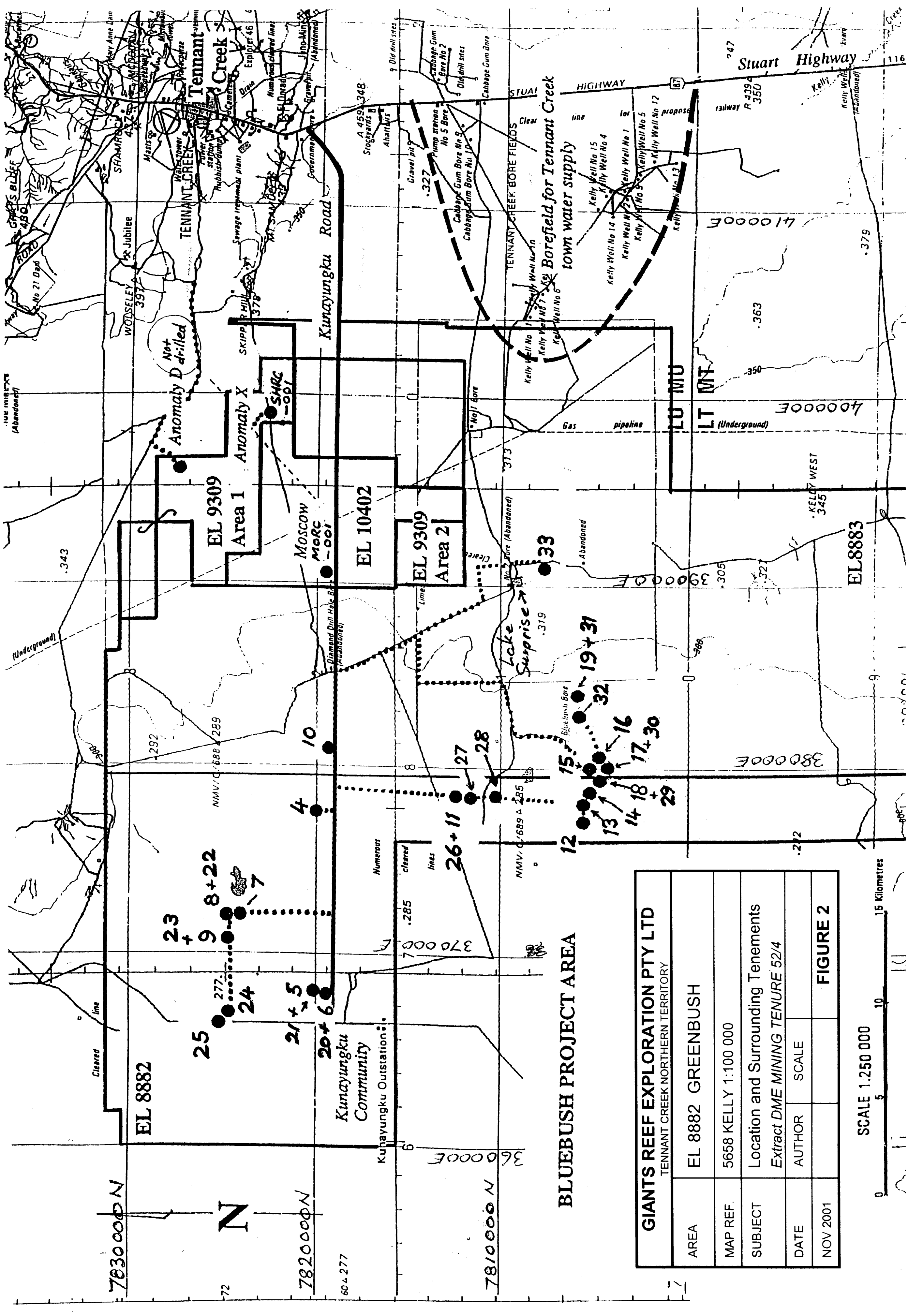
Exploration programs can be affected by results, and while these are the proposed programmes and expenditure, specific activities may vary according to the results achieved.

P G SIMPSON
EXPLORATION MANAGER

S C RUSSELL
SNR EXPLORATION GEOLOGIST



GIANTS REEF EXPLORATION PTY LTD TENNANT CREEK NORTHERN TERRITORY			
AREA	EL 8882 GREENBUSH		
MAP REF.	5658 KELLY 1:100 000		
SUBJECT	Location and Surrounding Tenements *Extract DME MINING TENURE 52/4*		
DATE	AUTHOR	SCALE	
NOV 2001			**FIGURE**


GIANTS REEF EXPLORATION PTY LTD
TENNANT CREEK NORTHERN TERRITORY
AREA
EL 8882 GREENBUSH
MAP REF.
5658 KELLY 1:100 000
SUBJECT
Location and Surrounding Tenements
Extract DME MINING TENURE 52/4
DATE
AUTHOR
SCALE
NOV 2001
FIGURE 2
SCALE 1:250 000
0
5
10
15 Kilometres
BLUEBUSH PROJECT AREA
N
EL 8882
EL 9309 Area 1
EL 10402
EL 9309 Area 2
EL8883
Kunayungku Road
Kunayungku Community
Kunayungku Outstation
Anomaly D
Not drilled
Anomaly X
Moscow MORC-001
SHRC-001
Lake Surprise
Borefield for Tennant Creek town water supply
Stuart Highway
Tennant Creek
7830000N
7820000N
7810000N
360000E
370000E
380000E
390000E
400000E
410000E

GIANTS REEF MINING LIMITED

HARD COPY REPORT META DATA FORM

REPORT NAME:	EL 8882 *GREENBUSH* FIRST ANNUAL REPORT 29TH AUGUST 2001-28TH AUGUST 2002
PROSPECT NAMES(s):	GREENBUSH
GROUP PROSPECT NAME:	BLUEBUSH PROJECT AREA
TENEMENT NUMBERS(s):	EL 8882
ANNIVERSARY DATE:	28 AUGUST 2002
OWNER/JV PARTNERS:	GIANTS REEF EXPLORATION PTY LTD (Owners) BHP BILLITON (ALLIANCE).
AUTHOR(s):	P.G.SIMPSON S.C.RUSSELL
COMMODITIES:	GOLD, COPPER, LEAD, ZINC, SILVER, BISMUTH
MAPS 1:250 000:	TENNANT CREEK SE53-14
MAPS 1:100 000:	TENNANT CREEK 5758 KELLY 5658
MAPS 1:25 000	
TECTONIC UNIT(s):	TENNANT CREEK INLIER
STRATIGRAPHIC NAME(s)	WARRAMUNGA FORMATION CAMBRIAN WISO BASIN
AMF GENERAL TERMS:	PETROGRAPHY - PONTIFEX
AMF TARGET MINERALS:	GOLD, COPPER, LEAD, ZINC.
AMF GEOPHYSICAL:	HELI-GRAVITY SURVEY, RESIDUAL BOUGUER GRAVITY ANOMALIES, MAGNETIC INTERP.
AMF GEOCHEMICAL:	HYDROGEOCHEMISTRY
AMF DRILL SAMPLING:	
HISTORIC MINES:	
DEPOSITS:	
PROSPECTS:	EXPLORER 15 AND EXPLORER 81.
KEYWORDS:	GREENBUSH PROJECT, EL 8882,

APPENDIX 1

EL 8882 GREENBUSH

MICROMINE DRILLING DATABASE

File Name	***Description***
Blue_Coll.dat	Drill hole collar locations
Blue_Surv.dat	Down hole survey data
Blue_Geol.dat	Drill hole lithological data
Blue_Samp.dat	Drill hole assay data

APPENDIX 2

EL 8882 GREENBUSH

RC DRILL HOLE MAGNETIC SUSCEPTIBILTY MEASUREMENTS

File Name	***Description***
EL 8882 Mag Sus.zip	Magnetic Susceptibilitiy measurements for: BBRC004 BBRC007 BBRC020 BBRC021 BBRC023 BBRC024 BBRC025 BBRC026 BBRC027 BBRC028

APPENDIX 3

EL 8882 GREENBUSH

BLUEBUSH PROJECT AREA PETROLOGICAL REPORTS

Mineralogical Report No. **8256** by Alan C. Purvis, PhD Sept 02
Mineralogical Report No. **8271** by Alan C. Purvis, PhD Oct 02
Mineralogical Report No. **8274** by Alan C. Purvis, PhD Oct 02

MINERALOGICAL REPORT No. 8256

by Alan C. Purvis, PhD

September 02, 2002

TO :	Mr Peter Simpson Giant's Reef Mining Limited PO Box 1244 TENNANT CREEK NT 0861
YOUR REFERENCE :	Order No. 200931 (EL8882, Sample Nos. 80585 to 80595) Order No. 200938 (EL8883, Sample Nos. 80596 and 80597)
MATERIAL :	RC Drill chip samples
WORK REQUESTED :	Thin section preparation, description and report with comments and interpretations as specified.
SAMPLES & SECTIONS :	Returned to you with this report.
DIGITAL COPY :	Enclosed with hard copy of this report.

PONTIFEX & ASSOCIATES PTY. LTD.

INTRODUCTION

Eleven samples of drill chips from EL8882 (O/N 200931) and two samples of drill chips from EL8883 (O/N 200938) are described in this report from the chips mounted in epoxy and prepared as thin sections. One sample (80595) was also examined in polished section to check for minerals which may contain the chemically anomalous Cu (2000 ppm) and P (2.53%) reported for this sample [but without success].

The locations of the drill holes, other than BBRC-006 are plotted in Fig 1 below. [Drill hole BBRc-006 appears to have been given the wrong co-ordinates in your covering letter, which places it about 616 Km from BBRC016.] The samples are numbered consecutively from 80585 to 80597 and a list of the essential petrography of each sample (as repeats of headers to the individual descriptions) appears in this report after the location Fig 1. These are basically the same as faxed to Giant's Reef, Tennant Creek office 30/8/02.

SUMMARY COMMENTS

Chips from two samples in drillhole BBRC-004 consist of tremolite-actinolite-rich schists with minor chlorite and accessory fine opaque oxide and these are interpreted to be primarily of ultramafic origin (metapyroxenite?). Chips in the adjacent hole BBRC010, (2 samples) consist of quartz-biotite-plagioclase schist and microcline-biotite-schist, representing metasediments partly with potassium enrichment and an attenuated quartz fabric suggesting some shearing. These metasediments may be related to metasandstones described in Pontifex Report No. 8158.

Igneous lithologies are more abundant in the southern area (BBRC12-016). Dacite porphyry occurs in BBRC-012 and 014, tonalite and altered plagioclase-porphyritic volcanic in BBRC-013, and pyroxene ± plagioclase-porphyritic lavas and breccias in BBRC-015-016. The lava in BBRC-015 has abundant actinolite and albite/sericite-altered plagioclase as well as disseminated leucoxene. The breccia in BBRC-016 has abundant epidote with various amounts of actinolite, albite and calcite. These lavas may relate to the more pyroxene-rich ankaramites and picrites described in Pontifex Report No. 8142, with similar metamorphism and alteration.

The lithologies in BBRC-006 have supergene alteration, with limonite in two samples and supergene or low-temperature hydrothermal quartz in the other. One sample 80595 from BBRC-006, 75-76m, has reported 2,000ppm Cu and 2.53% P. No minerals containing Cu or P were located in the thin section or the polished section of this sample, but possibly relevant comments follow. All chips examined from 80595 consist of massive earthy to microcrystalline limonite which appears to have invaded and largely replaced a very fine grained extensively altered metasediment, most recently of microdecussate clays with randomly scattered silt to fine sand size quartz grains, and lesser mica flakes. There are rare veinlets of microcrystalline quartz and of relict possible leached and ferruginised carbonate, also small interstitial fillings of ‘exotic’ clay and silt. There are no diagnostic textures indicating any specific genesis, but an intensely altered and weathered fine grained metasediment is possible. If both the anomalous Cu and P were to occur in the same phase, then the coloured secondary Cu-phosphate minerals may be suspected, with excess P (relative to Cu) in possible Fe-phosphate minerals or apatite? Such minerals were not seen (but may be too fine and totally camouflaged by limonite to allow optical recognition). Resampling and re-assaying may be considered as a follow-up check on the current determinations.

There are no samples described in this report that would seem to relate to those described in Pontifex Reports Nos. 8124 or 8246 as questioned in the letter accompanying these samples.

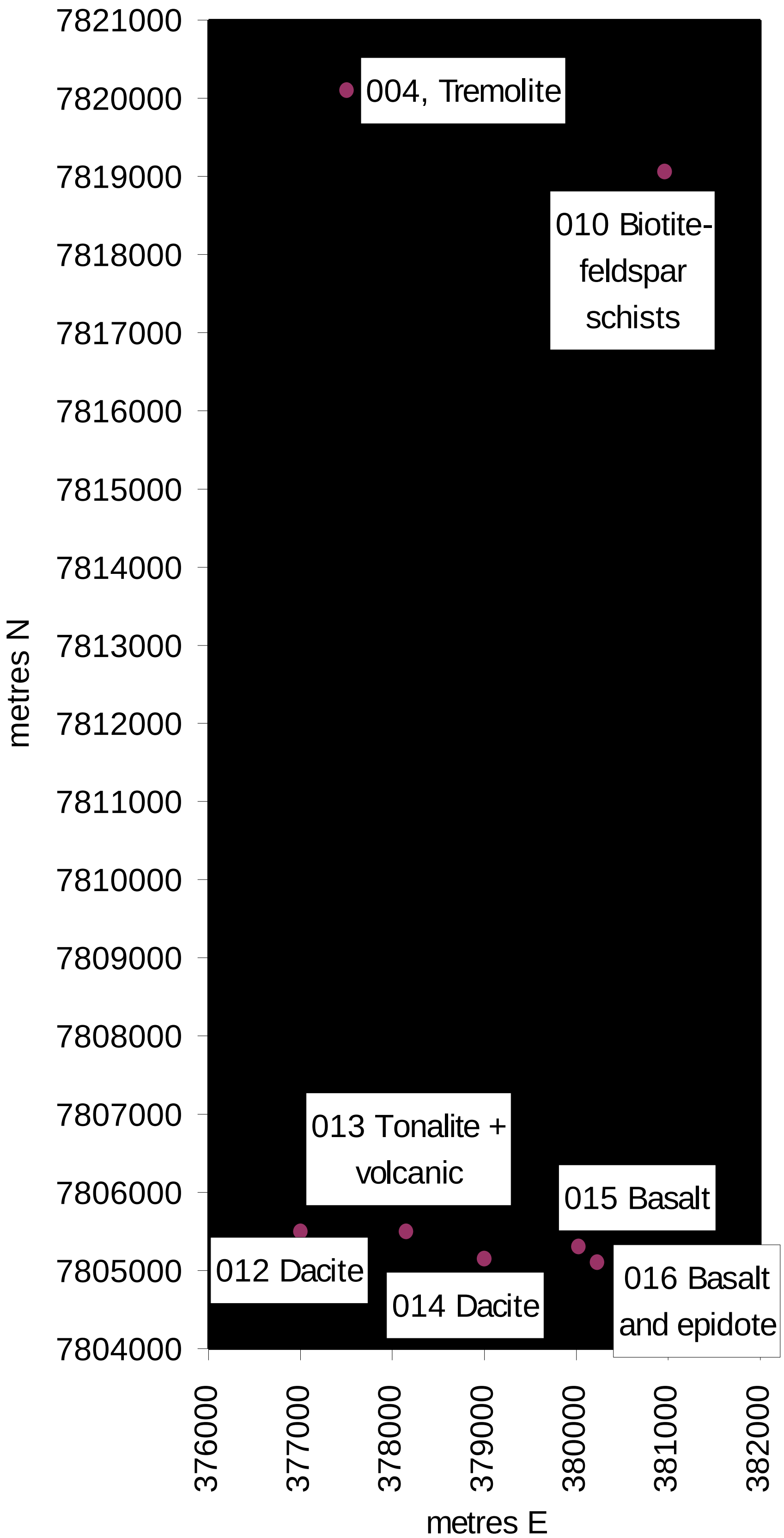


FIG 1: DISTRIBUTION OF DRILLHOLES BBRC004, 010 AND 012-016, REPORT NO. 8256

TABLE 1: SUMMARY OF HEADERS TO EACH PETROGRAPHIC DESCRIPTION

80585 BBRC-004, 47-48m	Tremolite-actinolite-chlorite schist with clays and limonite possibly after metamorphic olivine, lenses of possible ilmenite and areas flooded by hematite: metamorphosed ultramafic rock.
80586 BBRC-004, 52-53m	Tremolite-actinolite schist with minor chlorite and opaque oxide: metapyroxenite?
80587 BBRC-010, 47-48m	One small chip of tremolite-actinolite-chlorite schist. Numerous chips of quartz-plagioclase-biotite schist with very strong quartz fabrics and sericitised plagioclase. Two chips of quartz-biotite-muscovite schist with layer-parallel quartz veins or with quartz-microcline layers. Two chips of quartz-muscovite-biotite schist and one of muscovite-biotite-microcline schist. Almost all metasediment, probably amphibolite facies.
80588 BBRC-010, 58-60m	Quartz-biotite-plagioclase, biotite-plagioclase and biotite-microcline-plagioclase ± quartz schists, rarely with muscovite, locally with layer-parallel quartz veins: amphibolite-facies metasediments.
80589 BBRC-012, 64-66m	Albitised and sericitised dacite porphyry, with altered biotite in chips with fine-grained groundmasses. Minor quartz veinlets, also fractures with fine quartz, albite or K-spar.
80590 BBRC-013, 56-66m	Chips of variable composition : 1. Altered biotite tonalite with sericite, hematite, chlorite and clays 2. Brecciated granitoid flooded by clay and possible granitoid with abundant secondary K-spar 3. A sericite-chlorite-hematite-leucoxene-K-spar-altered lithology, possibly sheared and extensively altered intermediate or mafic volcanic rock.
80591 BBRC-014, 56-60m	Albite-sericite-clay-chlorite-limonite-leucoxene-altered dacite or dacite porphyry (with less abundant quartz phenocrysts compared to the porphyry in BBRC-012).
80592 BBRC-015, 70-72m	Pyroxene ± plagioclase-porphyritic basalt with alteration involving albite-smectite-limonite-leucoxene. Veins contain clay, quartz and sparse limonite after sulphide.

80593 BBRC006, 45-46m	Limonite-rich chips, with minor microcrystalline or very fine-grained scattered quartz ± rare sericite in vague layers. Interpreted as weathered largely fine-grained sediments or metasediments?
80594 BBRC-006, 60-61m	Massive to vaguely fine layered, cryptocrystalline to microcrystalline fibrous and locally microsparry (cherty) quartz. Probably of unspecified supergene or low-temperature hydrothermal origin. Rare limonite after pyrite and crystal-lined cavities, partly filled by limonite (primary or derived from carbonate?).
80595 ** BBRC-006, 75-77m	Chips of massive extremely fine limonite replacing a possible totally clay-altered very fine metasediment. Rare residual veinlets of quartz and of possible relict fine carbonate. Reported to be anomalous in Cu and P, but no minerals containing these elements were seen.
80596 BBRC-016, 47-48m	Partly weathered mafic lavas, with plagioclase and mafic phenocrysts, xenolithic vesicles, and cloudy actinolite-albite-sericite-leucoxene alteration.
80597 BBRC-016, 52-54n	Brecciated probable mafic lava, with extensive alteration to clouded epidote, actinolite, albite, limonite and calcite. Cut by limonite-filled micro-fractures and carbonate stringers.

** If the reported Cu (2000ppm) and P (2.53%) were to occur together in the one phase, then possible minerals could include turquoise [$CuAl_6(PO_4)_4(OH)_8.5H_2O$], pseudomalachite [$Cu_5(PO_4)_2(OH)_4$] and cornetite [$Cu_3PO_4(OH)_3$], but with excess phosphorus (a relative to Cu) possibly in apatite or in iron-bearing phosphates such as vivianite [$Fe_3(PO_4)_2.8H_2O$] or vauxite [$FeAl_2(PO_4)_2(OH)_2.5H_2O$]. No such coloured Cu-phosphates were seen in these chips however. Fe-rich phosphates may be extremely fine and camouflaged by the dominant limonite throughout these chips, but probe analysis would be required to investigate this.

INDIVIDUAL DESCRIPTIONS

80585
BBRC-004, 47-48m

Tremolite-actinolite-chlorite schist with clays and limonite possibly after metamorphic olivine, lenses of possible ilmenite and areas flooded by hematite: metamorphosed ultramafic rock.

Field Note: *Fine dark metamorphic*

The eight chips included in this thin section are largely composed of inequigranular tremolite-actinolite, from 0.1 to 1mm in grainsize, poorly oriented in some chips but strongly schistose in others. Most of these have a single schistosity, but a weak second schistosity is evident in one or two chips. Minor chlorite is disseminated (5-15% in the various chips) and is usually schistose. One chip also has patches altered to clay, possibly derived from metamorphic olivine, to 4mm in diameter. These areas also contain limonite-filled fractures, with other areas flooded by earthy hematite in lamellae parallel to the foliation. Attenuated lenses of black fine-grained opaque oxide, possibly ilmenite, to 1mm long and parallel to the main schistosity or to the second schistosity, where this is present. These opaque oxide lenses form up to 5% of some chips.

The original lithology was probably of ultramafic origin, possibly a pyroxenite.

80586 **Tremolite-actinolite schist with minor chlorite and opaque**
BBRC-004, 52-53m **oxide: metapyroxenite?**

Field Note: *Fine dark metamorphic*

Twelve chips of tremolite-actinolite-rich schist in this thin section are similar to those in the previous sample with some chips having poorly oriented amphibole and others having a strong schistosity. Some of the chips are fine-grained throughout, but others are inequigranular, with amphibole from <0.05mm to ~1mm in different areas. Chlorite is less abundant compared with the previous sample, with less than 5% chlorite in any one chip, but areas rich in opaque oxide (hematite ± ilmenite) are more widespread.

These chips are also interpreted to have an ultramafic origin, with pyroxenite as the most likely protolith. (A former impure dolomite is less probable.)

80587	**One small chip of tremolite-actinolite-chlorite schist.**
BBRC-010, 47-48m	**Numerous chips of quartz-plagioclase-biotite schist with very strong (attenuation) quartz fabrics and sericitised plagioclase.** **Two chips of quartz-biotite-muscovite schist with layer-parallel quartz veins or with quartz-microcline layers.** **Two chips of quartz-muscovite-biotite schist and one of muscovite-biotite-microcline schist.** **Almost all metasediment, probably amphibolite facies. Attenuated quartz fabric suggests shearing.**

Field Note: *Quartz-biotite schist*

There is a single small chip of tremolite-actinolite schist in this thin section, but most of the samples are metasediments. The tremolite-actinolite schist is similar to the more schistose chips in the previous two samples, with 2-3% chlorite but no opaque oxide. There are several types of metasediment, however.

The most common lithology, represented by numerous chips, is metasediment with abundant quartz and sericitised probable plagioclase as well as 10-15% altered schistose biotite. The altered plagioclase seems to have been from 0.1 to 0.4mm in grainsize in different layers, with quartz 0.2 to 0.8mm in grainsize, partly as grains elongate parallel to the schistosity. Many of these chips seem to have two schistosities at 20-30° to each other, including a crenulation cleavage affecting the first schistosity. The biotite is commonly parallel to the crenulation cleavage, but the quartz lamellae are parallel to both schistosities. In six or seven chips the quartz c-axes are aligned at a low angle to these foliations, but in three others the quartz c-axes are at a high angle to the foliations. One chip has relatively coarse-grained brown tourmaline and apatite, suggesting that the grainsize has been reduced during metamorphism. Finer-grained tourmaline in other chips is mostly green and may be of authigenic origin. One chip has a single small grain of garnet.

One chip has lamellae of altered schistose biotite, less abundant schistose muscovite and minor sericitised plagioclase, similar to that in the chips described above, with abundant quartz veins to 1mmm wide parallel to the schistosity. A layer of similar quartz-biotite-muscovite schist occurs in a second chip, without quartz veins but passing into a lithology with lamellae of quartz and minor microcline, alternating with layers of biotite schist

There are also two chips with about 25% muscovite as flakes to 1mm long aligned parallel to the first schistosity, with a crenulation cleavage at about 25° to the main schistosity. These chips have less abundant disseminated quartz than the more abundant muscovite-free chips, with correspondingly more biotite and altered plagioclase. Narrow quartz veins, to 0.2mm wide, are parallel to the first schistosity and have been crenulated. A third chip has abundant muscovite, as seen in the two chips described above, and in a band of pure muscovite 1mm wide. This chip also has lamellae of altered schistose biotite, but instead of quartz and altered plagioclase this chip has abundant fine-grained microcline, to 0.4mm in grainsize (40%), suggesting potassium metasomatism.

80588
BBRC-010, 58-60m

Quartz-biotite-plagioclase, biotite-plagioclase and biotite-microcline-plagioclase ± quartz schists, rarely with muscovite, locally with layer-parallel quartz veins: amphibolite-facies metasediments.

Field Note: *Quartz-biotite schist?*

This sample again has a number of chips of quartz-biotite-plagioclase schist containing sericitised plagioclase. In these the quartz is partly disseminated and partly in layer-parallel quartz veins from 0.2 to 1.5mm wide, but the quartz fabric is not as well-defined as in the previous sample. One chip has been cur parallel to the schistosity but has a diffuse compositional layering and has biotite flakes elongate in a parallel arrangement, apparently defining a lineation within the schistosity. The quartz c-axes in this chip are parallel to the layering and at a high angle to this apparent lineation. The same chip has a zoned zircon fragment 0.3mm in diameter, suggesting that its grainsize may have been reduced during metamorphism.

One chip has a layer composed largely of schistose biotite, totally sericite-altered plagioclase and very minor muscovite as unoriented flakes. This layer is in contact with a layer rich in schistose biotite and granular microcline (55%) as well as minor sericitised plagioclase. Other chips in this sample have microcline and schistose biotite as the main components, with or without quartz and/or altered plagioclase. These chips are laminated with biotite-plagioclase and microcline-rich layers, but in some chips the schistosity is at 25° to the layering.

80589
BBRC-012, 64-66m

Albitised and sericitised dacite porphyry, with altered biotite in chips with fine-grained groundmasses. Minor quartz veinlets, also fractures with fine quartz, albite or K-spar.

Field Note: *Felsic porphyry*

The chips in this sample contain or consist of large phenocrysts, including albite ± sericite-rich altered plagioclase phenocrysts to 6mm long and highly embayed quartz phenocrysts to 4mm long. Minor to abundant groundmass material is mostly fine-grained and quartzofeldspathic, with quartz and altered plagioclase as well as clay-limonite-altered biotite and limonite-filled fractures. Two chips contain or consist of coarser groundmass material, with quartz and largely albitised plagioclase to 0.25mm in grainsize, with albitised plagioclase phenocrysts in one of these chips. These chips seem to represent dacite porphyry.

One chip is composed of inequigranular vein-quartz, with cherty fine-grained areas and areas of coarse granular to prismatic quartz. Narrow fractures in other chips seem to contain quartz, albite or K-spar in different areas.

80590
BBRC-013, 56-66m

Chips of variable composition :

1. **Altered biotite tonalite with sericite, hematite, chlorite and clays**
2. **Brecciated granitoid flooded by clay and possible granitoid with abundant secondary K-spar**
3. **A sericite-chlorite-hematite-leucoxene-K-spar-altered lithology, possibly sheared and extensively altered intermediate or mafic volcanic rock.**

Field Note: *Basic Volcanic?*

There are several lithologies in this sample. Although some seem to be related, the other is extremely altered and difficult to interpret.

The most abundant lithology is a granitoid with abundant red-stained, sericitised plagioclase, with or without albite, generally euhedral and about 2-5mm in grainsize. There is also abundant interstitial quartz to 3mm in grainsize and disseminated altered biotite to 1mm in grainsize, altered to chlorite and/or clay (vermiculite?). Very minor (5-7%) microcline is present as interstitial grains to 2mm in diameter. Apatite occurs as prisms to 0.4mm long, with rare zircon to 0.3mm long but less than 50µm wide. This lithology has about 30% quartz and is probably an altered tonalite. One chip has fragments of quartz and red-stained, altered plagioclase is a matrix of mustard-yellow clay, possibly smectite, as well as abundant limonite-filled fractures. Another chip has red hematite-clay-altered plagioclase laths to 2mm long in a porous matrix largely composed of secondary K-spar, possibly adularia, with irregularly disseminated quartz and oxidised opaque oxide. Orange clays have replaced minor biotite in this chip. This may also represent an altered granitoid.

The other main lithology has massive sericite replacing what may have been plagioclase phenocrysts, from 1 to 4mm long in one chip and as much as 8mm long in the other. These are encloses in a mass of sericite ± limonite ± microcrystalline quartz, with disseminated former biotite flakes, to 0.6mm long, altered to chlorite or clay, ± sericite, and leucoxene. Small opaque oxide grains occur, now altered to leucoxene, and irregular lenses rich in granular K-spar, possibly microcline or adularia, are present. This lithology has no primary quartz and may represent a plagioclase-porphyritic mafic or intermediate volcanic rock or a shallow intrusion.

80591
BBRC-014, 56-60m

Albite-sericite-clay-chlorite-limonite-leucoxene-altered dacite or dacite porphyry (with less abundant quartz phenocrysts compared to the porphyry in BBRC-012).

Field Note: *Possibly a basic tuff?*

These chips have minor (5%) scattered quartz phenocrysts to 1.5mm in diameter, partly angular and subhedral, partly rounded and resorbed, occurring singly or in small aggregates. Altered plagioclase phenocrysts are far more abundant (35% of each chip) and much larger, to 6mm long. These have been altered to albite and also have minor chlorite and minor to abundant clouded sericite. Some of the chips have clays, limonite and leucoxene after aggregates of fine decussate biotite, apparently replacing mafic phenocrysts (5%). In several chips there are lenses of clays of this type defining a foliation and these pass into anastomosing limonite and clay-filled fractures also defining a foliation. Accessory apatite occurs largely in the clay aggregates and there are accessory microphenocrysts of opaque oxide, partly altered to leucoxene. The bulk of the groundmass areas are composed of a plagioclase-rich quartzofeldspathic micromosaic with abundant clays in many chips, but with very few clays in at least one chip. There are also irregular narrow quartz veins, partly extensional and partly related to shearing.

The overall mineralogy indicates a dacite or dacite porphyry, with fewer quartz phenocrysts compared to the porphyry in BBRC-012.

80592
BBRC-015, 70-72m

Pyroxene ± plagioclase-porphyritic basalt with alteration involving albite-smectite-limonite-leucoxene. Veins contain clay, quartz and sparse limonite after sulphide.

Field Note: *Intermediate Volcanic*

These chips are all altered/weathered with minor to abundant altered phenocrysts, mostly less than 1mm long, largely altered to smectite, but some albitised plagioclase phenocrysts occur in one chip. One chip has an altered phenocryst composed of microcline and smectite, adjacent to a clay-filled vein, suggesting that the microcline is secondary. The smectite seen in this thin section is most commonly derived from amphibole, but any amphibole in this sample may have formed from former pyroxene. Some of the chips have abundant fine-grained albitised plagioclase in the groundmass, mostly unoriented, as well as clays, limonite and leucoxene, but most are poor in, or lack, albite. The abundance of disseminated leucoxene suggests a reasonably titaniferous lithology, such as basalt, rather than an intermediate volcanic as suggested in your notes.

One chip has a vein with minor quartz in massive smectite possibly derived from chlorite. Veins containing clays, quartz and sparse limonite, possibly after sulphide, occur and there are small, deformed quartz-rich chips that may represent silicified material that has been sheared. Overall, the major lithology represented is interpreted as pyroxene (± plagioclase)-porphyritic basalt.

80593
BBRC-006, 45-46m

Limonite-rich chips, with minor microcrystalline or very fine-grained scattered quartz ± rare sericite in vague layers. Interpreted as weathered largely fine-grained sediments or metasediments?

Field Note: *Ferruginous sediment*

The ten small chips that make up this thin section consists very largely (90%) of opaque limonite, which is seen to have various micro textures in low-angle incident light. Several chips have minor (5-10%) fine quartz, mostly <0.1mm and which may be microcrystalline and/or fine detrital, disseminated or in small aggregates, some in poorly defined layers. Lesser somewhat coarser quartz grains (to 0.6mm in grainsize) are also scattered. The larger grains are commonly irregular and may be from veins, but may have been etched during weathering. Traces of sericite occur with the very fine-grained quartz, suggesting former silty sediments or metasediments, but the original lithologies represented by the other chips are uncertain. These chips may therefore represent ferruginised, but not necessarily originally iron-rich, metasediments.

80594
BBRC-006, 60-61m

Massive to vaguely fine layered, cryptocrystalline to microcrystalline fibrous and locally microsparry (cherty) quartz. Probably of unspecified supergene or low-temperature hydrothermal origin. Rare limonite after pyrite and crystal-lined cavities, partly filled by limonite (primary or derived from carbonate?).

Field Note: *Chert or quartzite?*

These chips are composed of quartz and very minor limonite. In several chips nearly all of the quartz is cryptocrystalline to microcrystalline, with bands defined by cryptocrystalline limonite in one chip, and small lenses of slightly coarser quartz in others. Other chips have lenses or pellets of clouded crypto-crystalline quartz, from 0.5 to 2mm long, separated by areas of fibrous or microgranular to microsparry quartz mosaic, locally as 'dog-tooth' spar. Minor small cavities in some chips are lined by similar micro-'dog-tooth' spar quartz, locally with rims of chalcedony, and there is rare limonite after pyrite cubes to 0.3mm long. In one chip there are larger crystal-lined cavities, to 5mm or more in length, filled by limonite. The limonite may be a primary infill or could be after carbonate.

Silica with these textures may be regarded to have a supergene or low-temperature-hydrothermal (?epithermal) origin, but the objective microscopy of isolated samples cannot really be more specific.

80595
BBRC-006, 75-76m

Chips of massive extremely fine limonite replacing a possible totally clay-altered very fine metasediment. Rare residual veinlets of quartz and of possible relict fine carbonate. Reported to be anomalous in Cu and P, but no minerals containing these elements were seen.

Field Note: *Dark fine-grained sediment? Has 2,000ppm Cu and 2.53% P.*

Four chips examined in thin section show massive opaque, extremely fine supergene limonite, with rare quartz, stringers in one chip and minor interstitial clay-silt filling in some more voids i.e. negligible information is offered in thin section.

Reflected light microscopy of another four of these chips examined in polished section, confirms the ubiquitous compact, extremely fine (opaque) earthy to cryptocrystalline limonite r± hematite). Microtexture is recognised within the limonite however (which cannot be seen in transmitted light).o Basically, it is massive but extremely fine decussate, suggesting pervasive supergene ferruginisation of pre-existing clays with the same texture. This forms a matrix (70%) to minor chaotically scattered, very small angular quartz grains (20%) of silt to fine sand size, and minor minute micas locally vaguely laminated. This lithology may be interpreted therefore as an intensely clay-altered (deeply weathered) pre-existing fine grained (?meta) sediment.

Variations to the above are :

1. In some areas, up to 80% in one chip, quartz grains are nil or negligible, with decussate fabric in limonite is slightly coarser, with more interstitial microporosity and in isolation could be objectively considered as intensely ferruginised, massive micro-amphibole aggregate. There is no real basis for proving or extending this interpretation, however.

2. One vein, to 0.5mm wide, has relict boxwork/replica, with a geometry suggesting former carbonate, but without apparent associated relict minerals (which could be considered as “mineralisation” for example).

If the reported anomalous Cu (2000pm) and P (2.53%) were to occur together in the one phase, then possible minerals could include turquoise [$CuAl_6(PO_4)_4(OH)_8.5H_2O$], pseudomalachite [$Cu_5(PO_4)_2(OH)_4$] and cornetite [$Cu_3PO_4(OH)_3$], but with excess phosphorus (a relative to Cu) possibly in apatite or in iron-bearing phosphates such as vivianite [$Fe_3(PO_4)_2.8H_2O$] or vauxite [$FeAl_2(PO_4)_2(OH)_2.5H_2O$]. No such coloured Cu-phosphates were seen in these chips however. Fe-rich phosphates may be extremely fine and camouflaged by the dominant limonite throughout these chips, but probe analysis would by required to investigate this.

80596
BBRC-016, 47-48m

Partly weathered mafic lavas, with plagioclase and mafic phenocrysts, xenolithic vesicles, and cloudy actinolite-albite-sericite-leucoxene alteration.

Field Note: *Basic volcanic?*

Up to 15% of these dark chips consist of uralitic amphibole, locally replaced by smectite, replacing scattered primary phenocrysts of clinopyroxene to 3mm long. Rarer plagioclase phenocrysts (3%), to 2mm long, have been replaced by sericite ± albite. Clouded aggregates of amphibole and albite possibly fill vesicles (5-7%). Small aggregates of composite uralitised pyroxene (partly altered to smectite) and albitised plagioclase seem to represent xenoliths.

The groundmasses are rich in clouded extremely fine actinolite and leucoxene, with lesser sericite in interstitial areas, apparently derived from plagioclase. Early threads and stringers with actinolite and smectite are cut by later micro-fractures, largely filled by probable adularia.

These chips represent altered pyroxene and plagioclase-porphyritic mafic lavas as described in previous reports on samples from this area.

80597
BBRC-016, 52-54m

Brecciated probable mafic lava, with extensive alteration to clouded epidote, actinolite, albite, limonite and calcite. Cut by limonite-filled micro-fractures and carbonate stringers.

Field Note: *Felsic volcanic?*

The chips in this sample seem to represent breccias with millimetre to centimetre-scale clasts altered to clouded very fine to fine-grained epidote. Some clasts have clear granular epidote patches apparently replacing phenocrysts, but it is not entirely clear whether the original phenocrysts were plagioclase or pyroxene. Some seem to have been pyroxene, however, and more obvious small plagioclase phenocrysts have been replaced by albite with minor epidote, actinolite and limonite. Irregular limonite-filled microfractures are abundant in many of the fragments.

Minor local interstitial areas are rich in granular to prismatic epidote, with minor to abundant albite, actinolite or quartz. In some chips the interstitial material is largely granular albite with less abundant granular to prismatic epidote, but in others epidote is more abundant, with minor to abundant actinolite and/or with common to abundant calcite.

One chip has parallel stringers of granular and fibrous carbonate, separated by lamellae of limonite.

The clouded nature of the epidote makes specific identification of any leucoxene quite difficult. Some of this clouding must surely be dispersed leucoxenitic dust, and considered together with the other gross mineralogy, a brecciated mafic volcanic would seem to be the most likely protolith.

MINERALOGICAL REPORT No. 8271

by Ian R. Pontifex MSc.

October 17th, 2002

TO :	Mr Peter Simpson Giant's Reef Mining Limited PO Box 1244 TENNANT CREEK NT 0861
YOUR REFERENCE :	Order No. 200953
MATERIAL & IDENTIFICATION :	RC drill chip samples, Bluebush Project area Numbers 71676, 677, 678, 679
WORK REQUESTED :	Thin section preparation, description and report with comments and interpretations as specified.
SAMPLES & SECTIONS :	Returned to you with this report.
DIGITAL COPY :	Enclosed with hard copy of this report.

PONTIFEX & ASSOCIATES PTY. LTD.

SUMMARY COMMENTS

Four samples of small drill chips from EL8882 are petrographically described in this report form thin section of the chips initially mounted in epoxy. Field data provided is :

Sample No.	**Location**	**Co-ordinates AGD84**	**Condensed notes**
71676	EL 8882 BBRC008 59-60m	372200E 7824500N	Probably decayed gabbroic rock
71676	EL 8882 BBRC020 73-74m	385995 7819696N	Possibly a dolomite
71678	EL 8882 BBRC021 64-66m	367996E 7820011N	Looks like a sheared ferruginous sediment
71679	EL 8882 BBRC021 105-106m	367996E 7820011N	Red gabbro or diorite

A summary of petrographic rock name with comments on alteration and genesis is provided as a header to each description, and comments relating to your field notes are included generally at the end of each description. The samples are sufficiently different to negate a composite suite summary, although 71678 is conceivably a strongly sheared (protomylonitic) equivalent of the relatively less tectonised (biotite)-tonalite sample 71679 (as questioned in your notes).

71676

- **35-40% chips of intensely weathered (undeformed) plagioclase-rich gabbro, with accessory apatite and opaque oxides.**
- **60-65% chips of "secondary" micritic and micro-sparry to clustered microprismatic carbonate (calcite) rock, with lesser associated quartz, and enclosing fragments of the altered gabbro. This carbonate may be supergene at the top of the gabbro, or it may be low-temperature hydrothermal.**

The numerous (80-100) drill chips, all <5mm, mounted for this thin section, have basically three compositions, as predicted in your field notes, in the following approximate proportions:

		Approx. vol. % of whole sample
*	Massive, coarse crystalline, undeformed plutonic-igneous rock, composed of co-dominant, altered plagioclase and altered mafic minerals including original biotite or phlogopite, with accessory scattered opaque oxide grains. These represent the "gabbro" mentioned in your field notes.	35-40%
*	Massive to weakly layered and zoned micritic carbonate incorporating minor scattered chlorite/chloritic-clays with accessory 'secondary' quartz, residuals of apatite and opaque oxide. Composite with poorly defined patches and layer veins and apparent breccia cement of microsparry carbonate. Rarer (vein) quartz, some with vague microcolloform textures.	30-40%
*	Independent chips of the microsparry and clusters of random prisms of calcite, ± (lesser) vein quartz, liberated from the composite calcite rock above.	15%

The 'gabbroic' chips commonly contain coarse former euhedral crystals of pyroxene and/or amphibole after pyroxene, almost completely altered to limonite-stained smectitic clays, together with slightly less-altered plagioclase, albeit densely clouded by clay-sericite. Equally coarse original micas (?biotite or phlogopite) are randomly intergrown in some chips (in fact, dominate some chips) and these are completely altered to smectite clays (which rapidly swell when wet). Original opaque oxide grains to 1mm size, are secondarily oxidised, and fewer primary apatite crystals occur in some chips. These chips have an undeformed, primary coarse crystalline plutonic/igneous texture ie. without any metamorphic fabric. The relative abundance of original plagioclase and mafic crystals, with accessory original magnetite and apatite and nil quartz, more or less confirms a primary gabbro (albeit unusually rich in mica).

It is of interest that many of the carbonate chips, incorporate small fragments of the intensely weathered gabbroic rock, including fragments of altered plagioclase, mafic crystals and micas, and rarely the accessory resistate opaque oxide and apatite grains.

The simplest genetic interpretation of the above seems to be a basement of altered ‘gabbro’ possibly as a palaeo-weathered surface overlain by supergene calcite-rich rock (‘calcrete’) which partly infiltrates this basement. Objectively the various textures within the carbonate and the minor accompanying secondary quartz, suggests an ‘active’ supergene accumulation of possible calcrete or indeed, possibly it has a low temperature-hydrothermal (?epithermal) genesis, in which case its relationship to the gabbro is less certain.

71677 **Chips of massive microcrystalline (including microsparry) dolomite (dolostone). One chip of cryptocrystalline silica with small scattered siliceous 'fragments' which may be unusual shards, (in a devitrified glassy tuff?) or which may be microfossils (in a chert?)**

Almost all of the chips in this sample (to 20mm size) consist of homogeneous, massive crystalline mosaics of sparry to sub-sparry carbonate crystals, average about 0.6mm, in some chips and about 0.25mm in others. Some chips are weakly reddened by limonite staining. No reaction to staining of the section offcut with Alizarin Red indicates that this carbonate is dolomite and considering the texture would seem to be represent a dolomite (low grade metamorphosed dolomitic chemical sediment).

These chips are entirely different from the carbonate (calcrete/limestone)-rich chips in sample 71676 and there is no petrographic reason therefore to (geologically) relate the carbonate chips in these two samples.

One chip in this sample to 10mm across, is quite different, being composed of massive micro to cryptocrystalline quartz, clouded by opaque (or very weakly translucent) dust, defining a vague possible micro-ignimbritic texture. In addition, there are minor (3%) scattered siliceous "curved spicules", about 0.02mm wide to 0.8mm long, which could be unusual shards, or fossil fragments. There are also ovoid to irregularly circular "bodies" (7-10%) of cryptocrystalline apparent clay-chlorite-chalcedony, some internally microscopically cellular, which may be microfossils (of unknown classification). This siliceous chip may therefore represent a "fossiliferous chert" (perhaps, rather than a devitrified glassy tuff?) This chip does not show any metamorphic deformation.

71678 **Proto-mylonitic. partly granulose schist, of co-dominant quartz sericitised plagioclase and minor muscovite, reddened by dusty limonite/hematite oxidation.**
[Conceivably a more sheared and reconstituted equivalent of the 71679 rock type with former biotite altered to muscovite.]

These chips have a reddish-brown colouration due to widespread permeation of limonitic ± hematite dust oxidation. The gross texture is fine to medium grained, tectonically layered and schistose, including local tectonic distortion, elongation-shear fabric, and mylonitic quartz, variably in different chips. In the sample as a whole, the chips consist of co-dominant quartz and sericitised ex-plagioclase, together with minor scattered muscovite.

The quartz is commonly elongate recrystallised (with fabric and in discontinuous incipient veins) but some is granular including finely fragmented. Sericitised plagioclase tends to be more granular, with a size <0.5mm, some within inherited aggregates, some fine brecciated and comminuted with some clay-sericite along schistosity and shears. The micas are variably schistose, and random due to the tectonism.

These chips clearly represent a shear protomylonitic zone. Their gross composition does approximate the mineralogy of the somewhat coarser grained and less tectonised chips in 71679, to the extent that it could very well represent a more sheared and reconstituted equivalent of that 71679 rock type.

71679 **Medium grained (biotite-quartz)-diorite or tonalite, moderately sheared with quartz recrystallised, and elongated together with schistose biotite. Plagioclase is partly sericitised and the biotite partly chloritised. No diagnostic accessory minerals.**

Macroscopically these chips are seen to have greyish schistose matrix domains incorporating variably minor to co-dominant reddish “spots” of apparent ferruginised plagioclase crystals to 5mm in size.

Petrographically, the chips have a residual medium grained plutonic-igneous texture, albeit with some recrystallisation forming a foliation due to “moderate” shearing, but generally not as severe as in 71678. Original plagioclase crystals (50%) 1mm to rarely 5mm, retain a subhedral to euhedral shape, and some are weakly elongate, and show variable 15% to 30% sericitic alteration, with variable reddening by iron-oxide dust. These are fairly evenly disposed through a moderately foliated matrix of finer quartz mosaic (35%) which has recrystallised form earlier granulose quartz, and which incorporates lesser schistose biotite, incipiently chloritised (10-15%). There are no diagnostic accessory minerals although trace small grains of leucoxenised opaque oxides are present.

In some chips, the recrystallised quartz approaches a protomylonitic fabric, indicating localised higher shear, (but not as widespread as in 71678).

This rock is classified as a moderately sheared and recrystallised (biotite) quartz-diorite, or tonalite. It is quite different from the chips of original undeformed-gabbro in 71676

MINERALOGICAL REPORT No. 8274
by Alan C. Purvis, PhD

PRELIMINARY SUMMARY

October 24, 2002

TO :	Mr Peter Simpson Giant's Reef Mining Ltd PO Box 1244 TENNANT CREEK NT 0861
YOUR REFERENCE :	Order No. 200981
MATERIAL :	RC Drill chip samples EL8882, 8883, 9309, 10402 Sample Nos. 81642 to 81665 (total 24)
WORK REQUESTED :	Thin section preparation, description and report with comments and interpretations as specified.
SAMPLES & SECTIONS :	Returned to you with this report.
DIGITAL COPY :	Enclosed with hard copy of this report.

PONTIFEX & ASSOCIATES PTY. LTD.

SUMMARY COMMENTS

Twenty-four samples of RC-chips are described in this report from thin sections made from multiple chips mounted in epoxy. They are all from the Bluebush area southwest of Tennant Creek in the Northern Territory.

Various partly variolitic and/or pyroxene-porphyritic **basalt** lavas, hyaloclastites, breccias and tuffs are seen in BBRC-029 to 031 and 033, mostly with chlorite-sericite-quartz-carbonate alteration, but with actinolite and sericite in BBRC-033. **Veins**, with quartz, carbonate or adularia are common and seem to have an epithermal character. It is not clear from the present study whether these have any economic potential. **Interbedded sediments** include dolomite and carbonaceous slate (BBRC-029, 103-104m) sandy dolomite (BBRC-030, 70-71m) and sandy shale or greywacke (BBRC-031, 119-120m). Sediment is also seen in BBRC-028, probably siltstone but totally flooded by limonite. Altered **gabbro** is seen in BBRC-023, with some actinolite-albite-rich chips (± chlorite, biotite) and some **potassic-altered biotite-rich chips** with patches of quartz containing **limonite after pyrite**. Quite different mafic lithologies occur in SHRC-001 (altered and partly recrystallised **hypersthene-dolerite** passing into quartz-rich pegmatite zones) and MORC-001 (uralitised and sericitised **oxide-poor gabbro**).

Holes BBRC-026 and 027 contain altered high-level **granitoids**, ranging from granodiorite to monzogranite. One has albitised K-spar (BBRC026, 69-70m), but the others have fresh microcline as well as red sericite-albite-hematite-altered plagioclase. Altered biotite is also abundant with clays and K-spar in lenses parallel to the cleavage. Fresh, oxidised and leucoxenised opaque oxides occur as well as apatite and zircon. The quartz is partly bipyramidal and partly in graphic patches, indicating a shallow emplacement level.

Fine-grained **gneissic tonalite** in BBRC-021 is quite different to the granitoids described above, but also has chlorite and clay after biotite as well as partly red albite ± sericite-rich altered plagioclase. Finer-grained, chloritised and albitised **quartz-plagioclase-biotite-schist** is also present in this sample as well as a totally clay-chlorite-altered chip, with leucoxene, limonite and quartz, of uncertain origin. **Veins** with quartz, chlorite and adularia occur in some of the granitoid samples, again indicating epithermal temperatures.

There is also a sheared, quartz-poor, fine-grained **felsic igneous lithology** in BBRC032, with albite, chlorite and muscovite as well as rutile or leucoxene. This may represent a quartz microdiorite or andesitic intrusion.

The following petrographic summaries for each sample will basically constitute headers to the individual descriptions in the final report.

TABLE 1: SAMPLES DESCRIBED IN REPORT NO. 8274

81642 BBRC-021, 85-86m	Altered foliated fine-grained tonalite with albite-sericite-chlorite-clay-leucoxene-limonite alteration and altered quartz-biotite-plagioclase schist with altered possible cordierite. One chip totally altered to clay (sericite/ smectite), chlorite, hematite and leucoxene with minor quartz but poor textural preservation.
81643 BBRC-023, 89-90m	Two large chips and one small chip of amphibole-rich altered gabbro and two large chips of biotite-rich altered gabbro with rutile ± leucoxene after opaque oxide and quartz-rich lenses containing limonite after pyrite.
81644 BBRC-026, 69-70m	Weakly deformed and albite-sericite-chlorite-altered granitoid with albite ± sericite-rich altered plagioclase, albitised K-spar, chloritised biotite and leucoxenised opaque oxide. Apatite and rare zircon (<0.1mm) are present and there are chlorite-rich veins.
81645 BBRC-026, 83-84m	Coarse heterogeneous granitoid (granodiorite to monzogranite): some chips are quartz-rich and lack K-spar, others have minor or very abundant, coarse-grained K-spar (microcline) locally with graphic zones. Quartz is partly interstitial but partly bipyramidal with anhedral K-spar. Biotite is partly coarse-grained partly fine-grained and decussate, partly altered, with clays parallel to the cleavage and patches of epidote. Sericite and rare epidote also occur in the plagioclase. Clay-hematite veins occur. Accessory apatite, oxides and zircon, with zircon to 0.35mm long.
81646 BBRC-027, 78-79m	Altered probable monzogranite with red sericite-albite-altered plagioclase and fresh perthitic microcline. Altered biotite partly as large flakes and partly decussate. Some bipyramidal quartz suggesting shallow emplacement. Oxides, apatite and zircon (0.05-0.2mm) occur. Rare veins with adularia and clay.

81647 BBRC-027, 93-94m	Altered granodiorite to monzogranite with red sericite and hematite-stained coarse plagioclase, undeformed quartz, partly bipyramidal and resorbed with resorption channels and interstitial areas of microcline passing into coarse microcline. Abundant biotite has been altered to chlorite and leucoxene. Accessories include apatite, oxides and zircon 50-150µm long.
81648 BBRC-027, 85-86m	Altered monzogranite with red sericite-hematite-albite-altered euhedral plagioclase and coarse K-spar (orthoclase to microcline) as well as coarse and decussate altered biotite. Oxide, apatite and zircon (0.05-0.15mm) occur.
81649 BBRC028, 57-58m	Limonite-flooded possible siltstones with disseminated very fine-grained quartz.
81650 BBRC-029, 68-69m	Albite-sericite-carbonate-leucoxene-limonite-altered partly variolitic basalt and fragmental basaltic rock with a clay-quartz matrix. Adularia-quartz veins and clay veins are present.
81651 BBRC-029, 87-88m	Weakly to strongly deformed (mylonitic), sparsely plagioclase-porphyritic basalt, mostly albite-rich, partly chlorite-rich, flooded and veined by carbonate and cut by quartz veins containing adularia.
81652 BBRC-029, 103-104m	Four chips of laminated dolomite, remaining abundant chips of laminated carbonaceous slate with abundant veins containing quartz and/or carbonate and irregular patches of carbonate.
81653 BBRC-029, 109-110m	One chip of very fine-grained tremolite-actinolite-rich schist with folded lenses of chlorite and disseminated leucoxene. The other chips are more massive and rich in tremolite-actinolite with amphibole-opaque oxide pseudomorphs of pyroxene phenocrysts to 2.5mm long and chlorite-tremolite possibly after olivine and plagioclase phenocrysts.
81654 BBRC-029, 119-120m	Massive lava and hyaloclastites with uralitic actinolite after pyroxene phenocrysts and recrystallised amphibole after possible olivine in amphibole-rich altered glass, devitrified glass with microspherulitic textures or recrystallised possibly glassy material. Vesicles are present and the hyaloclastites have a cement of carbonate, clouded epidote and clinopyroxene.

81655 BBRC-029, 144-145m	Massive and vesicular pyroxene-porphyritic lava and hyaloclastite, tremolite-actinolite-rich, with carbonate, quartz, leucoxene and opaque oxide. Veins contain albite, epidote, carbonate and adularia.
81656 BBRC-030, 70-71m	Weathered impure dolarenite with disseminated fine sand-sized quartz and minor microcline.
81657 BBRC-030, 87-88m	Chlorite-carbonate-leucoxene schists with very minor quartz. The chlorite has replaced plagioclase to 1.5mm in grainsize, with carbonate after pyroxene and possibly late magmatic quartz in a fine-grained metadolerite, sheared and altered.
81658 BBRC-031, 79-80m	Chlorite-quartz-sericite-leucoxene-altered basaltic rocks with poor textural preservation: aphyric, pyroxene porphyritic and fragmented, locally flooded by quartz and/or carbonate. Several chips contain or consist of coarse-grained deformed carbonate from large veins.
81659 BBRC-031, 89-90m	Partly brecciated altered mafic rocks with albitised plagioclase and chlorite ± quartz after pyroxene as well as leucoxene after partly dendritic oxides. Some variolitic areas. Matrix of chlorite and hydrothermal quartz in the breccias. One chip of coarse carbonate with lenses or fragments of granular to prismatic hydrothermal quartz,
81660 BBRC-031, 99-100m	Massive and brecciated plagioclase-porphyritic, partly variolitic basalts with albite, chlorite, quartz and leucoxene. Leucoxene has replaced partly dendritic opaque oxides. The brecciated chips have a chlorite-quartz matrix as in the previous sample.
81661 BBRC-031, 119-120m	Schistose matrix-rich greywacke or sandy shale with single-crystal quartz grains to 0.5mm (medium-grained sandstone) and rare lithic grains: also has slate composed of sericite ± quartz. Narrow veins of sparry quartz.
81662 BBRC-032, 115-117m	Albite-chlorite-muscovite-leucoxene/anatase schist with minor quartz, accessory apatite and zircon. Veins of chlorite and of albite. Metamorphosed felsic igneous rock.

81663 BBRC-033, 89-91m	Albite-actinolite-epidote-leucoxene-altered sparsely pyroxene porphyritic basalt with rare vesicles. Rare tuff with pyroxene and basalt fragments in a clouded epidote-rich matrix and some chips altered to clay, chlorite, carbonate and quartz. Sparse veins of quartz ± carbonate and irregular lenses of quartz.
81664 SHRC-001, 76-78m	Recrystallised hypersthene dolerite with partly ophitic and partly recrystallised orthopyroxene, recrystallised clinopyroxene, clear plagioclase laths, biotite and opaque oxide. Some areas are highly altered to actinolite and sericite with clays after orthopyroxene. In other areas fresh rock passes into quartz-rich areas that seem to represent mafic pegmatites.
81665 MORC-001, 158-160m	Altered gabbro with albite ± sericite-rich altered plagioclase and largely uralitised clinopyroxene. Has some recrystallised amphibole and patches of chlorite rimming the amphibole. One chip has commonly fresh clinopyroxene and oriented clays replacing orthopyroxene, with curious altered symplectites. Rare chlorite after biotite. Oxides are rare and fine-grained and apatite is rare or absent.

APPENDIX 4

EL 8882 GREENBUSH

BLUEBUSH PROJECT AREA PETROLOGICAL GROUND WATER DATABASE

Exploration Implications from Geochemistry of Groundwaters from Bluebush RC Drill Holes.

Angela Giblin
CSIRO Exploration and Mining
16.10.02

CSIRO

Summary

- Groundwaters from RC drill holes provide information from 2 new locations outside the gravity anomaly and also illustrate groundwater variations at closer spatial densities at 2 previously sampled locations including that sampled by diamond drilled groundwaters GRW 4 and 5.
- Major constituent variation in RC drill hole groundwaters indicates that groundwaters fom BBRC7, 8, 9, 12 and 19 have lesser relative concentrations of Mg and Ca, than others in this sample group. The first 3 of these locations indicate a new zone in addition to the previously indicated central zone of rocks that are more felsic/less mafic than those that surround them. The felsic/mafic contrast between BBRC12 and 19 groundwaters and other RC groundwaters in this immediate region support the presence of the sharp geochemical boundary previously illustrated between GR6/GRW3 and GRW4 and 5.
- Statistical clustering of all sampled locations (including the new RC drill holes), on the basis of groundwater concentrations of a suite of major and trace constituents, delineates discrete zones that apart from GR3, GR13 and RC holes 7, 8 and 9, coincide with the general zone of high residual gravity. This clustering may constitute a groundwater geochemical signature for the source of the gravity anomaly. Allocations between clusters, derived from the compositions of groundwaters from RC holes 12 – 18 support the apparent geochemical boundary exhibited between diamond drill holes GRW3 and GRW4,5.
- In this increased data set, although Sc still correlates overall at 95% confidence with NMg, the correlation is not uniform suggesting more than one rock type as the sources of Sc. For example elevated Sc in groundwaters from the new RC holes in the NW is accompanied by low NMg and elevated U, Mo and F, a combination suggesting granites, pegmatites etc rather than rocks high in ferromagnesian minerals. This implies that the statistical cluster reflects more than one felsic rock type.
- Although ore element concentrations are unremarkable in RC drill hole groundwaters, Cu and Pb concentrations in BBRC7 and 13 and Zn concentrations in BBRC13 were sufficiently high to indicate saturation of groundwater from BBRC13 with Cu, Pb and Zn oxidised ore minerals and BBRC7 with Cu and Pb oxidised ore minerals
- All groundwaters from RC drill holes contained modest concentrations of arsenic that are too low to indicate proximity to sulphide minerals, but do not exclude possibly deep or further distant sources.
- Groundwaters from the RC drilling plotted on the relevant mineral stability field diagram, fit the same trend as the groundwaters from previous programs. Groundwaters in the new area of BBRC5 and 6 are equilibrated with kaolinite, in the area of BBRC19 with phengite whilst the rest are equilibrated with muscovite.

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Groundwater Analyses

Bluebush RC Drill Holes

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Bluebush RC Drill Hole Groundwater Data (page 1)

Sample No.	Type	Water Table	Sample Depth	AMG Zone	Grid East	Grid North	Temp (C)	pH	Eh mV	Ca mg/l	Mg mg/l
BBRC-005	DH	9.1	20	53	368005	**7820005**	30.4	4.42	592	44	35
BBRC-006	DH	6.2	20	53	368000	7819000	31	5.97	610	31	28
BBRC-007	DH	8	18	53	372200	7824500	27.1	6.80	920	13	18
BBRC-008	DH	7.5	18	53	372200	7825000	29.5	6.92	559	15	22
BBRC-009	DH	7.7	11	53	370900	7824900	30.1	6.84	246	7	8
BBRC-010	DH	4.5	14	53	380960	7819060	30.2	6.34	483	44	38
BBRC-011	DH	8.5	18	53	378500	7812500	31	6.29	1170	53	41
BBRC-012	DH	6	16	53	377000	7805500	31.6	6.67	228	25	21
BBRC-013	DH	5.7	16	53	378150	7805500	30.7	7.31	911	46	39
BBRC-014	DH	5.9	16	53	379000	7805150	30.5	7.05	302	39	29
BBRC-015	DH	5.8	16	53	380025	7805305	31.4	6.54	402	32	17
BBRC-016	DH	5.6	16	53	380225	7805105	31.1	6.75	298	30	23
BBRC-017	DH	5.7	16	53	380025	7804605	32.4	6.62	542	43	24
BBRC-018	DH	5.9	16	53	379825	7805105	32.5	6.76	482	29	22
BBRC-019	DH	8.3	10	53	382900	7806000	30.1	7.64	420	35	98

Sample No.	Na mg/l	K mg/l	Cl mg/l	SO4 mg/l	HCO3 mg/l	Cu ug/l	Pb ug/l	Zn mg/l	F mg/l	U ug/l	Al mg/l
BBRC-005	21	24	20	9	140	0.8	0.05	-0.03	1.0	4.4	0.037
BBRC-006	70	46	50	22	155	1.2	0.04	-0.03	1.8	5.7	0.021
BBRC-007	358	65	235	104	275	4.6	0.39	-0.03	2.2	23.0	0.103
BBRC-008	492	84	275	144	390	4.2	0.32	-0.03	3.7	30.3	0.185
BBRC-009	312	32	195	82	180	1.0	0.01	-0.03	3.6	11.9	0.077
BBRC-010	131	37	140	69	165	0.9	0.29	-0.03	2.2	9.6	0.041
BBRC-011	150	33	155	79	195	2.4	0.11	-0.03	1.7	9.1	0.014
BBRC-012	205	35	130	102	155	1.9	0.21	-0.03	2.2	5.5	0.048
BBRC-013	332	49	240	186	265	3.4	0.34	-0.03	1.7	13.0	0.034
BBRC-014	260	39	205	123	210	2.8	0.32	-0.03	1.3	6.6	0.018
BBRC-015	64	25	20	19	125	0.8	0.04	-0.03	1.1	3.8	0.092
BBRC-016	59	44	30	23	140	1.0	0.03	-0.03	1.0	4.0	0.042
BBRC-017	24	32	15	12	125	0.8	0.06	-0.03	1.0	3.5	0.099
BBRC-018	75	38	40	27	140	0.8	0.01	-0.03	1.5	3.7	0.113
BBRC-019	1571	141	1800	918	435	11.2	1.10	-0.03	3.0	302.8	0.009

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Bluebush RC Drill Hole Groundwater Data (page 2)

Sample No.	Fe mg/l	Ti mg/l	Mn mg/l	B mg/l	P mg/l	Ag ug/l	Ba mg/l	Be mg/l	Cd ug/l	Co ug/l	Cr ug/l
BBRC-005	0.008	-0.002	-0.002	0.151	-0.05	-1	0.227	-0.002	0.03	0.040	1.32
BBRC-006	-0.005	-0.002	0.006	0.313	-0.05	-1	0.081	-0.002	0.04	0.044	4.84
BBRC-007	-0.005	0.004	-0.002	0.931	0.06	-1	0.087	-0.002	-0.01	0.085	8.21
BBRC-008	0.013	0.004	-0.002	1.50	0.09	-1	0.044	-0.002	0.04	-0.066	5.79
BBRC-009	0.007	0.004	-0.002	0.898	0.06	-1	0.046	-0.002	-0.04	-0.033	10.69
BBRC-010	0.011	-0.002	-0.002	0.412	-0.05	-1	0.071	-0.002	-0.06	-0.033	2.20
BBRC-011	-0.005	-0.002	-0.002	0.442	-0.05	-1	0.076	-0.002	0.09	0.059	2.44
BBRC-012	0.032	0.003	-0.002	0.420	0.07	-1	0.114	-0.002	0.04	0.053	5.63
BBRC-013	0.028	-0.002	-0.002	0.567	0.05	-1	0.050	-0.002	0.12	0.095	5.57
BBRC-014	0.010	-0.002	-0.002	0.498	-0.05	-1	0.058	-0.002	0.03	0.068	4.24
BBRC-015	0.034	0.003	-0.002	0.251	-0.05	-1	0.162	-0.002	0.03	0.036	2.60
BBRC-016	0.020	-0.002	-0.002	0.262	0.06	-1	0.344	-0.002	0.01	0.064	4.01
BBRC-017	-0.005	0.002	-0.002	0.160	-0.05	-1	0.257	-0.002	0.01	0.031	1.23
BBRC-018	0.017	0.005	-0.002	0.323	-0.05	-1	0.194	-0.002	0.02	0.035	1.42
BBRC-019	-0.005	-0.002	0.003	5.27	0.23	-1	0.015	-0.002	0.40	0.217	5.24

Sample No.	La ug/l	Mo ug/l	Sc ug/l	Sr mg/l	Y ug/l	Ni ug/l	Yb ug/l	As ug/l	Li mg/l	Si mg/l	Au ng/l
BBRC-005	0.042	1.73	14.86	0.677	0.04	0.96	-0.008	0.3	-0.005	38	0.1
BBRC-006	0.007	3.94	9.89	0.483	0.02	1.36	-0.008	0.1	-0.005	29	2.3
BBRC-007	0.085	4.94	11.59	0.351	0.04	0.83	-0.024	1.5	-0.005	33	0.1
BBRC-008	0.067	7.73	11.96	0.470	0.07	0.70	-0.007	2.0	-0.005	30	2.9
BBRC-009	0.008	13.04	10.05	0.127	0.01	0.41	-0.016	1.1	-0.005	25	4.0
BBRC-010	0.014	2.34	14.50	0.626	0.02	0.50	-0.016	1.0	-0.005	38	4.2
BBRC-011	0.014	1.53	14.72	0.773	0.03	0.16	-0.016	1.0	-0.005	34	0.1
BBRC-012	0.026	4.91	11.92	0.391	0.04	0.15	-0.016	0.9	-0.005	29	0.1
BBRC-013	0.035	1.65	13.61	0.705	0.03	0.18	0.006	1.0	-0.005	33	0.1
BBRC-014	0.013	2.77	16.37	0.607	0.12	0.21	-0.016	1.5	-0.005	39	0.1
BBRC-015	0.026	1.39	12.64	0.355	0.04	0.37	-0.008	1.0	-0.005	34	0.1
BBRC-016	0.044	0.80	11.98	0.464	0.01	0.30	-0.008	1.8	-0.005	34	0.1
BBRC-017	0.049	0.35	15.28	0.524	0.02	0.26	-0.008	1.4	-0.005	44	0.1
BBRC-018	0.032	3.62	14.11	0.428	0.02	0.42	-0.008	1.5	-0.005	34	0.1
BBRC-019	-0.038	29.66	15.46	1.44	0.14	1.44	-0.080	1.3	-0.005	36	0.1

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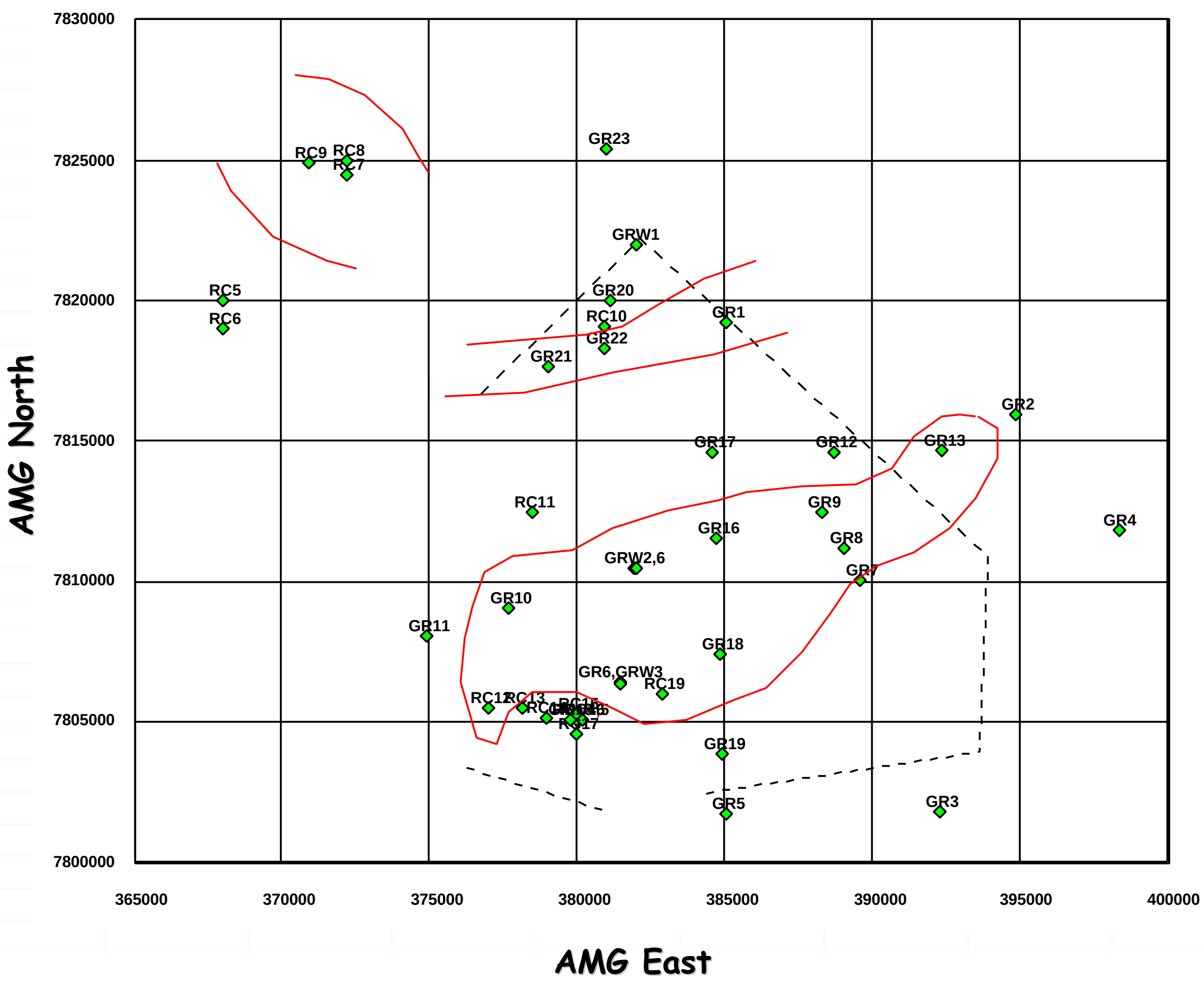
Bluebush RC Drill Hole Groundwater Data (page 3)

No.	V	Sb	Bi	Th	Rb	Cs	Tl	Ga	Ge	Tb
BBRC-005	mg/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l
BBRC-006	0.015	0.05	0.004	0.012	17.7	0.20	0.013	0.023	-0.14	0.007
BBRC-007	0.026	0.21	0.009	0.013	20.2	0.32	0.015	0.017	-0.14	0.005
BBRC-008	0.039	0.06	0.031	0.026	23.0	0.25	0.030	-0.027	-0.52	0.008
BBRC-009	0.049	0.05	0.008	0.017	25.1	0.23	0.032	0.052	-0.64	0.010
BBRC-010	0.040	-0.02	-0.006	0.018	13.6	0.13	0.009	-0.018	-0.28	-0.002
BBRC-011	0.036	-0.02	-0.006	-0.006	29.0	0.17	-0.006	-0.018	-0.28	-0.002
BBRC-012	0.020	0.03	-0.006	0.012	29.5	0.15	0.022	-0.018	0.32	0.004
BBRC-013	0.020	-0.02	-0.006	0.011	19.7	0.22	0.010	0.018	-0.28	0.002
BBRC-014	0.026	-0.04	-0.009	-0.009	25.8	0.55	0.009	-0.027	-0.52	-0.003
BBRC-015	0.033	0.02	-0.006	-0.006	21.9	0.44	0.011	-0.018	-0.28	-0.002
BBRC-016	0.024	0.02	-0.003	0.010	15.4	0.34	0.010	0.011	0.14	-0.001
BBRC-017	0.028	0.02	-0.003	0.004	23.1	0.73	0.014	0.016	0.19	-0.001
BBRC-018	0.052	0.03	-0.003	0.011	19.3	0.44	0.007	0.018	-0.14	-0.001
BBRC-019	0.022	0.06	-0.003	0.015	24.4	0.53	0.009	0.023	-0.14	0.003
	0.019	-0.10	0.098	-0.030	104.7	0.78	0.076	0.017	-1.40	0.014

Statistical Clustering

Locations grouped by groundwater chemical components.



Groundwaters from locations within red lines fit into a statistical cluster (A) that was calculated from concentrations of trace elements and normalised majors. Apart from GR3, GR13 and RC holes 7, 8 and 9, clustered locations all coincide with discrete zones of high residual gravity. This clustering may constitute a groundwater geochemical signature for the source of the gravity anomaly in the Bluebush project region. Note that diamond drill holes represented by GRW1,2 and 6 fit in this cluster but that represented by GRW4 and 5 does not. Composition of groundwaters from RC holes 12 – 18 support this apparent geochemical boundary.

Analysed variables used for clustering – Cu, Pb, Zn, U, Al, Fe, Mn, Ba, Co, Sr, Ni, As, Li, Si, V, Rb, Cs, NCa, NMg, NK, NSO4, Sc, F, Au, Mo and Ge.

Clustering procedure was k-means clustering of Principal Component scores 1,2,3 and4.

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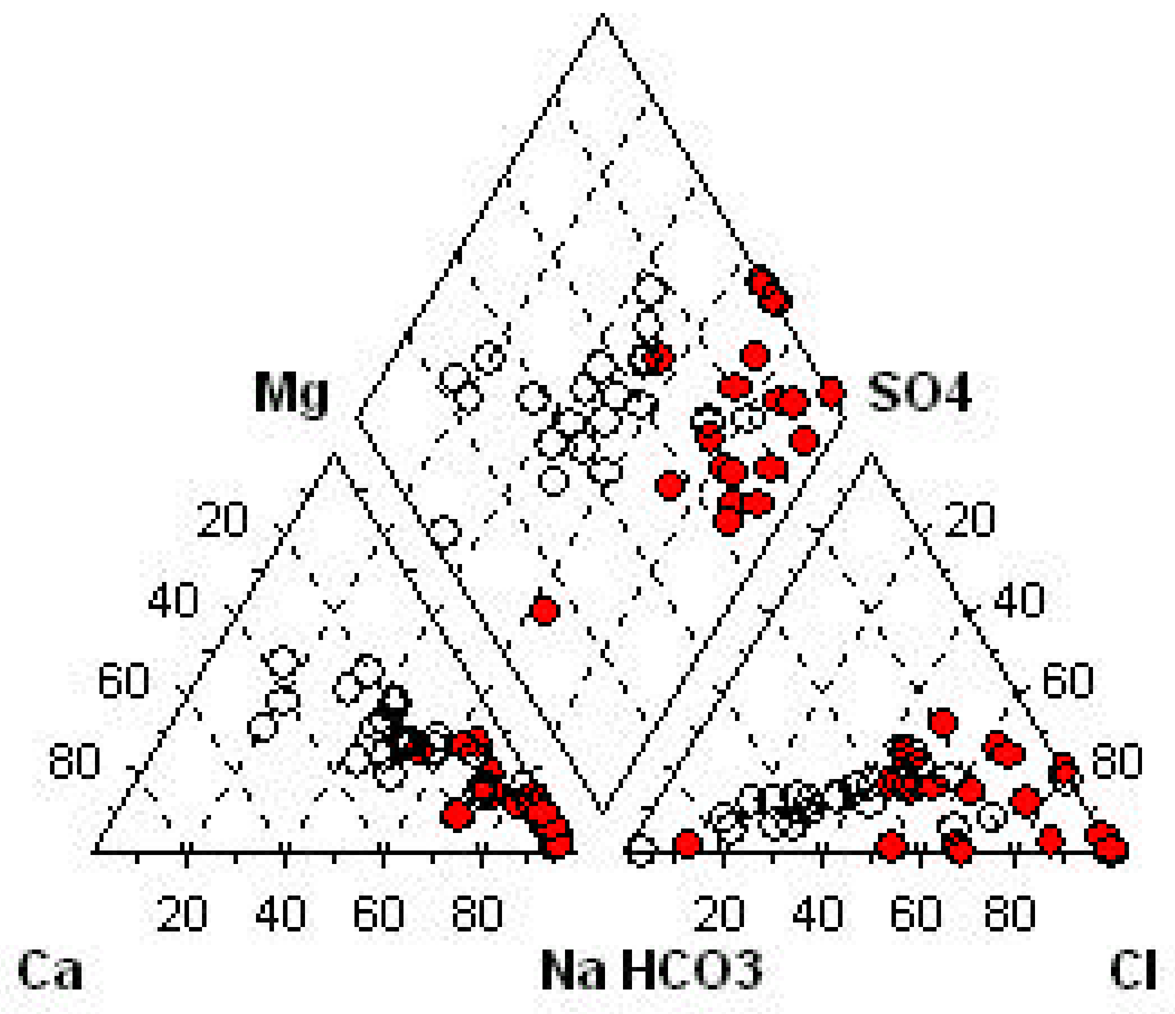
Characteristics of Aquifer Rocks

Identified from major groundwater components – Ca, Mg, Na, K, Cl, SO4 and carbonate



All groundwater samples from Bluebush collections plotted on a major element diagram that illustrates grouping in terms of major element composition, and hence aquifer rock types. Those shown in red are from the statistical cluster (A) that coincides most closely with zones of high residual gravity.

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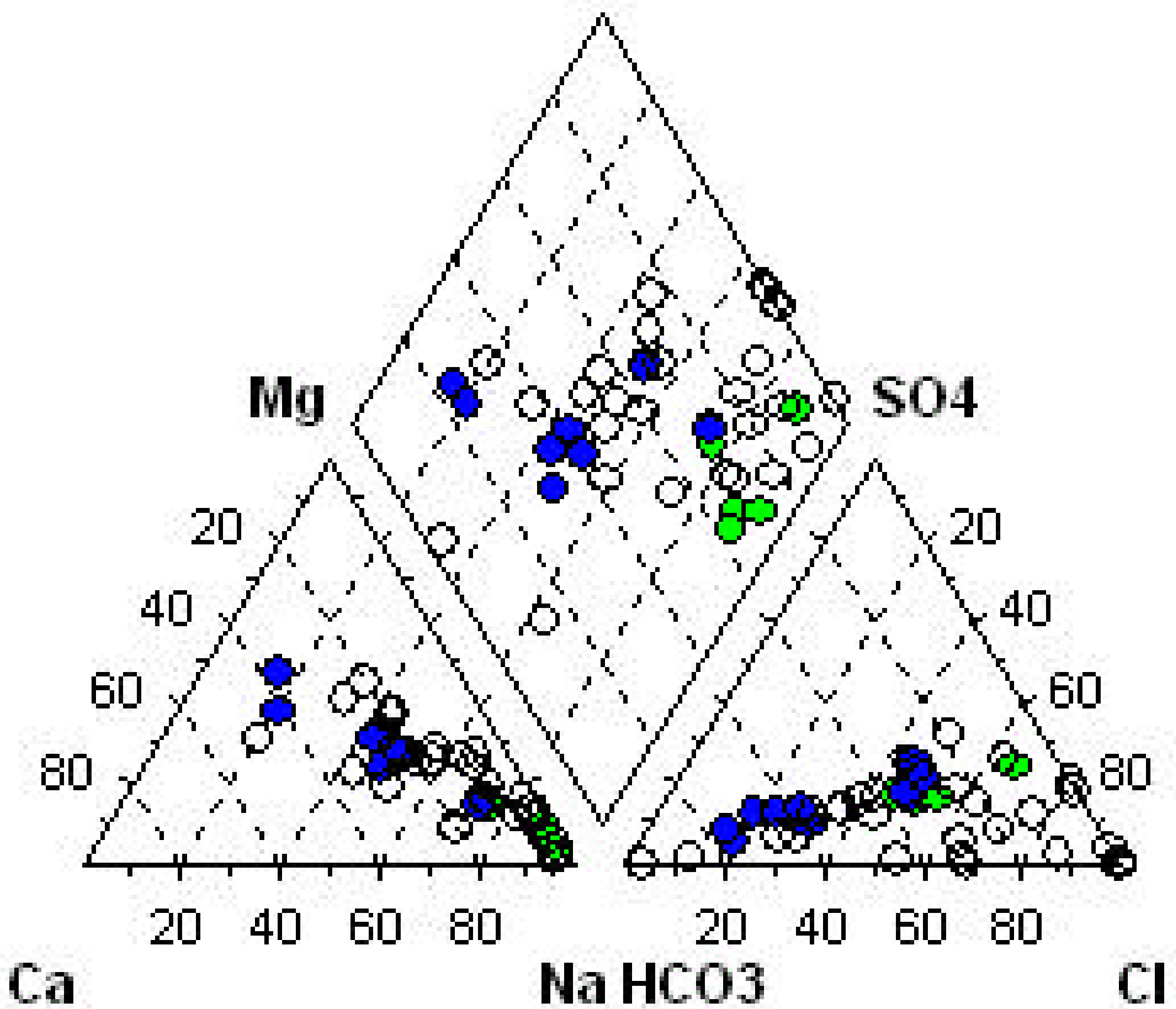
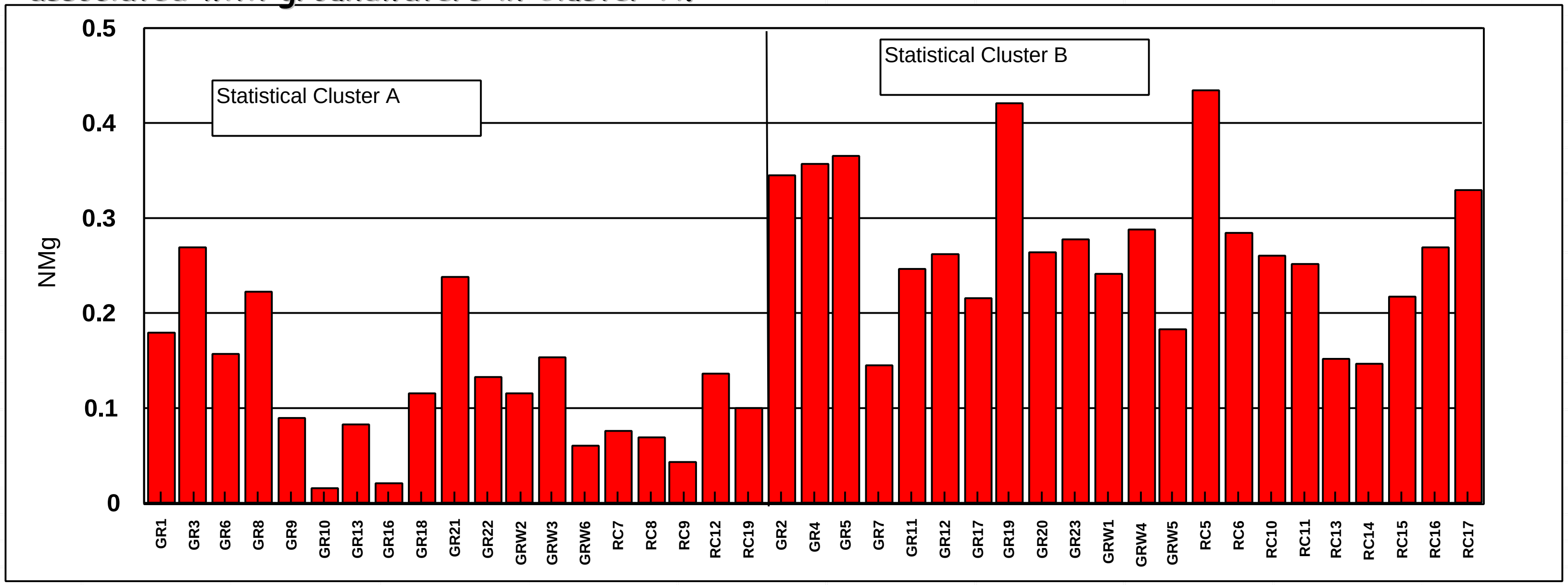
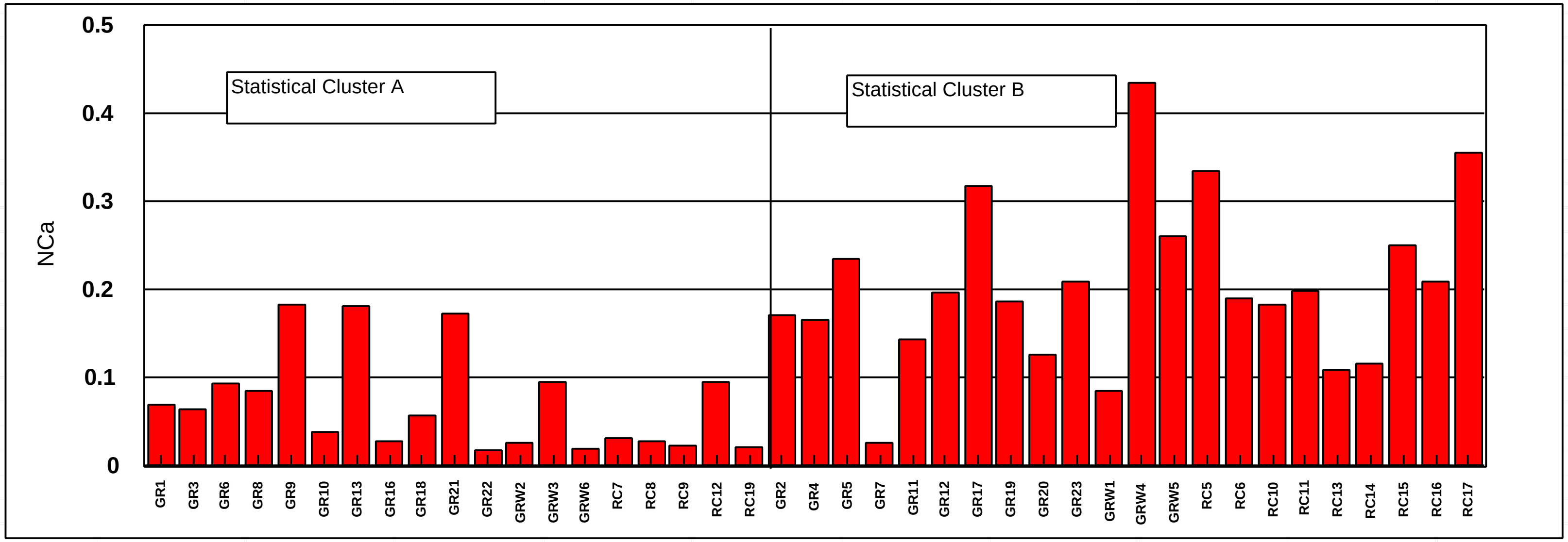


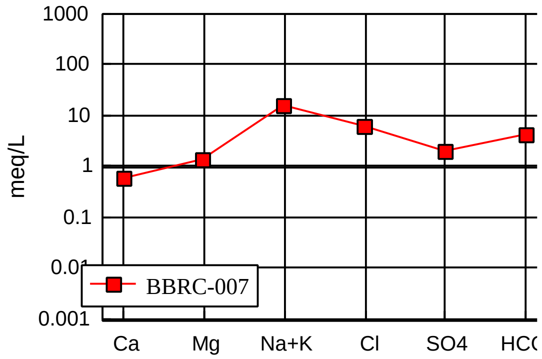
Major element composition of groundwaters from the RC drilling (blue and green) are plotted with samples from previous programs. Those that geochemically fit with samples from the statistical cluster (A) that coincides most closely with zones of high residual gravity are shown in green.

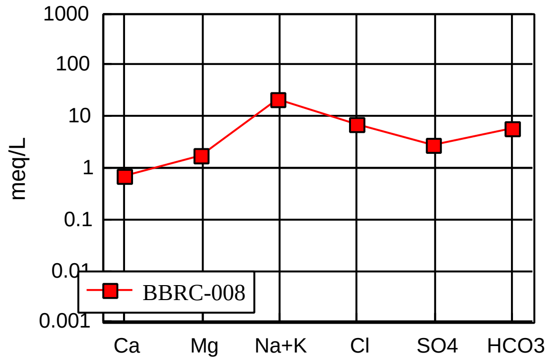
NMg and NCa are the relative proportions of total major cations, (Ca, Mg, Na, K) contributed by Mg and Ca respectively. Because NMg and NCa are higher in groundwaters from mafic rocks than for those from felsic rocks, it is apparent that groundwaters in Cluster B derive from rocks that are more mafic than are the rocks associated with groundwaters in Cluster A.

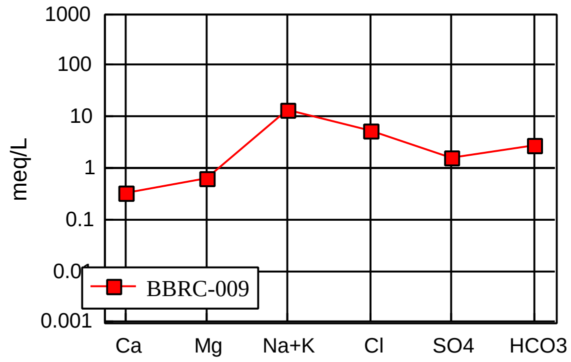


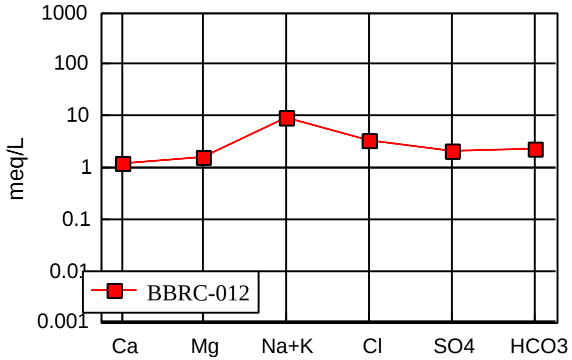


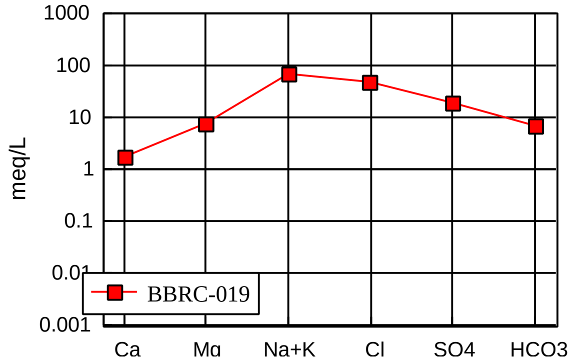
Major element composition plots of groundwaters from RC drill holes that geochemically fit with samples from the statistical cluster (A). Locations of these groundwaters coincide most closely with zones of high residual gravity. In these groundwaters Ca and Mg are less dominant than Na and K.

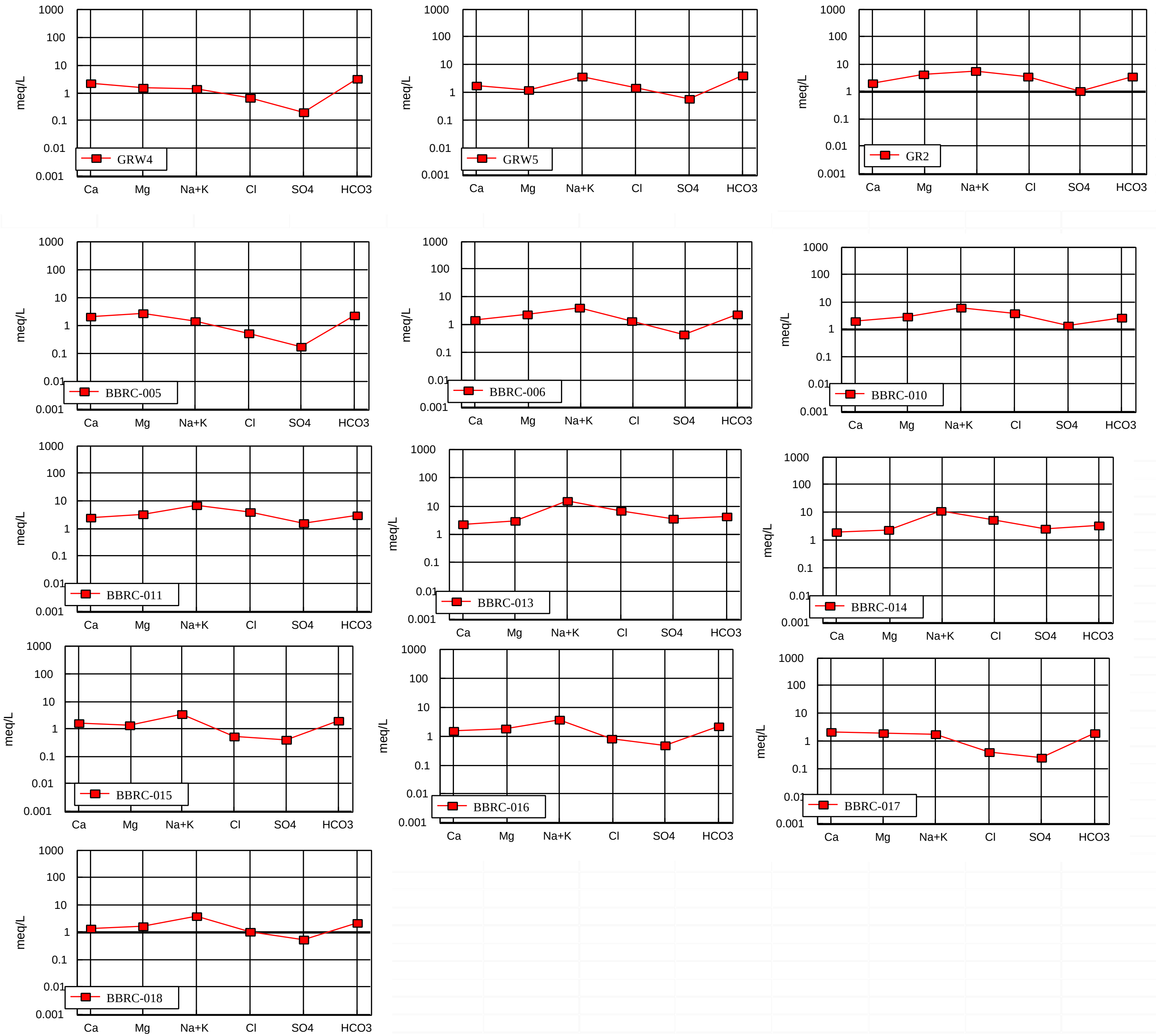








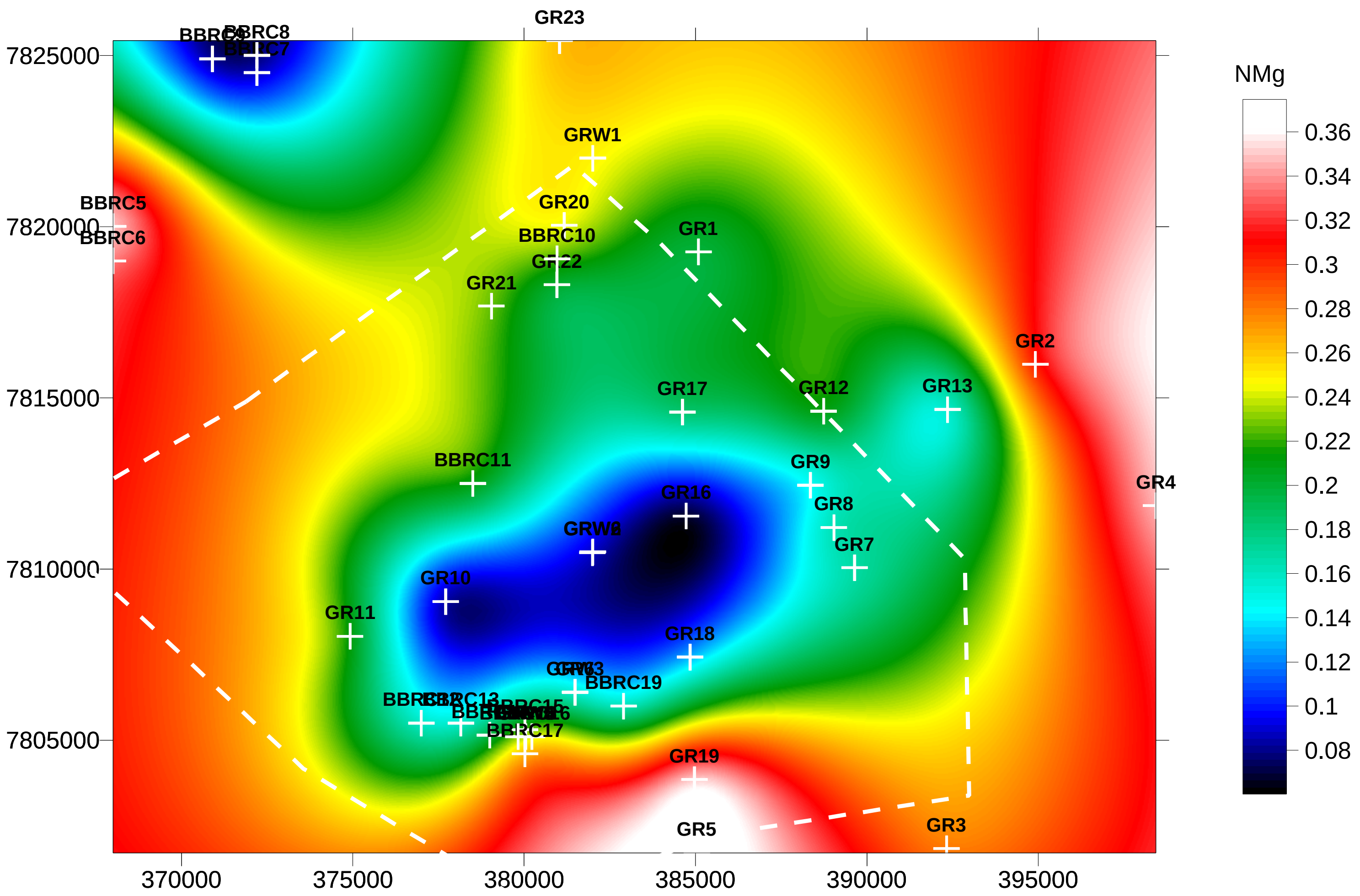




Major element composition plots of groundwaters from cluster B, i.e. those that do NOT cluster with samples that coincide most closely with zones of high residual gravity.

All patterns reflect significant mafic rock contributions of Ca and Mg to groundwaters

CSIRO



The low NMg anomaly that was previously found to coincide with the general region of anomalous gravity, is confirmed by the samples from RC drill holes. The sharp boundary in NMg previously illustrated between GR6/GRW3 and GRW4 and 5 is confirmed by new data that supports the southern increase in NMg evident in the original bore water data. The RC NMg values also indicate an additional zone in the NW of rocks that are more felsic/less mafic than those that surround them.

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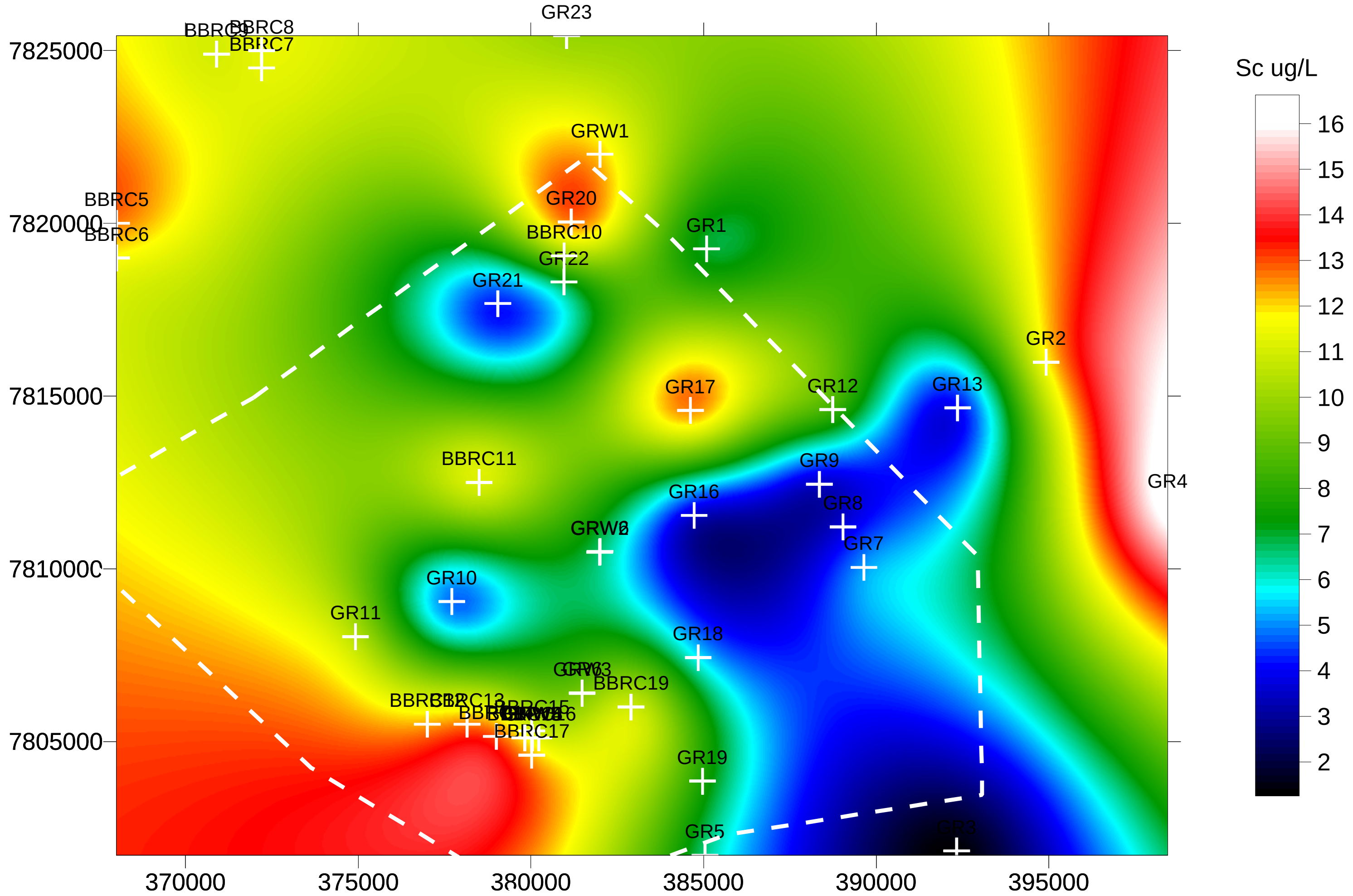
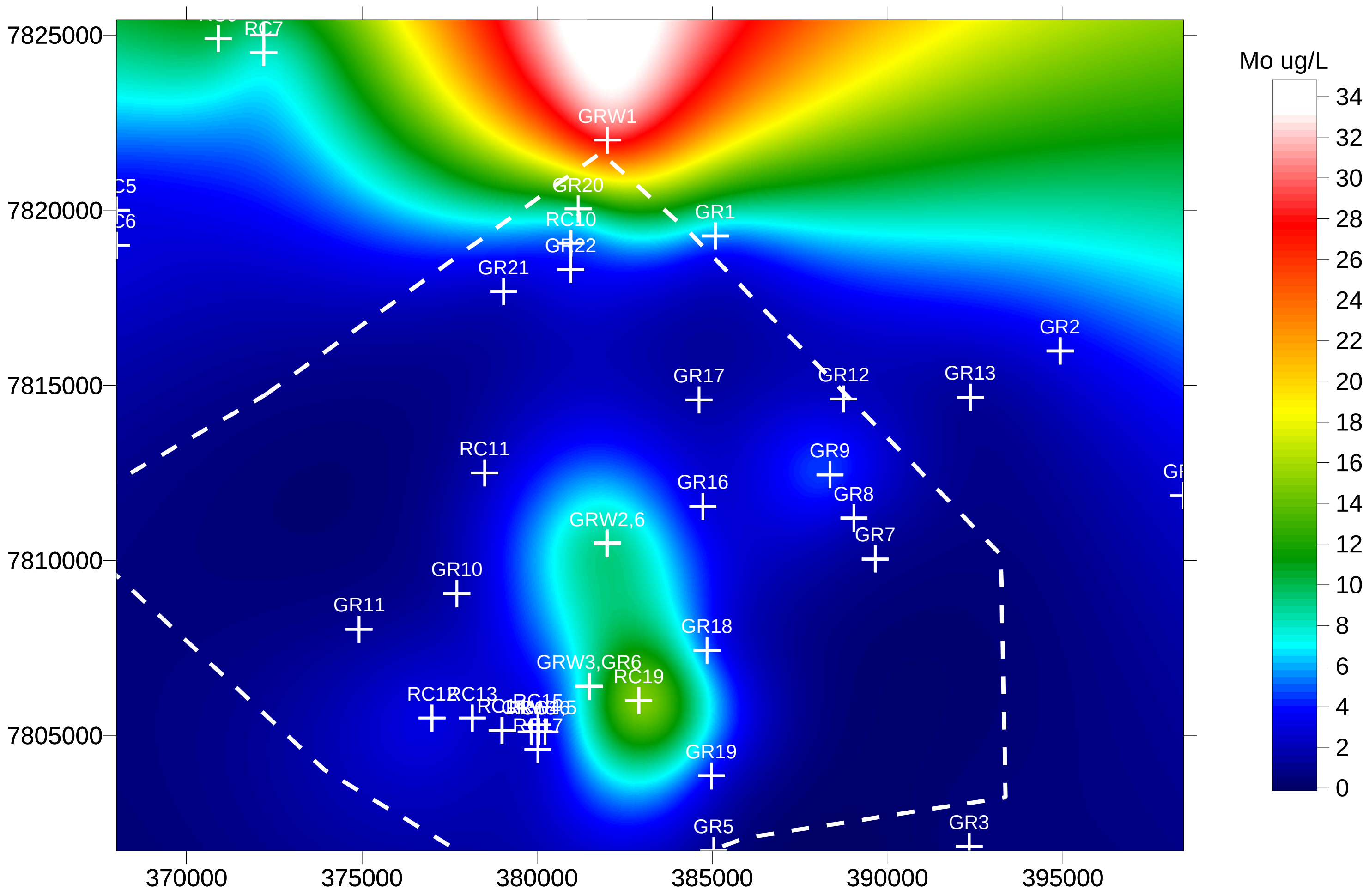
Characteristics of Aquifer Rocks

Indications from trace components.

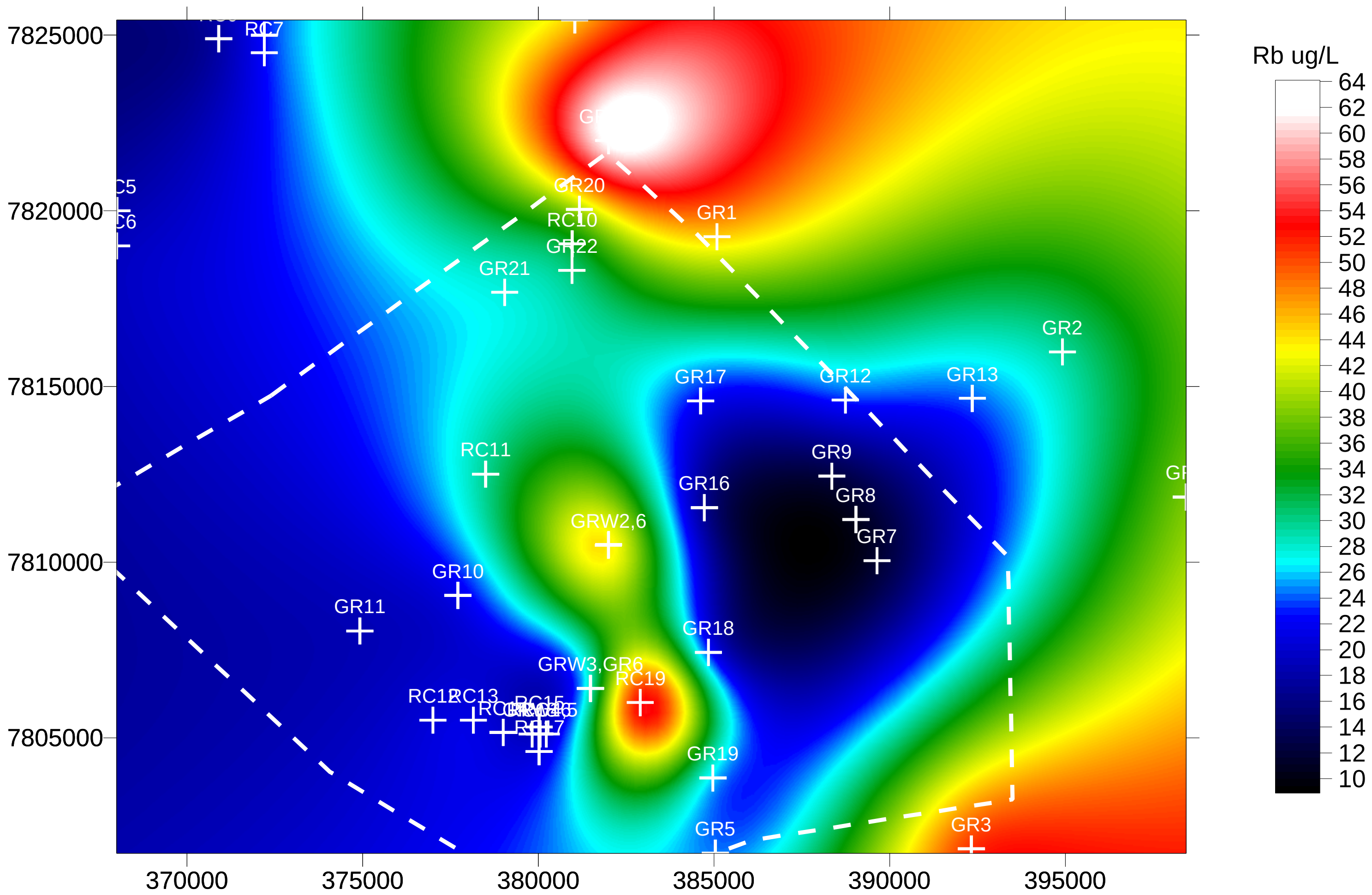
CSIRO



Scandium in groundwaters can be a good indicator to ferro-magnesian minerals in aquifer rocks. In this increased data set, although Sc still correlates overall at 95% confidence with NMg, the correlation is not uniform, suggesting more than one rock type in the sources of Sc. For example elevated Sc in groundwaters from the new RC holes in the NW is accompanied by low NMg and elevated U, Mo and F, a combination suggesting granites, pegmatites etc rather than rocks high in ferromagnesian minerals.



Elevated Mo in groundwaters from RC holes in the NW suggests that Mo values in GRW1 and GR23 were indicating a rock source of Mo north of the gravity anomaly. In the centre of the gravity anomaly, a lesser but locally significant elevation in groundwater Mo concentrations occurs.



Rubidium content of groundwaters from the additional RC drill-hole samples suggests that a north-south belt of rocks, that are locally more potassic, extends through the middle of the gravity anomaly. This belt has some locations where groundwaters also have elevated Mo.

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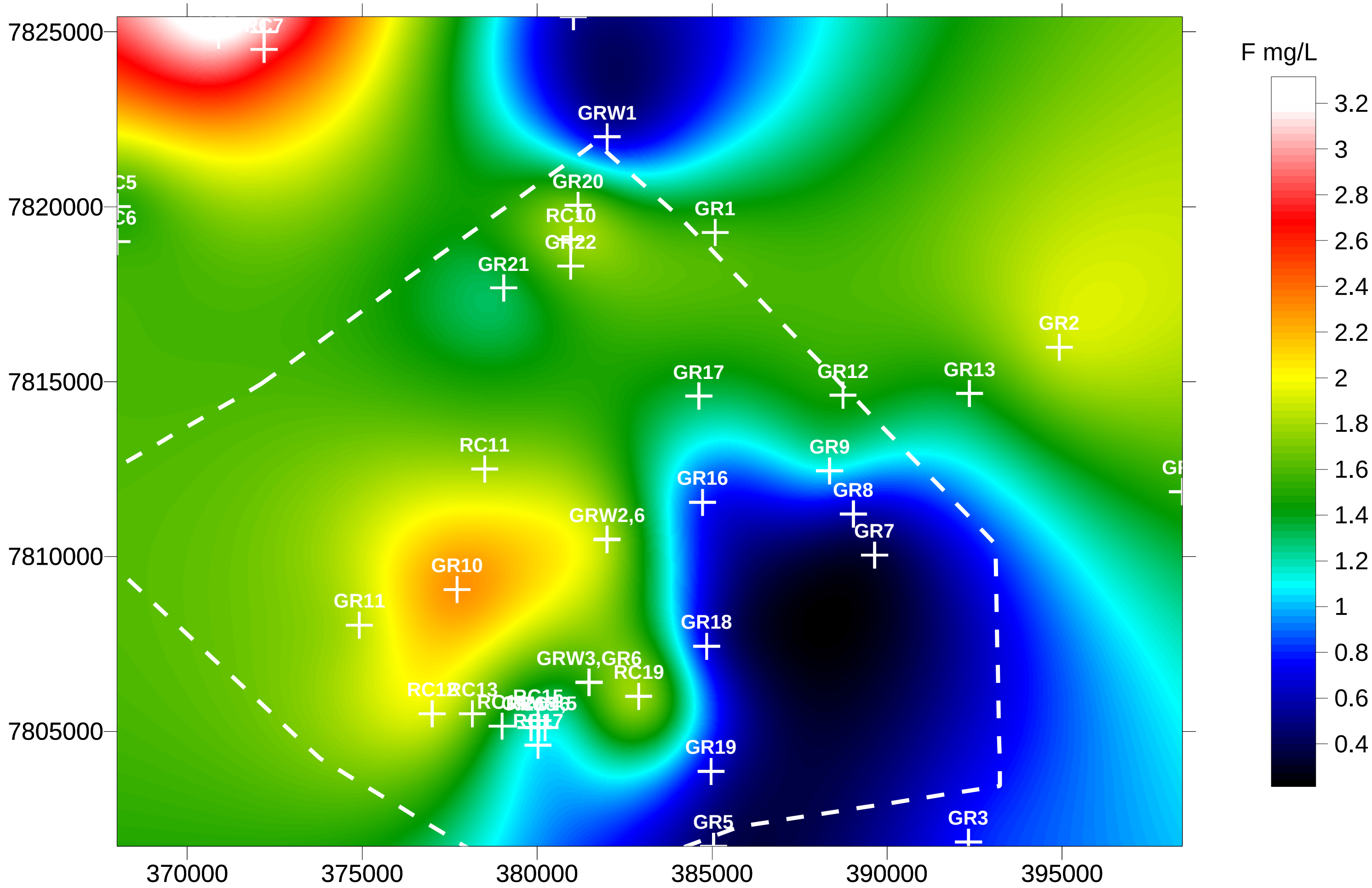
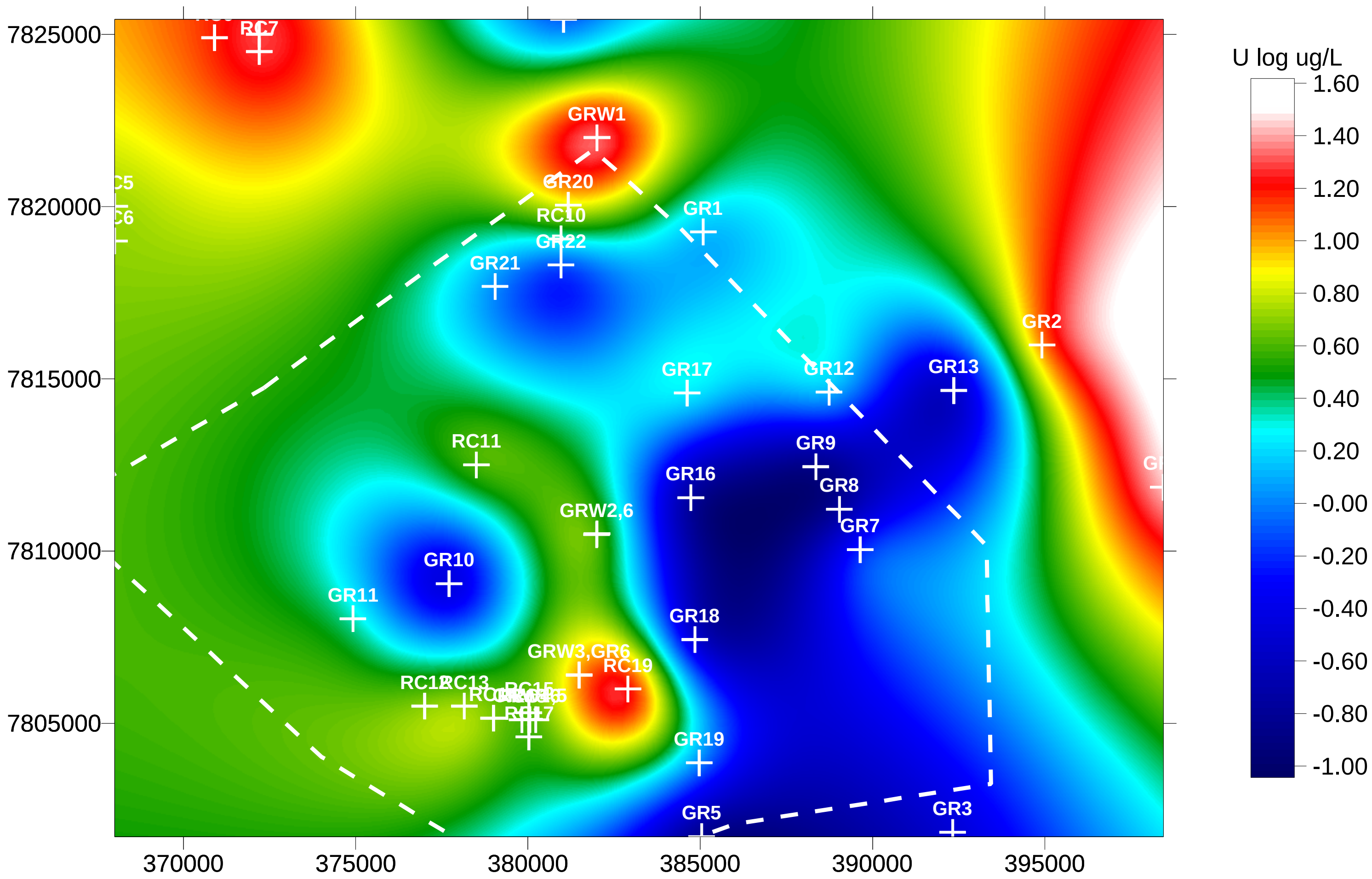


The new data do not change the previous conclusion that in general concentrations of F in groundwaters accord with locations of mapped sediments such as sandstones. A geochemically significant lithological boundary in the vicinity of GRW4 and 5 is supported by variations in F concentrations in groundwaters from the RC drill holes. Also, elevated F in groundwaters from the new RC drill holes in the NW suggest the possibility of local felsic igneous rocks.

CSIRO

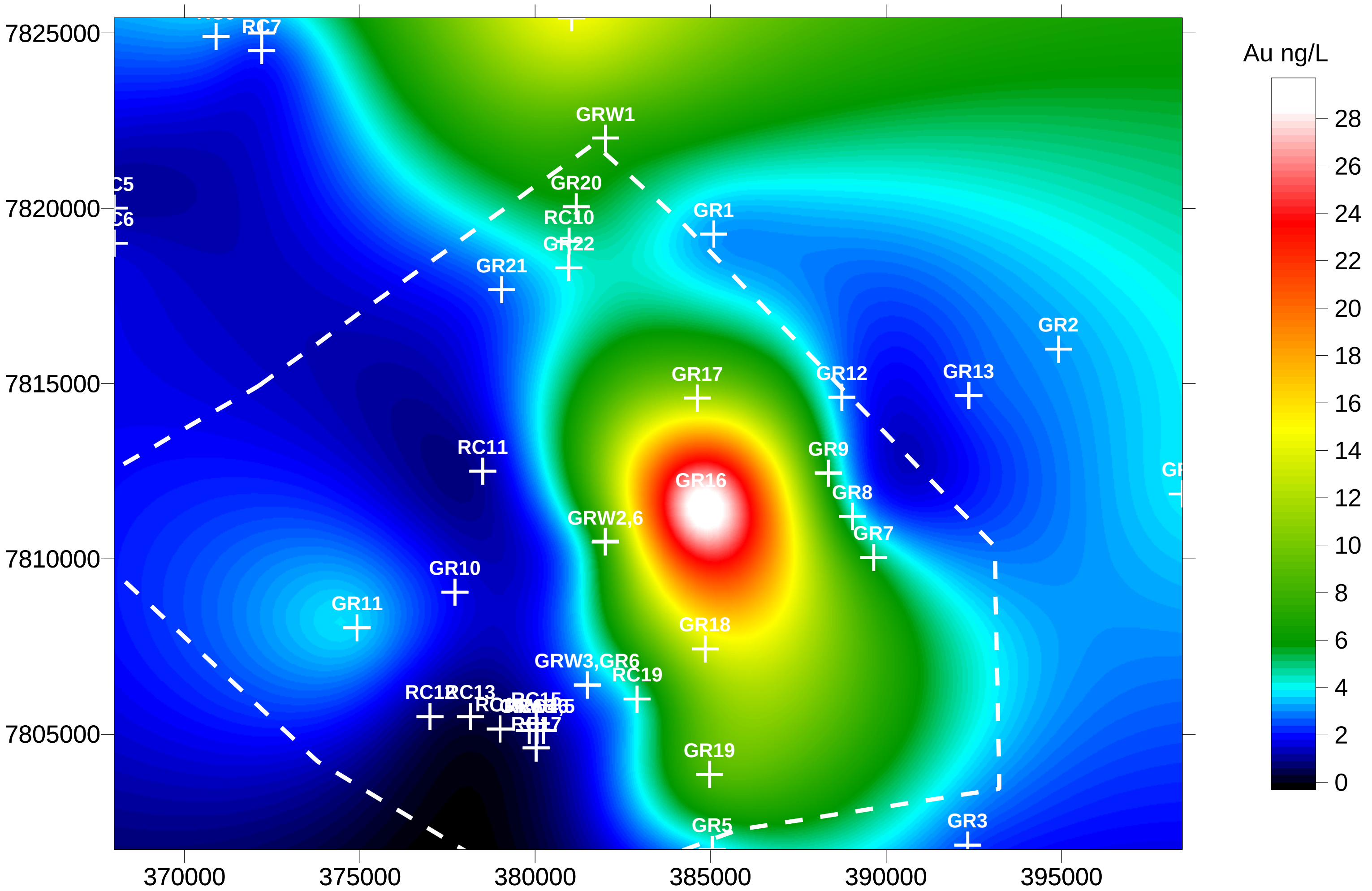


Concentration levels of uranium in Bluebush groundwaters suggest lithological boundaries within the gravity anomaly. Locations of groundwaters with elevated uranium, imply felsic igneous rocks. These zones can be further characterised by considering coincidently elevated F or Mo or Rb. Groundwaters from the new RC drill holes in the NW with co-leached fluorine suggest local granites or felsic volcanics, whereas the absence of fluorine in groundwater from GRW1 is similar to that observed in extremely uranium enriched groundwaters in the Short Range region north of Warrego.

Economic Mineral Indicators

Gold, Lead, Zinc, Copper,
Arsenic

CSIRO



Gold values in groundwaters from RC drill holes confirm the western boundary of the groundwater gold anomaly, evident from the previous study. Modest gold contents in BBRC6, 8, 9 and 10 support previous observations. Apart from GR16, gold values accord with sulphide sources rather than gold as a separate commodity.

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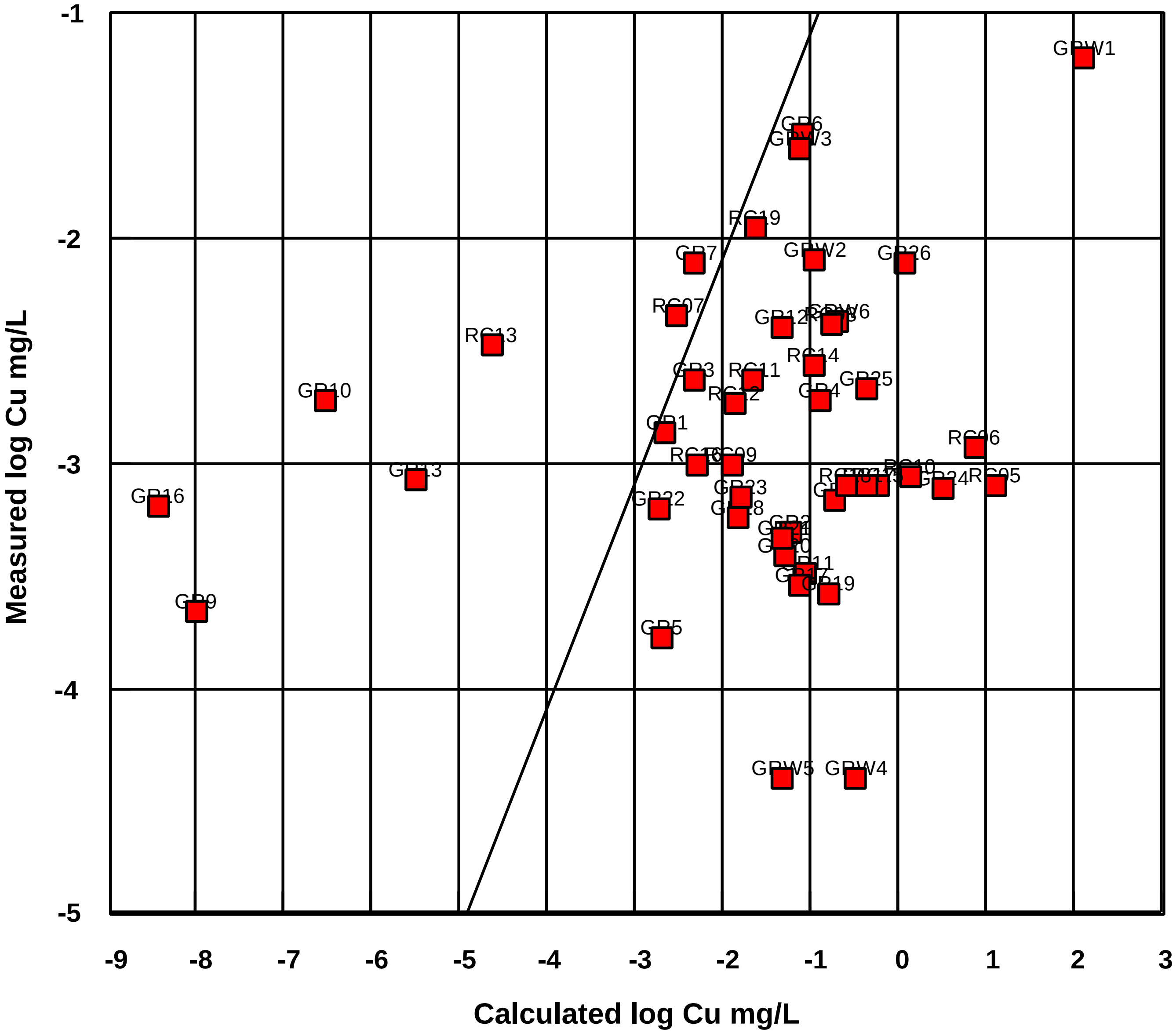

This plot compares measured concentrations of Cu in groundwaters with those calculated for a groundwater-rock system that includes oxidised Cu minerals. Illustrated are 7 samples in which the Cu content is high enough for the conclusion that Cu minerals are present. Two of these, BBRC7 and 13 are groundwaters from RC drilling.

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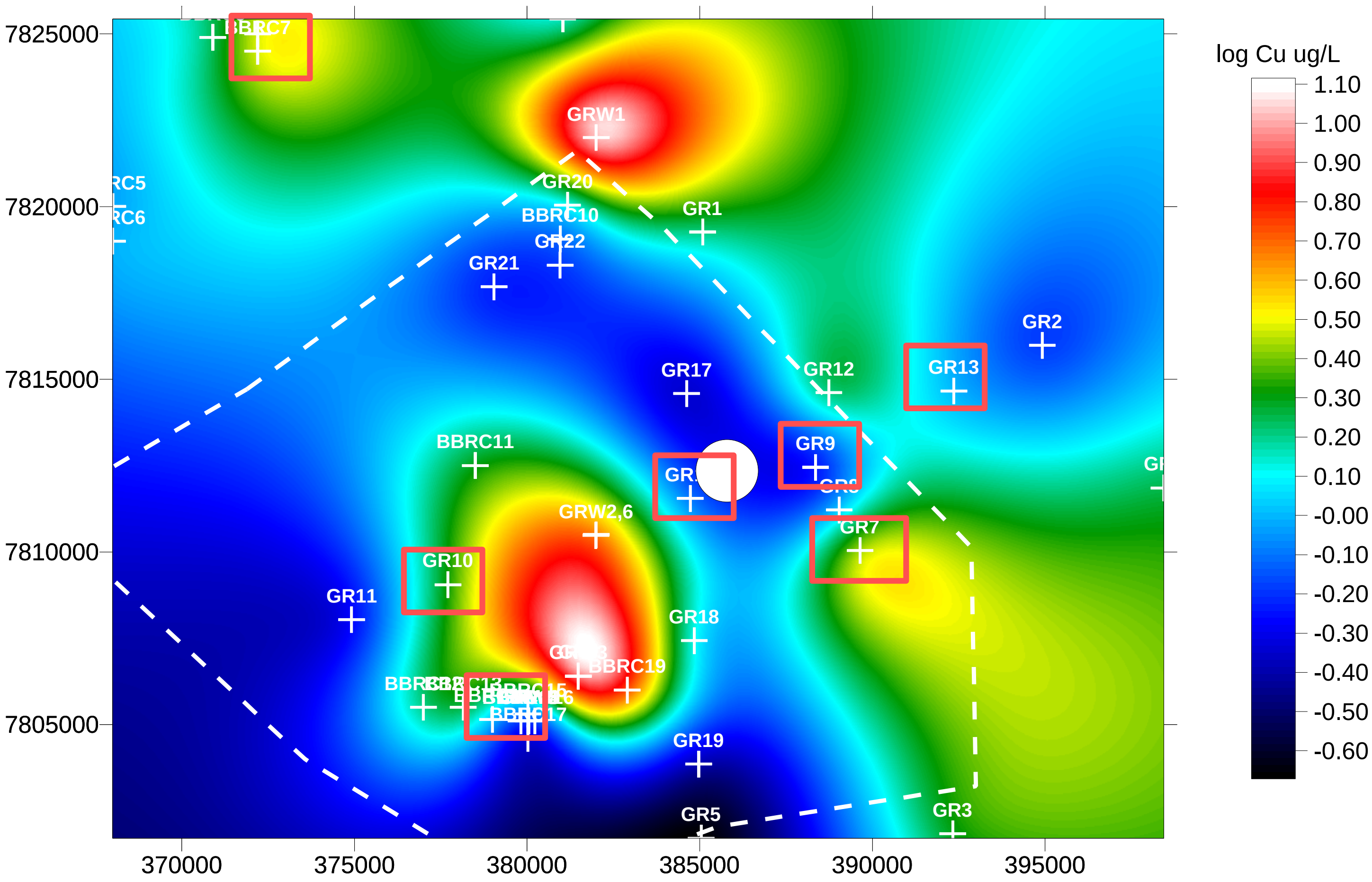
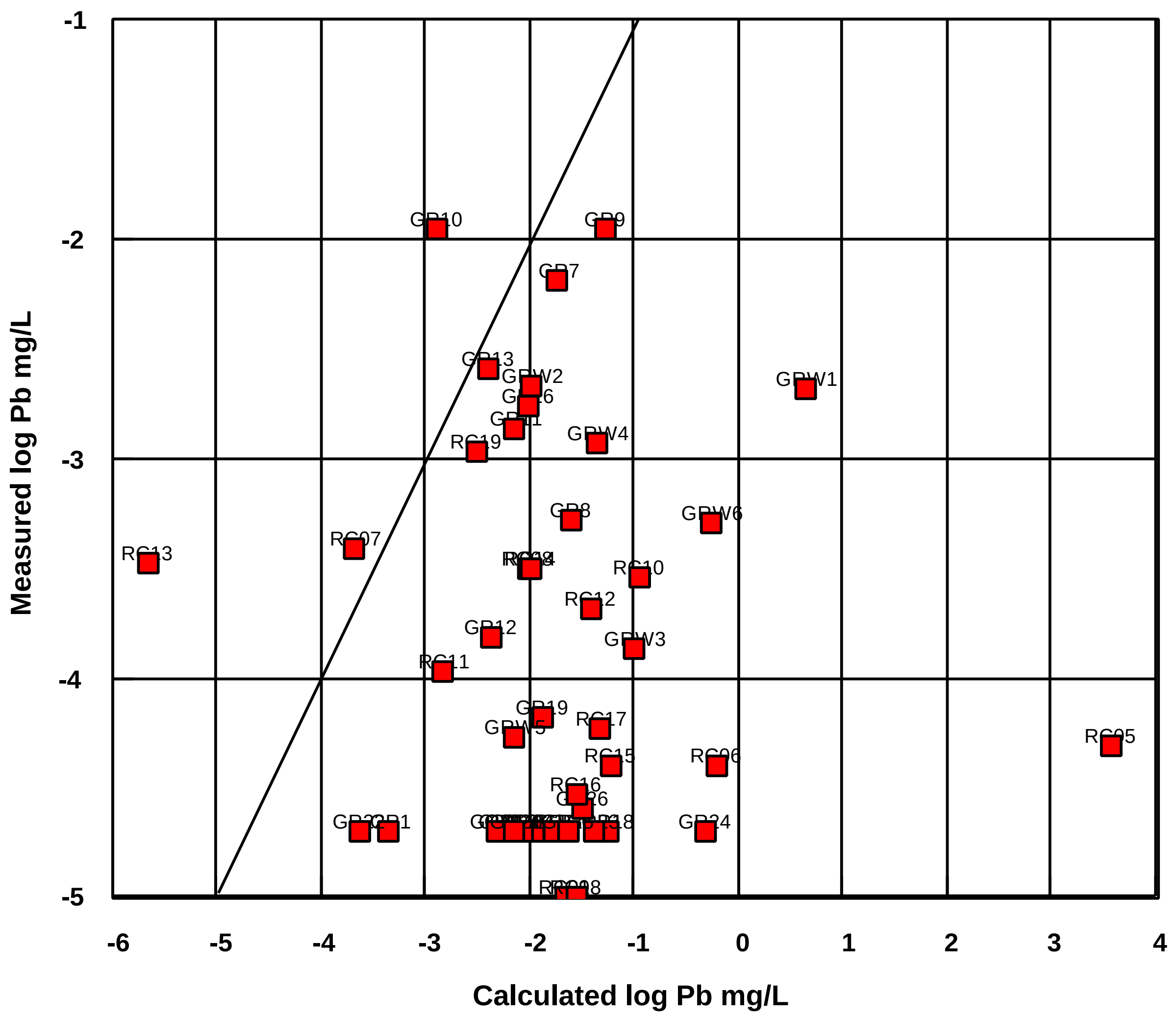
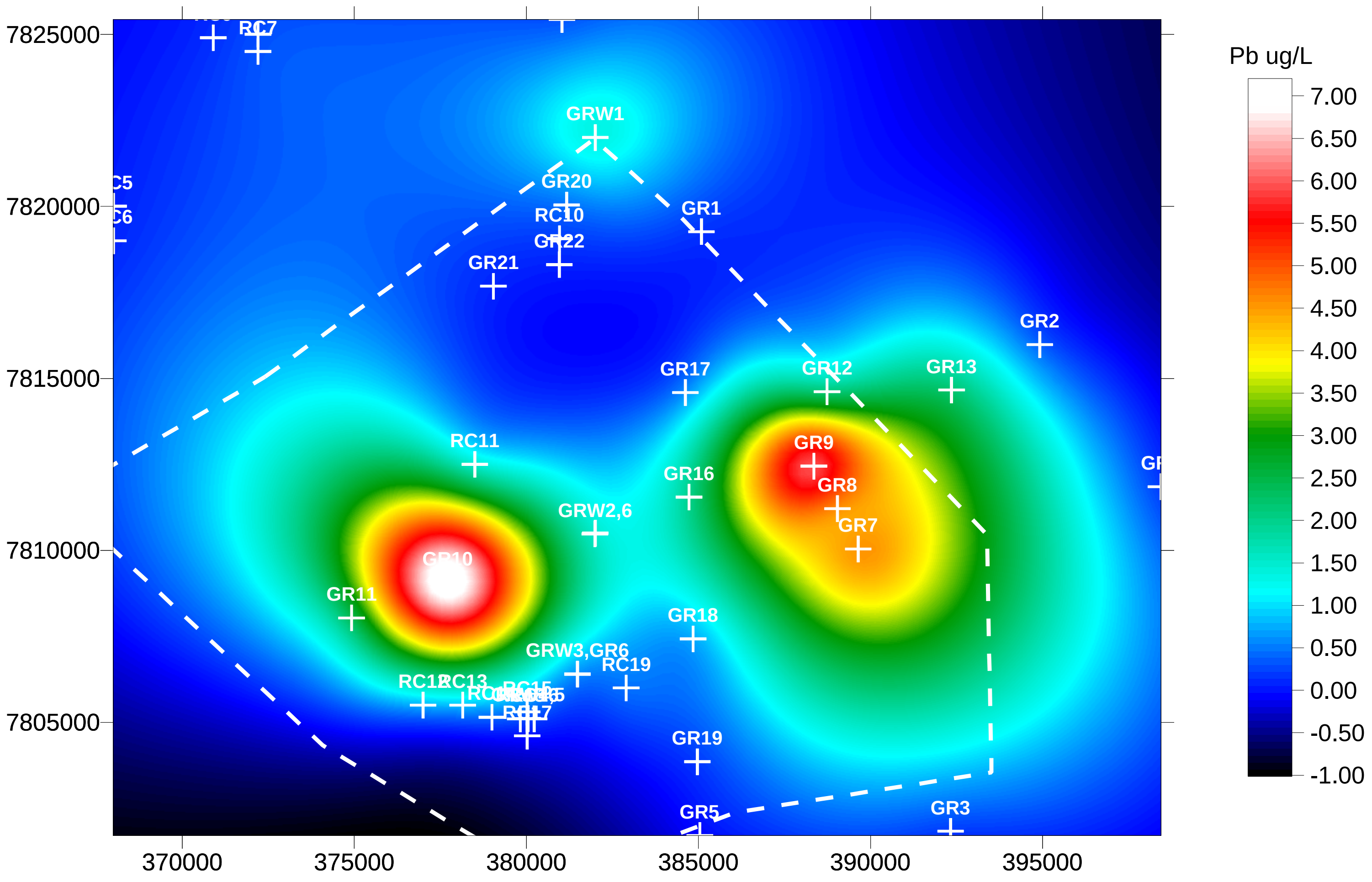


Copper values in groundwaters from RC drill holes support the possibility of a Cu source within the area bounded by GR10, GR6 and GRW2,6. Weight is added to this suggestion by the very modest values in GR10 and BBRC13 being actually higher than predicted if they were in contact with oxidised Cu minerals (indicated by red aquares). Other locations where modest Cu concentrations in groundwaters exceed that predicted for contact with Cu minerals suggest additional locations of Cu mineralisation that might not be evident from raw Cu data. Included is BBRC7 which may relate to elevated Cu in groundwater from GRW1.

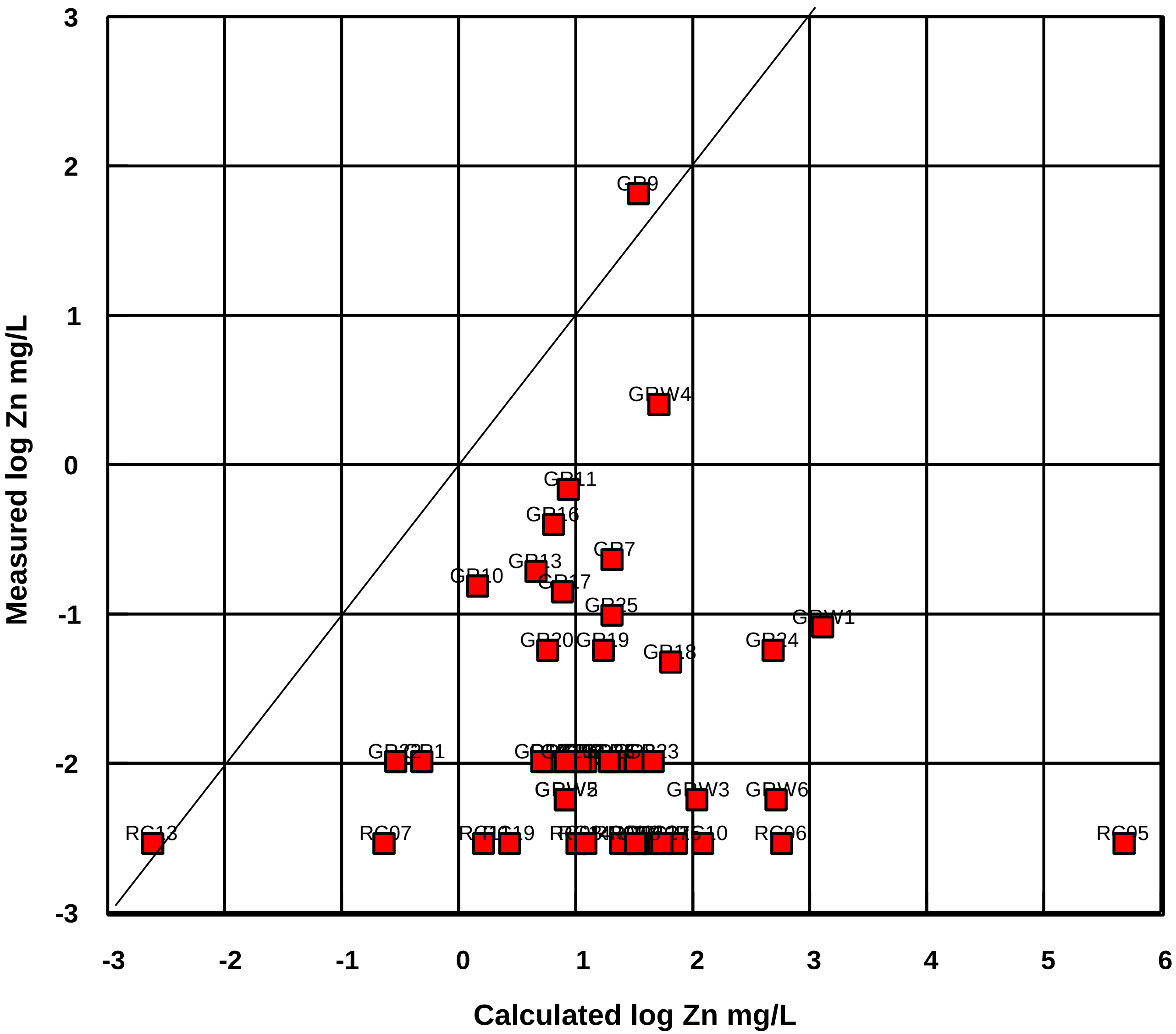


This plot compares measured concentrations of Pb in groundwaters with that calculated for a groundwater-rock system that includes oxidised Pb minerals. Illustrated are 3 samples in which the Pb content is high enough for the conclusion that Pb minerals are present. Two of these, BBRC7 and 13 are groundwaters from RC drilling.



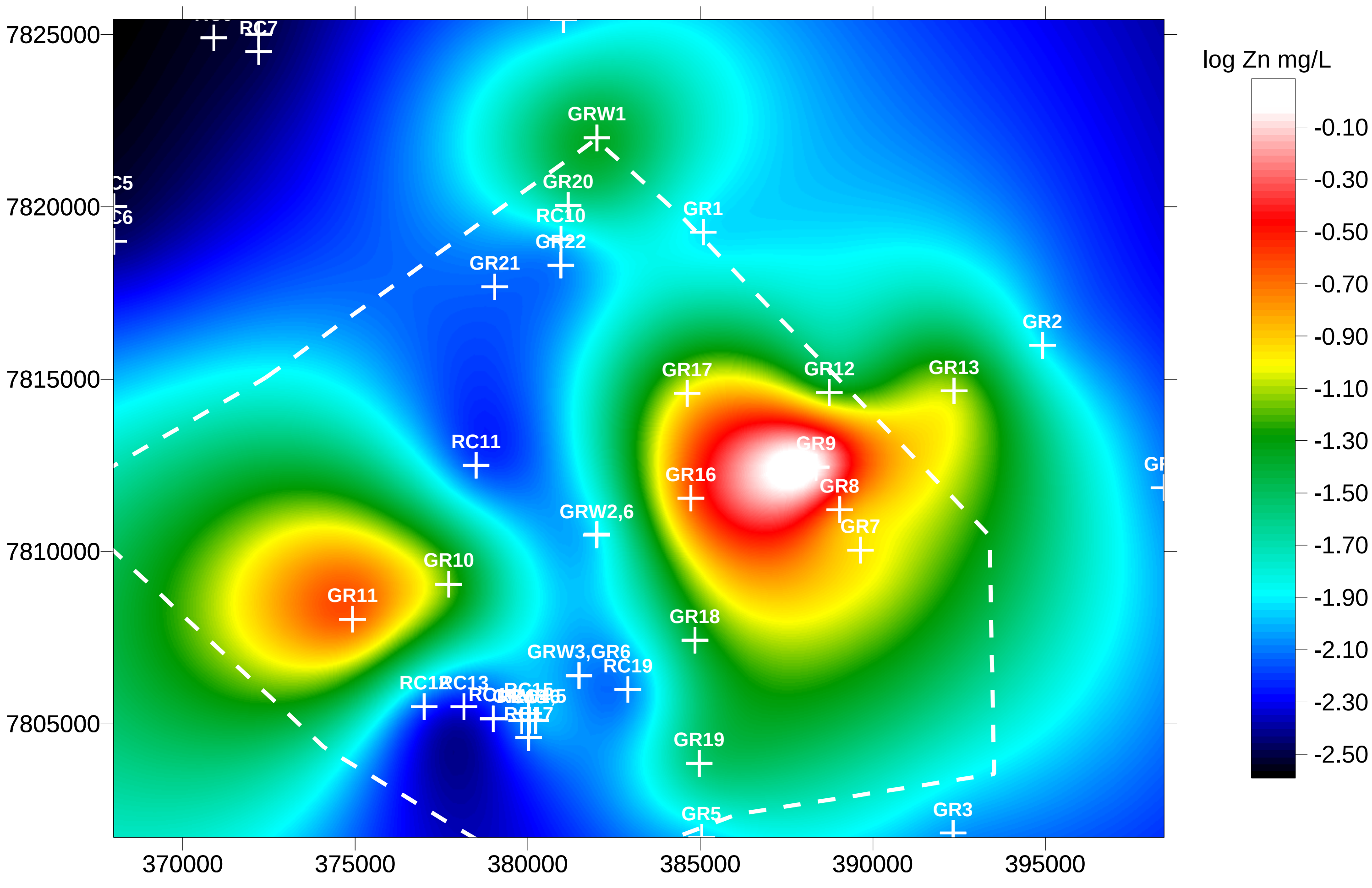
Although groundwaters in RC drill holes did not contain elevated concentrations of lead, 2 groundwaters, BBRC7 and 13, contained lead at concentrations indicative of oxidised lead ore minerals.

CSIRO



This plot compares measured concentrations of Zn in groundwaters with that calculated for a groundwater-rock system that includes oxidised Zn minerals. Illustrated are 2 samples in which the Zn content is high enough for the conclusion that Zn minerals are present. One of these, BBRC13 is a groundwater from RC drilling.

CSIRO



Although groundwaters in RC drill holes did not contain elevated concentrations of Zn, 1 groundwater, BBRC13, contained Zn at concentrations indicative of oxidised Zn ore minerals. This location is not close to any zones where groundwaters contain more obviously elevated Zn. These latter zones appear to flank the north-south belt of potassic rocks suggested by elevated Rb in groundwaters.

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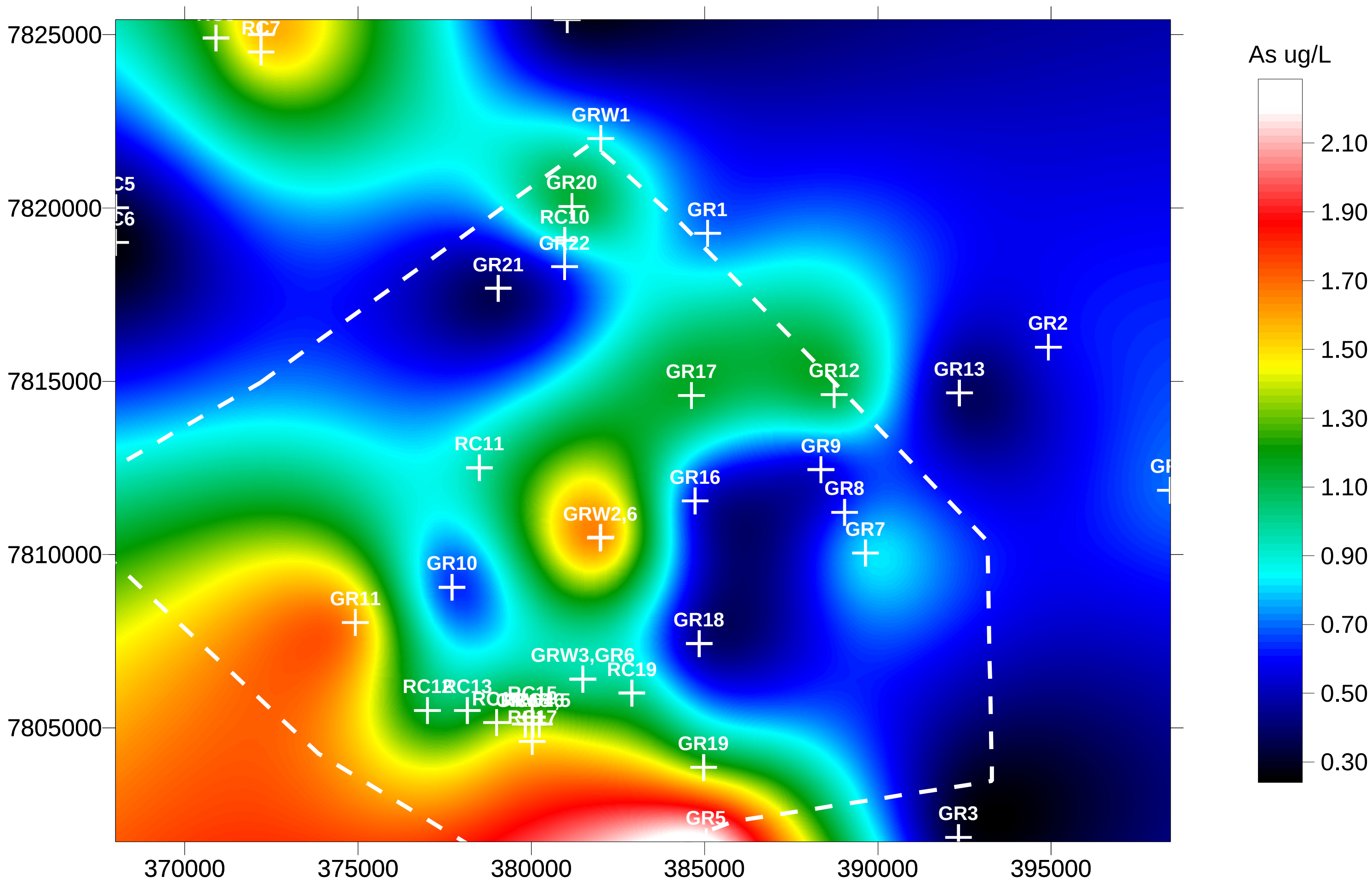
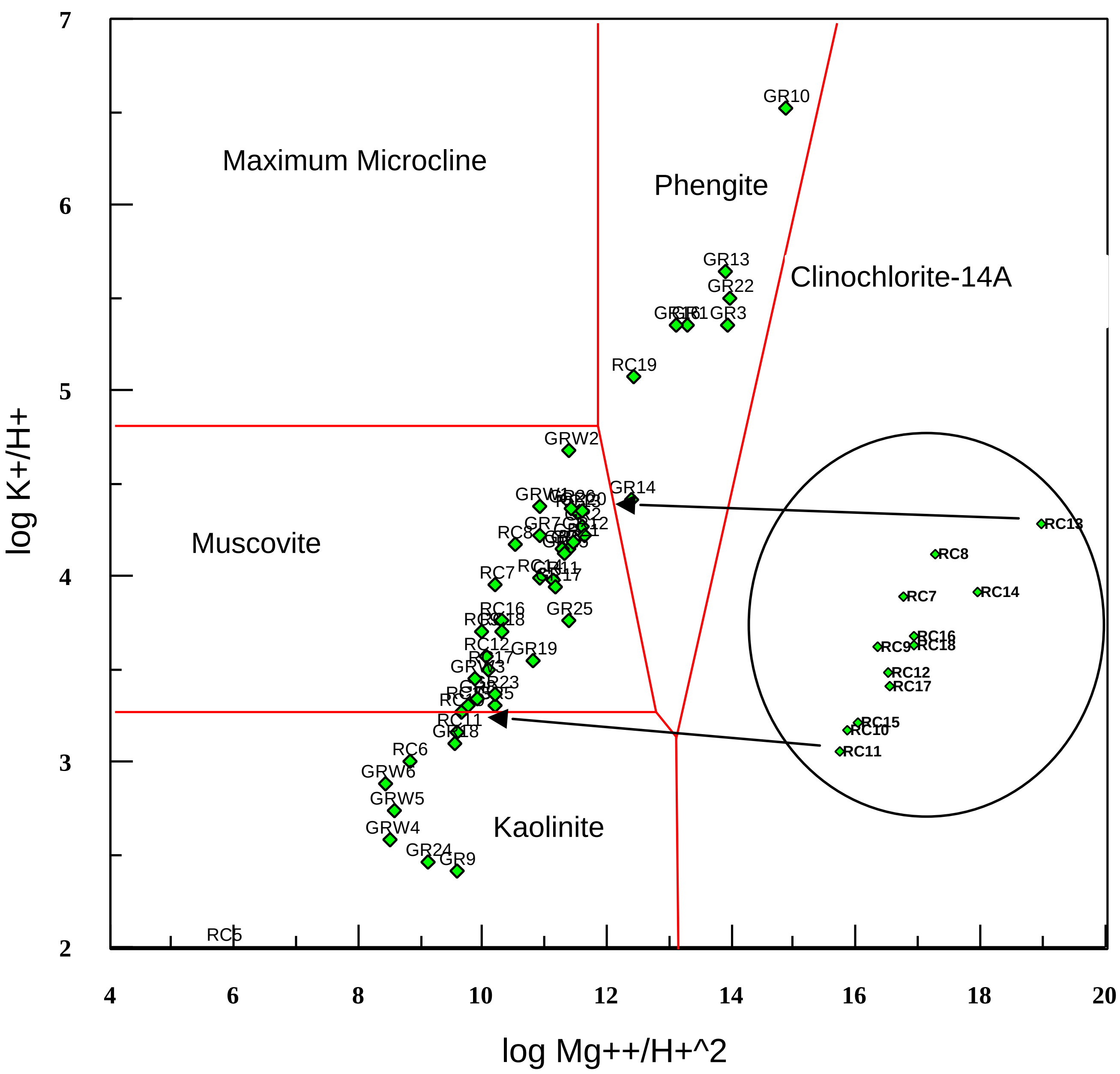


Apart from BBRC5 and 6, all groundwaters from RC drill holes contained modest concentrations of As that contribute to a regional pattern. However the values are too low to conclude their source to be significant quantities of nearby sulphide minerals. They might however be indicating deeper sources of As.

Silicate Mineral Stabilities

Indicated by compositions of groundwaters in RC drill holes.



Groundwaters from the RC drilling plotted on the relevant mineral stability field diagram, fit the same trend as the groundwaters from previous programs. Most new groundwaters plot in the Muscovite field. Groundwaters BBRC5 and 6 plot in the Kaolinite field whilst the most saline of the RC waters BBRC19 plots in the Phengite field.

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GIANTS REEF MINING LIMITED

Water Bore Geochemistry Log Sheet

Personel Steve Russell
Shaun Tracey

Date 29-Aug-01

ORIGINAL HOLE No	SAMPLE No	DRILL HOLE	DATE	EASTING (AGD84)	NORTHING (AGD84)	WATER LEVEL	SAMPLE DEPTH	Ph	Eh (mV)	AMBIENT TEMP	SAMPLE TEMP	CONDUCT mS,uS/cm	SALINITY ppk/ppm	CONTAM (oils etc)	BORE TYPE
O	**BBRCW005**	BBRC005	23/08/02	368005	7820005	9.1m	20m	4.42	592	31.8	30.4	725uS	352ppm	Slightly muddy sample	RC
P	**BBRCW006**	BBRC006	23/08/02	368000	7819000	6.2m	20m	5.97	610	33	31	886uS	436ppm		RC
L	**BBRCW007**	BBRC007	23/08/02	372200	7824500	8m	18m	6.80	920	26	27.1	2273uS	1165ppm		RC
K	**BBRCW008**	BBRC008	23/08/02	372200	7825000	7.5m	18m	6.92	559	26.9	29.5	2887uS	1480ppm		RC
Y	**BBRCW009**	BBRC009	23/08/02	370900	7824900	7.7m	11m	6.84	246	28.3	30.1	1843uS	934ppm		RC
R	**BBRCW011**	BBRC011	27/08/02	378500	7812500	8.5m	18	6.29	1170	31.7	31	1440uS	725ppm		RC
V	**BBRCW012**	BBRC012	27/08/02	377000	7805500	6m	16m	6.67	228	35.1	31.6	1636uS	822ppm		RC
W	**BBRCW013**	BBRC013	27/08/02	378150	7805500	5.7m	16m	7.31	911	30.4	30.7	2345uS	1207ppm		RC
X	**BBRCW014**	BBRC014	27/08/02	379000	7805150	5.9m	16m	7.05	302	29.9	30.5	1907uS	963ppm		RC
Y	**BBRCW018**	BBRC018	28/08/02	379825	7805105	5.9m	16m	6.76	482	36.9	32.5	834uS	401ppm		RC