

Processing of
Airborne Geophysical Data
over
EL 18/2011 (Heemskirk Project)
for
Minrex Resources NL.

October 2012

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Author : Phil Muir
Client contact : Geoff Booth

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Map coordinates

Unless noted otherwise, coordinates in this report are MGA55 (datum: GDA94, projection: Map Grid of Australia zone 55)

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1. Introduction

This report examines airborne geophysical data flown by Mineral Resources Tasmania in 2001. The “Western Tasmania, Area C” regional magnetic and radiometric survey covers a large portion of NW Tasmania, which includes complete coverage of Minrex’s Heemskirk Project exploration licence (EL 18/2011). The survey comprises east-west flight-lines, spaced 200 m apart, flown at a nominal, 80 m ground clearance. Geochemical assay results from a recently completed rock chip and stream sediment survey (Allen, 2012) are used in this report to provide a basic framework against which to assess this state-issued geophysical data.

2. Regional Setting

2.1. Geology - regional

The Devonian Heemskirk Granite outcrops along the coast between Trial Harbour and Granville Harbour. It extends inland approximately half way to the town of Zeehan, before gently dipping into a broad east-oriented ridge, reaching a depth of two - four kilometres in the Zeehan District (Leaman and Richardson, 1989). It comprises a layered biotite granite (“red”), intruded by late muscovite granite (“white”), with tin mineralisation typically associated with the latter white phase. Irregularities in the granite’s overall geometry are thought to control much of the mineralisation in the Zeehan district (Leaman and Richardson, 1989) and regionally.

EL 18/2011 lies wholly within the Heemskirk Granite outcrop; white granite occupies the western two-thirds of the EL, while the eastern third is underlain by red granite. Figures 1- 3 illustrate local geology, with symbol overlays depicting Minrex rock and stream sediment results for Tin (Sn), Tungsten (W) and Molybdenum (Mo).

2.2. Magnetics - regional

Regionally, the Heemskirk Granite is an area of comparatively low magnetic relief, bounded by a strong magnetic aureole in surrounding country rock. This magnetic pattern is typical of ilmenite-bearing granites with which tin deposits are frequently associated, and is comparable to other mineralised intrusions observed locally (Webster, 1984a).

Larger tin deposits in northwest Tasmania are associated with prominent magnetic anomalies in close proximity to each deposit, located peripherally to granitic intrusions within their magnetic aureoles (Webster, 1894a).

The area covered by EL 18/2011 is all underlain by granite. Based on historical occurrences deposits within the Heemskirk Granite are generally vein-hosted, forming small high-grade bodies less than 300m along strike (Allen, 2012).

Given the low magnetic relief within the granite, the likely size of a deposit and the 200 m aeromagnetic flight-line spacing, any magnetic response directly associated with mineralisation is likely to be both small and subtle.

2.3. Radiometrics - regional

Regionally, the Heemskirk Granite outcrop is defined by a stronger radiometric signal when compared with surrounding country rock. Its eastern half (red granite) exhibits a significantly higher radiometric signal when compared with its western half (white granite). Individual drainage channels near the coast have stronger radiometric signals, as does all coastline between Trial and Granville Harbours. Such observations are consistent with selective erosion from radiometrically active portions of the granite, with subsequent accumulation in local drainages and distribution along the adjacent coastline.

3. Magnetics

The magnetic signal (TMI; total magnetic intensity) over the Heemskirk Granite is low when compared with the high signal (the magnetic aureole) of surrounding areas. The western white granite has an extremely flat magnetic appearance that contrasts markedly with stronger magnetic activity in the eastern red granite (Figure 4).

Wells (1978) reports tin-bearing granite in the South Heemskirk Tin Field contains small concentrations of magnetite, which are absent in barren granite. As tin mineralisation is typically associated with the white granite, this raises the possibility that subtle magnetic variations in the white granite may correlate with tin mineralisation. This likelihood reinforces the need to process and interpret the aeromagnetic data with care, whilst attempting to detect such variations. A data processing technique called “Tilt Derivative” is a useful method for enhancing subtle features in the magnetic data. This technique acts like an Automatic Gain Control (AGC) filter by visually balancing the weak and strong signals across the dataset, and has been applied to the TMI magnetic data with the following results (Figure 5):

- (a) Magnetic anomalies are better resolved across the red granite.
- (b) Distinct magnetic features appear in the white granite.
- (c) Subtle magnetic noise is also enhanced and should not be interpreted as real geological features; examples of these artefacts occur in the marine coverage, and can be observed in magnetically-subdued terrestrial areas.

Within the white granite, one of the most prominent Tilt-enhanced features is a north-northwest to south-southeast trending zone about 3 km in strike, which traverses close to the “Fisher And Smith’s Section Working” deposit. If Wells’ (1978) conjecture regarding magnetite in tin-bearing granite is correct, then this 3 km zone is likely to be prospective for high-grade vein-hosted deposits. Significantly, this same zone runs sub-parallel to the contact between coarse and fine-grained phases of the white granite (Figure 1).

Significantly, a small north-northeast to south-southwest striking splay off this zone plots about 200m to the west of Fisher And Smith’s Section Working. In recent field work, Allen (2012) noted two proximal shafts were sunk on a sub-vertical fine-grained quartz- tourmaline vein, intruded along a similar strike. With its location and parallel structure, it is tempting to speculate that subtle magnetite enrichment associated with the vein has been detected by this aeromagnetic survey.

In other areas of the white granite, comparable magnetic features are observed, including a 1.5 km long Tilt-enhanced anomaly near the Peripatetic mine, together with subtle zones to the west and south of Fisher And Smith’s Section Working. At this stage, the significance of all these weaker zones remains unknown however these may prove useful exploration vectors in future surveys.

4. Radiometrics

Some locally elevated radiometric readings correlate with parts of the drainage system and can be explained by deposition of eroded material from the potassic red granite (Figure 8); examples include the South Gap, Granite, Gap and St. Dizier Creeks, together with an unnamed creek between the Peripatetic Mine and the coast. Positive correlation is also observed between increased radiometrics and topographic highs; in lower topographic areas the radiometric signal is typically dampened by thicker surficial cover.

However near North Heemskirk Spur and Gap Peak the maximum radiometric readings are offset to the northwest from the local topographic high and approach twice the readings of other parts of the Spur and Gap Peak. This SSE trending anomaly differs from the SE trending topography so appears to be reflective of local compositional changes within the granite, which may prove useful in follow-up exploration programs.

In the radiometric data near Fisher And Smith's Section Working there is a discrete area of high readings located about 200m to the west of the Working. This appears to be exactly coincident with the small splay in the Tilt-enhanced magnetic data.

A useful benchmark in radiometric analysis is the uranium-to-thorium ratio, with Hoover et.al. (1992) observing that for tin skarn and related deposits "high uranium or high thorium often are keys to enriched parts of [the granite] pluton". Collins et.al. (1981) undertook spectrometer measurements on outcrops of Tasmanian granites, including the Heemskirk Granite, discovering quartz-topaz-tourmaline greisen alteration in the latter with generally low uranium to thorium ratios.

Current U/Th ratio analysis (Figure 7) outlines a broad (1 - 2 km wide) and somewhat diffuse zone of low U/Th ratios stretching across northern section of EL 18/2011, encompassing historic deposits such as McGuinness, Fisher And Smith's Section Working, and Peripatetic. Whereas such U/Th signatures may not be suitable for defining discrete greisen mineralisation, they may be indicative of more highly prospective terrain.

5. Discussion and Conclusions

Recent selective rock and stream sediment sampling by Allen (2012) at Heemskirk was not intended to be comprehensive; geochemical assay data compiled in Figures 1-2 is only indicative of what may follow in a more systematic and unbiased sampling programme. This existing geochemistry data is not suitable for drawing reliable conclusions about the relationship between mineralisation and the geophysical observations.

Apart from the small area immediately to the west of the Fisher And Smith's Section Working deposit with overlapping Tilt-enhanced magnetic and radiometric anomalies, the processing and analysis of government airborne geophysical data has not generated any discrete targets of note.

Since the ability to resolve small (i.e. <300m) strike-length targets is limited by the flight line spacing of the existing airborne data, mineralisation of the variety sought may only appear as minor spikes across 1 or 2 flight lines. In the course of follow-up exploration activity, more detailed and possibly lower altitude airborne surveys may prove to be useful in target discrimination.

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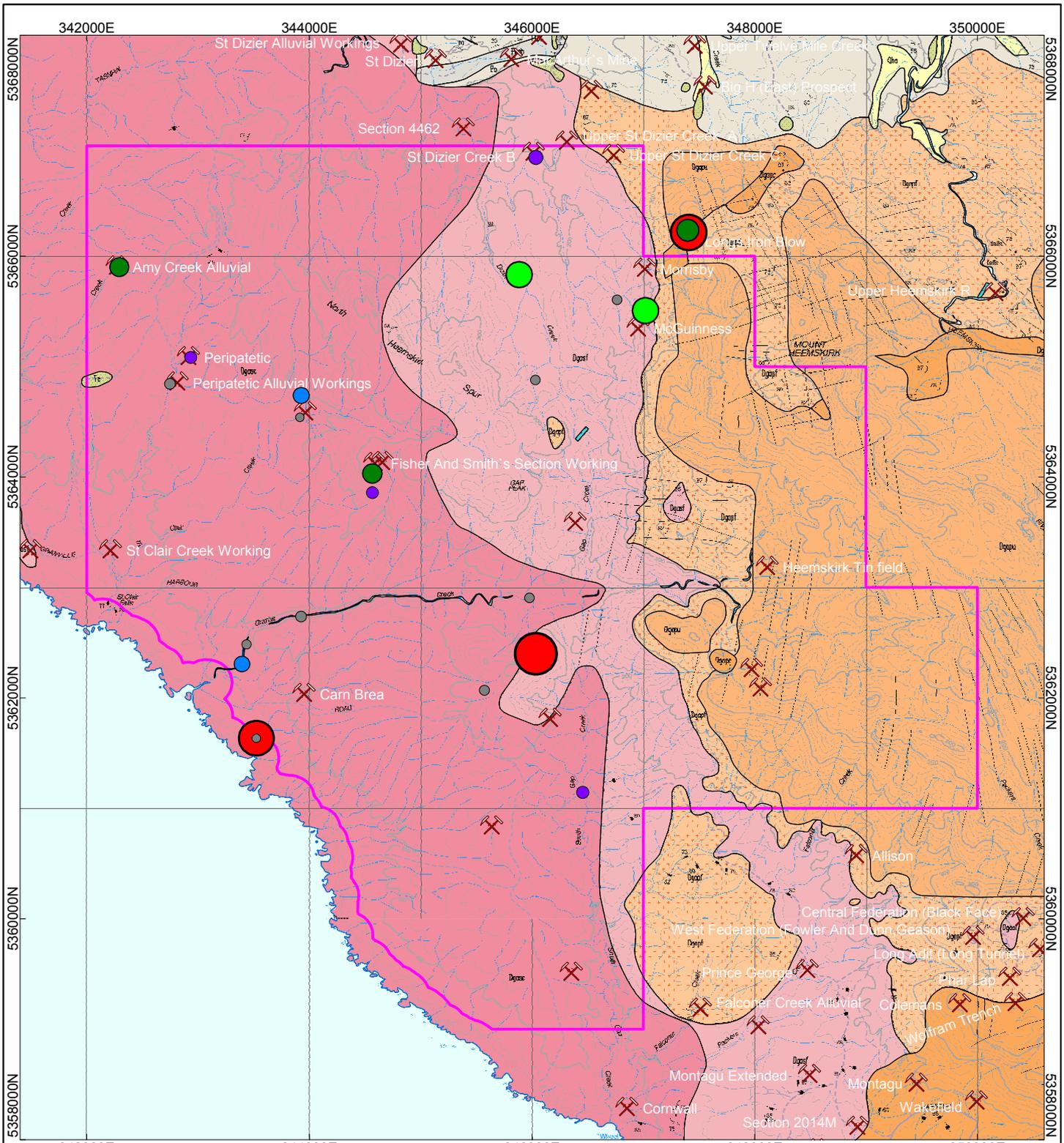
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geology from 1:25k scale
Mineral Resources Tasmania
digital geology series data

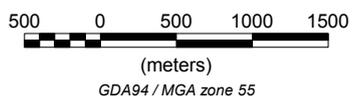
tenement boundary
 historic mine

DEVONIAN	Dgasc	Coarse-grained, leucocratic, equigranular biotite granite/adamellite with sparse to common patches and nodules of quartz-tourmaline (Dgasc).
	Dgasf	Fine- to medium-grained, leucocratic, equigranular to porphyritic (feldspar and quartz) biotite alkali-feldspar granite/granite with sparse to common patches and nodulus of quartz-tourmaline (Dgasf).
	Dgapf	Fine- to coarse-grained generally porphyritic (feldspar and quartz), pink, biotite granite/adamellite. Variably developed patches and nodules of quartz-tourmaline (Dgapf).
	Dgappc	Coarse- to very coarse-grained, equigranular, pink biotite granite/adamellite. Variably developed sparse patches and nodules of quartz-tourmaline (Dgappc).

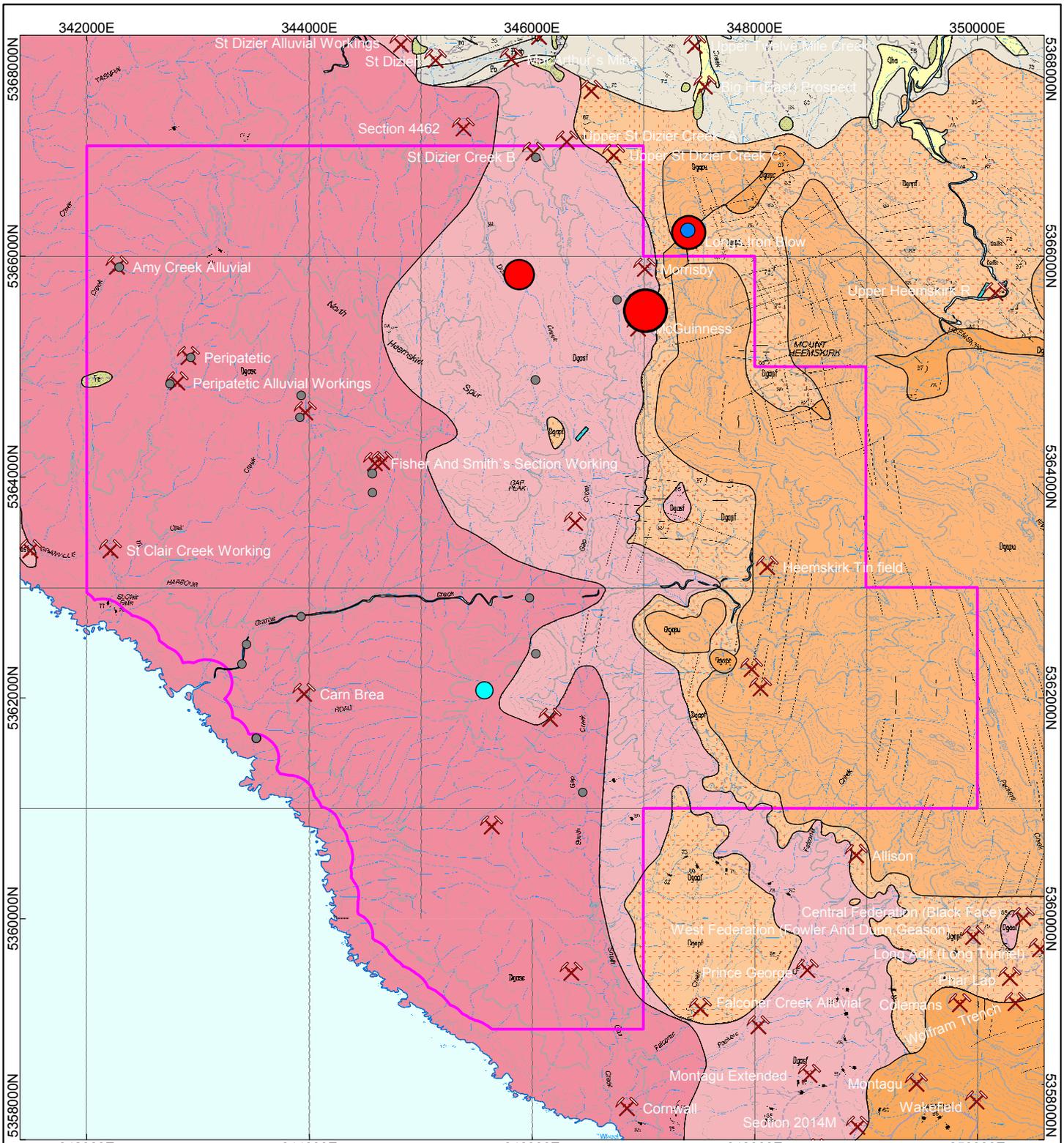
Sn ppm

	> 7
	6 - 7
	5 - 6
	4 - 5
	2 - 3
	1 - 2
	< 1

Figure 1



Geochemistry - Tin
stream sediment and rock sampling
Heemskirk Project



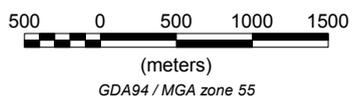
geology from 1:25k scale
Mineral Resources Tasmania
digital geology series data

tenement boundary
 historic mine

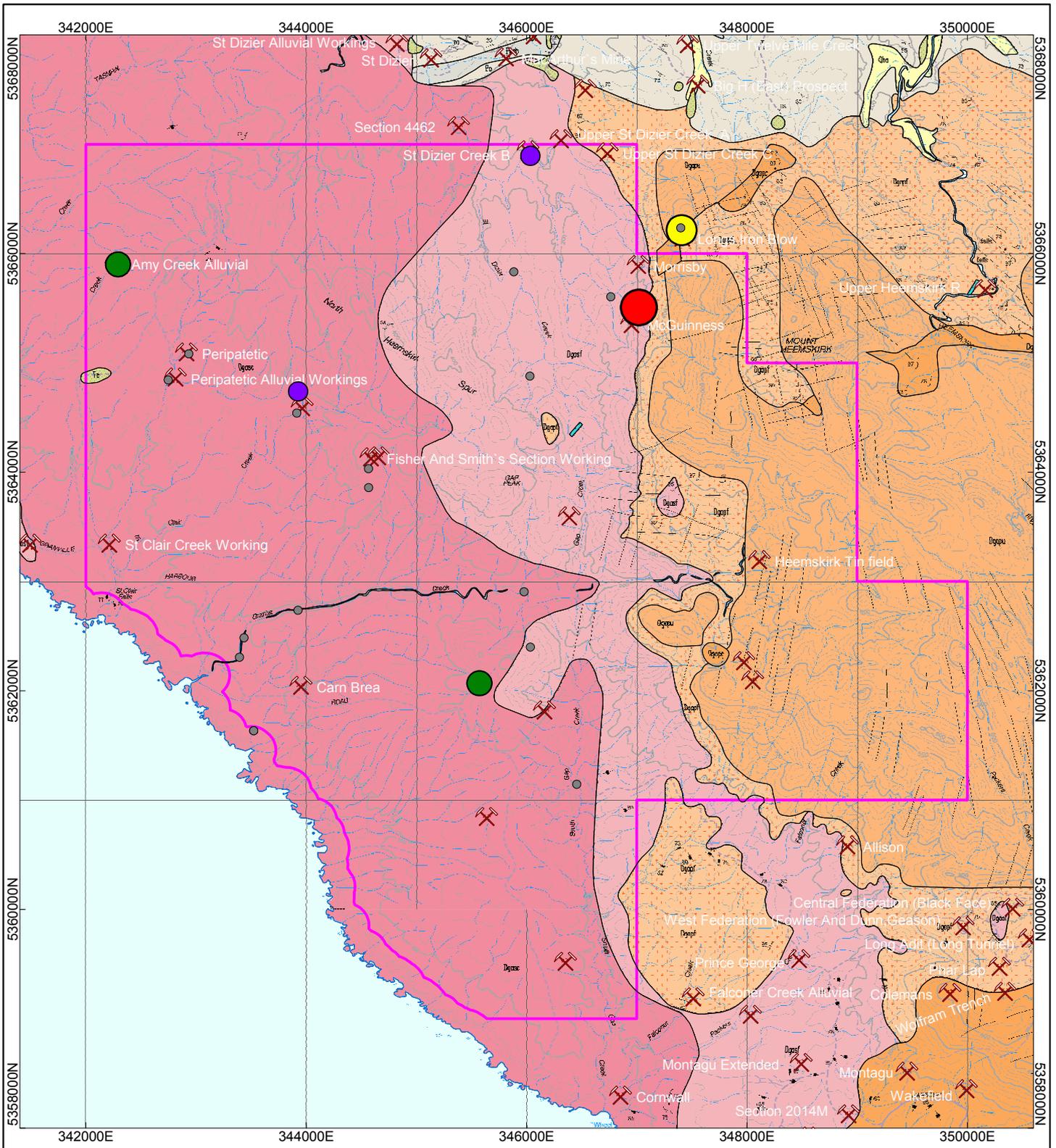
DEVONIAN	Dgasc	Coarse-grained, leucocratic, equigranular biotite granite/adamellite with sparse to common patches and nodules of quartz-tourmaline (Dgasc).
	Dgasf	Fine- to medium-grained, leucocratic, equigranular to porphyritic (feldspar and quartz) biotite alkali-feldspar granite/granite with sparse to common patches and nodulus of quartz-tourmaline (Dgasf).
	Dgapf	Fine- to coarse-grained generally porphyritic (feldspar and quartz), pink, biotite granite/adamellite. Variably developed patches and nodules of quartz-tourmaline (Dgapf).
	Dgapc	Coarse- to very coarse-grained, equigranular, pink biotite granite/adamellite. Variably developed sparse patches and nodules of quartz-tourmaline (Dgapc).

W ppm	Color
> 70	Red
60 - 70	Orange
50 - 60	Yellow
40 - 50	Green
30 - 40	Cyan
20 - 30	Blue
10 - 20	Purple
< 10	Grey

Figure 2



Geochemistry - Tungsten
stream sediment and rock sampling
Heemskirk Project



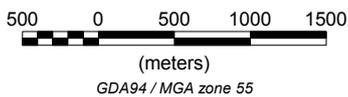
geology from 1:25k scale
Mineral Resources Tasmania
digital geology series data

tenement boundary
 historic mine

DEVONIAN	Dgasc	Coarse-grained, leucocratic, equigranular biotite granite/adamellite with sparse to common patches and nodules of quartz-tourmaline (Dgasc).
	Dgasf	Fine- to medium-grained, leucocratic, equigranular to porphyritic (feldspar and quartz) biotite alkali-feldspar granite/granite with sparse to common patches and nodulus of quartz-tourmaline (Dgasf).
	Dgafp	Fine- to coarse-grained generally porphyritic (feldspar and quartz), pink, biotite granite/adamellite. Variably developed patches and nodules of quartz-tourmaline (Dgafp).
	Dgapu	
	Dgpc	Coarse- to very coarse-grained, equigranular, pink biotite granite/adamellite. Variably developed sparse patches and nodules of quartz-tourmaline (Dgpc).

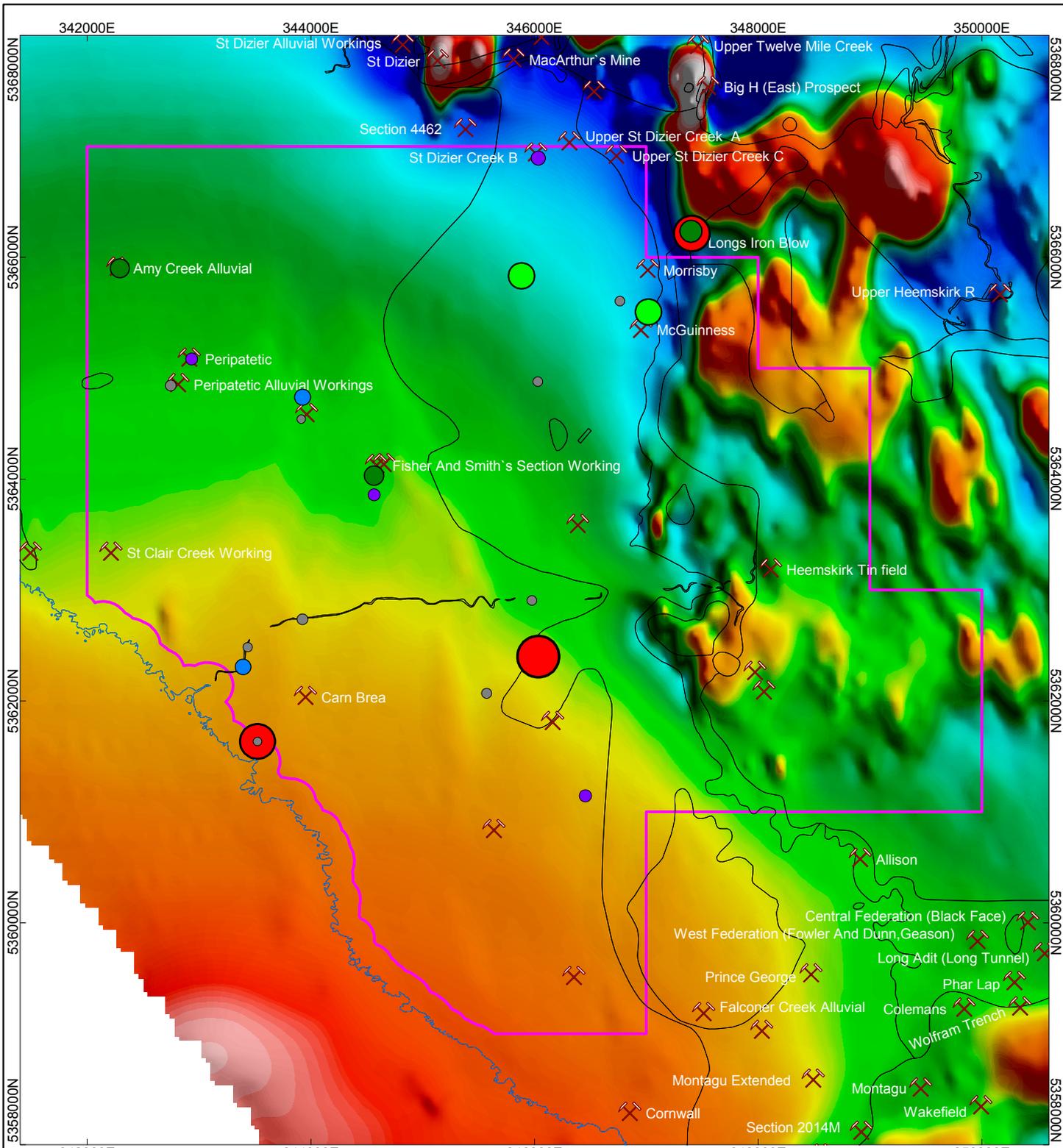
Mo ppm	Color
> 3.5	Red
3 - 3.5	Orange
2.5 - 3	Yellow
2 - 2.5	Green
1 - 1.5	Blue
0.5 - 1	Purple
< 0.5	Grey

Figure 3



Geochemistry - Molybdenum

stream sediment and rock sampling
Heemskirk Project



geology from 1:25k scale Mineral Resources Tasmania digital geology series data

geological boundaries (refer to coloured geology figures)

tenement boundary

historic mine

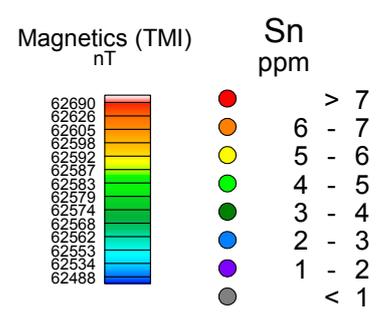
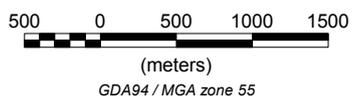
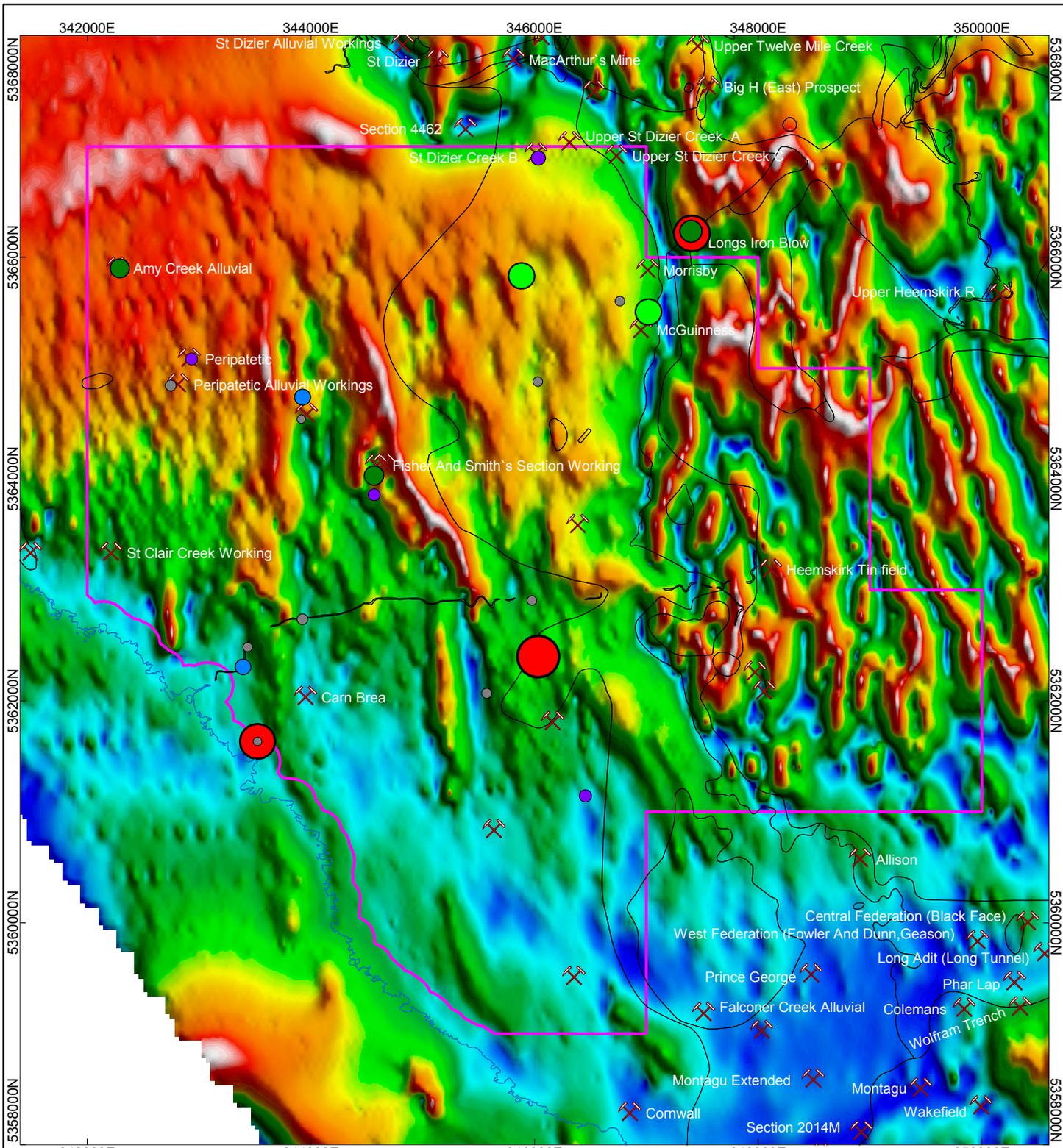


Figure 4



Aeromagnetics - TMI
with geochem - Tin
Heemskirk Project



geology from 1:25k scale
Mineral Resources Tasmania
digital geology series data

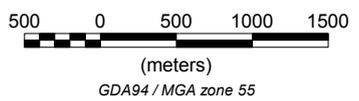
geological boundaries
(refer to coloured geology figures)

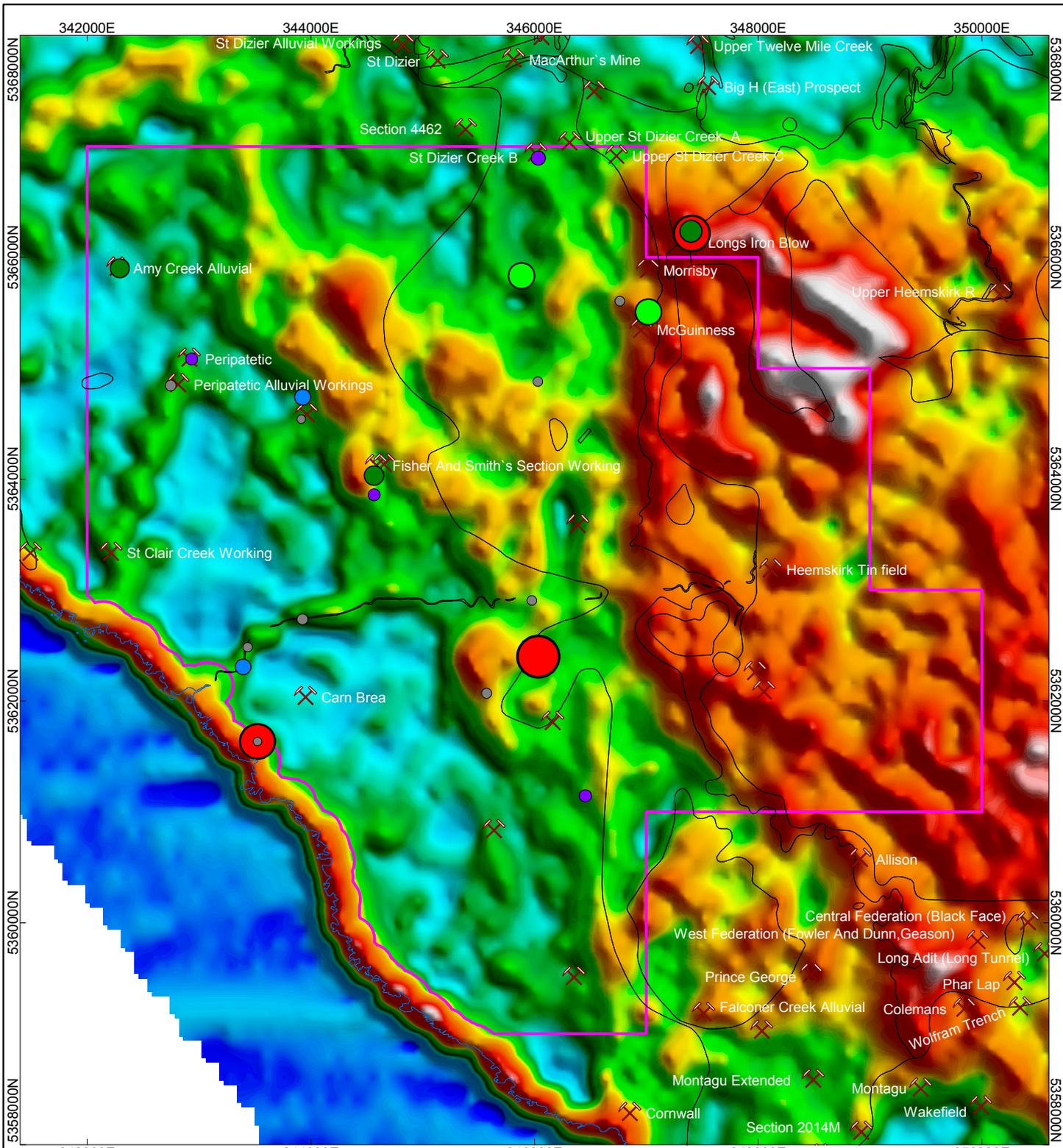
- tenement boundary
- historic mine

Magnetics (tilt ratio)	Sn ppm
1.2	> 7
1.0	6 - 7
0.8	5 - 6
0.5	4 - 5
0.2	3 - 4
-0.1	2 - 3
-0.4	1 - 2
-0.6	< 1
-0.8	
-1.1	
-1.2	
-1.3	
-1.4	

Figure 5

**Aeromagnetics - enhanced
with geochem - Tin
Heemskirk Project**





geology from 1:25k scale
Mineral Resources Tasmania
digital geology series data

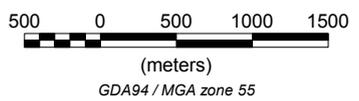
geological boundaries
(refer to coloured geology figures)

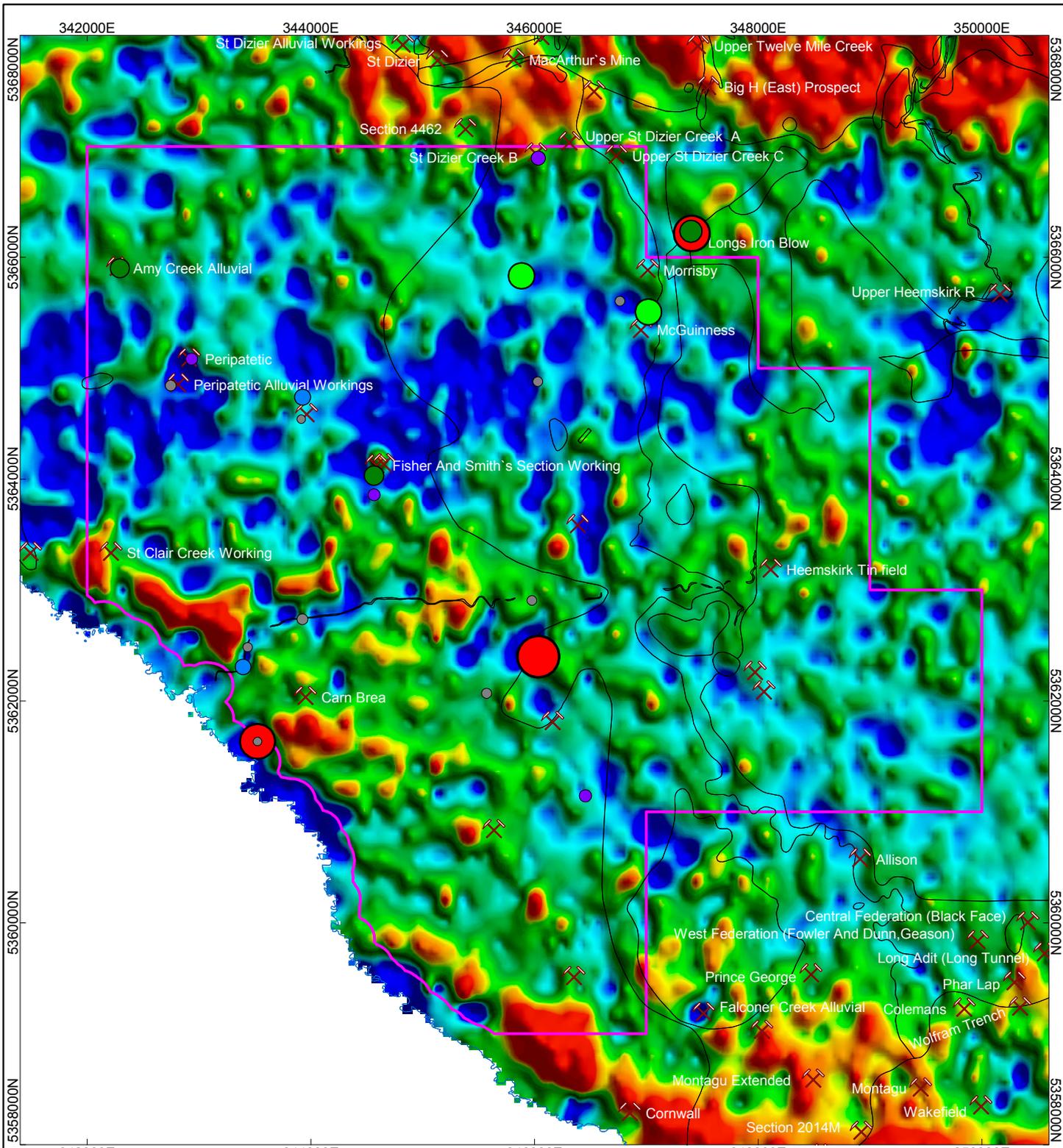
- tenement boundary
- historic mine

Radiometrics cps	Sn ppm
	> 7
	6 - 7
	5 - 6
	4 - 5
	3 - 4
	2 - 3
	1 - 2
	< 1

Figure 6

**Radiometrics - total count
with geochem - Tin
Heemskirk Project**





geology from 1:25k scale
Mineral Resources Tasmania
digital geology series data

geological boundaries
(refer to coloured geology figures)

-  tenement boundary
-  historic mine

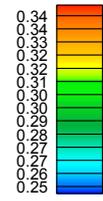
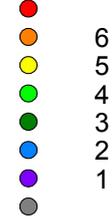
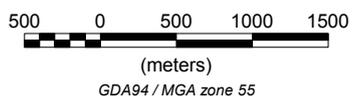
Radiometrics U / Th ratio	Sn ppm
	

Figure 7



Radiometrics - U / Th ratio
with geochem - Tin
Heemskirk Project



geology from 1:25k scale
Mineral Resources Tasmania
digital geology series data

topography image is from
1:100,000 TasMap series
(c) Tasmanian Government

geological boundaries
(refer to coloured geology figures)

-  tenement boundary
-  historic mine

Figure 8



(meters)
GDA94 / MGA zone 55

Topography

Heemskirk Project