

Memorandum To: David Broomfield

From: Phil Hawke

Date: 24 Oct 2011

Re: Results of the 2011 gravity survey at Francis Creek (EL24040 & 24715)

Background

Following on from the geophysical interpretation and gravity survey work completed in 2010 (refer Hawke Geophysics Report 10-TTY1), gravity data coverage was extended further north into greenfields exploration areas within EL24040 and EL24715. This survey was designed using government mapping and the 2010 interpretation to provide coverage over the main stratigraphic target for hematite mineralisation; the lower part of the Wildman Formation.

The main objectives of the survey were to identify new targets for hematite mineralisation at the northern extension of the Frances Creek Project either by direct detection as local gravity highs or by identification of the commonly associated (footwall?) carbonaceous shales within the Wildman Formation, which are identified as a low density marker.

Data Acquisition and Processing

A total of 1794 new stations of gravity data were collected by Haines Surveys during September and October 2011. Gravity data were collected at a 50x200m station spacing on lines oriented roughly perpendicular to the local stratigraphy (Figure 1).

Local survey and gravity base stations were established in the survey area by Haines. These stations were located using AUSPOS post-processing of base station GPS data and have been tied to the Australian National Gravity Grid. Base station details are:

Station ID	East(MGA)	North(MGA)	Elevation	Observed_gravity
4301	809774.99	8526668.80	114.636	978283.745
4302	807657.67	8528081.84	109.976	978287.640
4303	812921.02	8530049.39	102.053	978285.685

Survey locations are recorded in GDA94 Zone 52 coordinates and Australian height datum (AHD). Observed gravity has been levelled to Isogal71 values. Gravity data were reduced to Bouguer Anomaly values using formulas supplied by Geoscience Australia to a density of 2.67 g/cc.

Gravity base stations were tied and levelled to previous surveys in the Frances Creek area. Compiled gravity data for the entire Frances Creek area were gridded to a 40m grid cell size. Standard image products were created including the Bouguer Anomaly and first vertical derivative. An image of the first vertical derivative (over the Frances Creek North area) is shown in Figure 2.

Interpretation

A basement geology interpretation, including locations of interpreted hematite mineralisation, is shown in Figure 3. This interpretation follows the same style / colours / naming convention to that previously established in Hawke Geophysics Report 10TTY-1, with geological units defined as follows:

Granite basement (light purple) – Proterozoic granite has been primarily interpreted with the assistance of regional geological mapping. Where geophysical coverage is available, it is characterized by a low magnetic and gravity response.

Mundogie Sandstone (pale brown) – The Mundogie Sandstone is best defined by radiometric data, with its extent identified by a low radiometric (particularly in the potassium, uranium channels) response. The gravity and magnetic response of this unit is mixed. The Mundogie Sandstone has been partially displaced by the intrusion of the granite pluton in the south-east of the study area.

lower Wildman Formation (orange) – in addition to the strong radiometric response noted previously, the lower Wildman Formation is generally characterized by a moderate-high gravity response; with the following exception:

Low Density Marker (grey) - low density (gravity) markers are interpreted at several stratigraphic positions within the lower Wildman Formation. These are interpreted to most likely reflect black shales which have been related to hematite mineralisation in the Frances Creek mining areas.

upper Wildman Formation (brown) – the gravity survey was planned to not extend fully across the upper Wildman Formation (as stratigraphic target(s) lie within the lower). The upper / lower Wildman contact is generally defined by a decrease in the gravity response, corresponding with a decrease in the radiometrics.

The majority of faults are interpreted in a NW direction, roughly parallel with the dominant axis of folding. A few faults are interpreted in a north-south and northeast orientation.

Targets

Several criteria have been used in the interpretation of hematite mineralisation, outcropping occurrences mapped by the NTGS, mapping of the stratigraphic host (particularly the Low Density Marker black shales) and direct detection of the dense hematite ore as a local gravity high.

Using these criteria, the interpretation of the iron mineralisation horizon (in the “Frances_2011_targets” table) has been divided into three categories:

- *Confirmed (blue)*: where iron mineralisation has been mapped at surface by the NTGS or identified from drilling.
- *High priority (red)*: interpreted in prospective stratigraphic horizons (within the lower Wildman Formation) directly along strike from mapped mineralisation. Will generally be directly targeting a direct gravity signature (local high adjacent / within the low density marker).
- *Low priority (orange)*: targets are located further from known mineralisation or where the geophysical anomalies are not as conclusive.

A total of 15 targets have been selected after the gravity survey for further follow-up and review as shown in Figure 4 and summarised in Table 1. These targets have been priority ranked from 1 (highest) to 3 (lowest).

ID	East_MGA	North_MGA	length	outcrop*	gravity	LDM°	priority	comments
A	806400	8527400	500m			x	2	
B	806470	8527900	200m			x	3	
C	807600	8529250	450m		x	x	1	may be terrain effect
D	808170	8528290	600m	x	x	x	2	
E	809430	8527400	600m		x	x	2	
F	809770	8527140	500m	x	x	x	1	
G	810100	8527300	300m		x	x	1	
H	810150	8525250	1000m		x		1	similar to Jasmine
I	809700	8528040	300m	ext.	x		2	
J	810040	8527750	400m	x	x		1	
K	810300	8527950	400m	ext.	x		2	
L	810600	8527430	400m		x		3	
M	811300	8527250	600m	x/ext.	x	x	1	
N	811500	8527750	300m	x	x	x	1	
O	810700	8528500	1400m			x	3	strat. target

Table 1: Summary of targets generated in the Frances Creek North area (note: * mapped outcrop indicated by an “x”, extension of outcrop by “ext.”, ° LDM = proximity to low density marker).

Further commentary on the targets is given below:

Targets A and B represent the along strike continuation of Targets 41 (defined in part by outcropping hematite) identified during the 2010 interpretation. While both targets occupy a similar stratigraphic position to the outcropping hematite relative to a low-density marker (LDM) they are offset from the outcrop by faulting.

Target C is defined by a 450m long series of narrow gravity highs within an overall low gravity response near the stratigraphic contact between the lower and upper Wildman Formations which shows a close similarity to the gravity signature of the Miller's (manganiferous) Fe mineralisation. A 30m high topographic ridge lies immediately to the north of the high density target. Terrain effects from this ridge may contribute, but are unlikely to be the sole cause of, the observed gravity low in this area.

Targets D and E are gravity high anomalies in a stratigraphic position similar to that seen in the Francis Creek mining area directly overlying the low density marker.

Mapped mineralisation at **Target F** can be interpreted to reflect a similar stratigraphic target as previous Targets D and E in the eastern limb of a tightly folded (breached by faulting?) syncline closure. A prominent low-density response is interpreted as black shale in the footwall to this mineralisation.

Target G is a moderate gravity high response adjacent to a low gravity response which is difficult to link up with the main low-density marker trend. Nonetheless this feature is identified as a possible direct detection (of hematite) response.

Target H represents a series of high density anomalies near the base of the Wildman Formation. The target area is in structural setting (synclinal fold closure proximal to a large granite body) which shows a number of similarities to the Jasmine deposit.

Target J is outcropping hematite mineralisation mapped by the NTGS near the lower / upper Wildman Formation stratigraphic contact. While no discrete "direct" gravity target is identified, it does occur at the transit between a high and low gravity response (probably due to stratigraphy). **Targets I and K** represent the along strike continuation of this stratigraphic position.

Target L is similar to the above, but located further along strike, with the stratigraphic position offset 150m to the south by faulting.

Targets M and N are outcrops of hematite within the low density marker horizon at the far eastern margin of the survey area. Subtle gravity highs can be directly related to the hematite outcrops and probably represent a direct response of the mineralisation.

Target O follows the low-density marker trend, with patchy subtle gravity highs which may represent direct targets.

Recommendations

A total of 15 targets have been identified from direct geophysical signatures and as indirect stratigraphic targets during this interpretation study.

It is recommended that these targets be ground-truthed to confirm the geological interpretation and to test for presence of surficial mineralisation leading to drill testing of favourable areas.

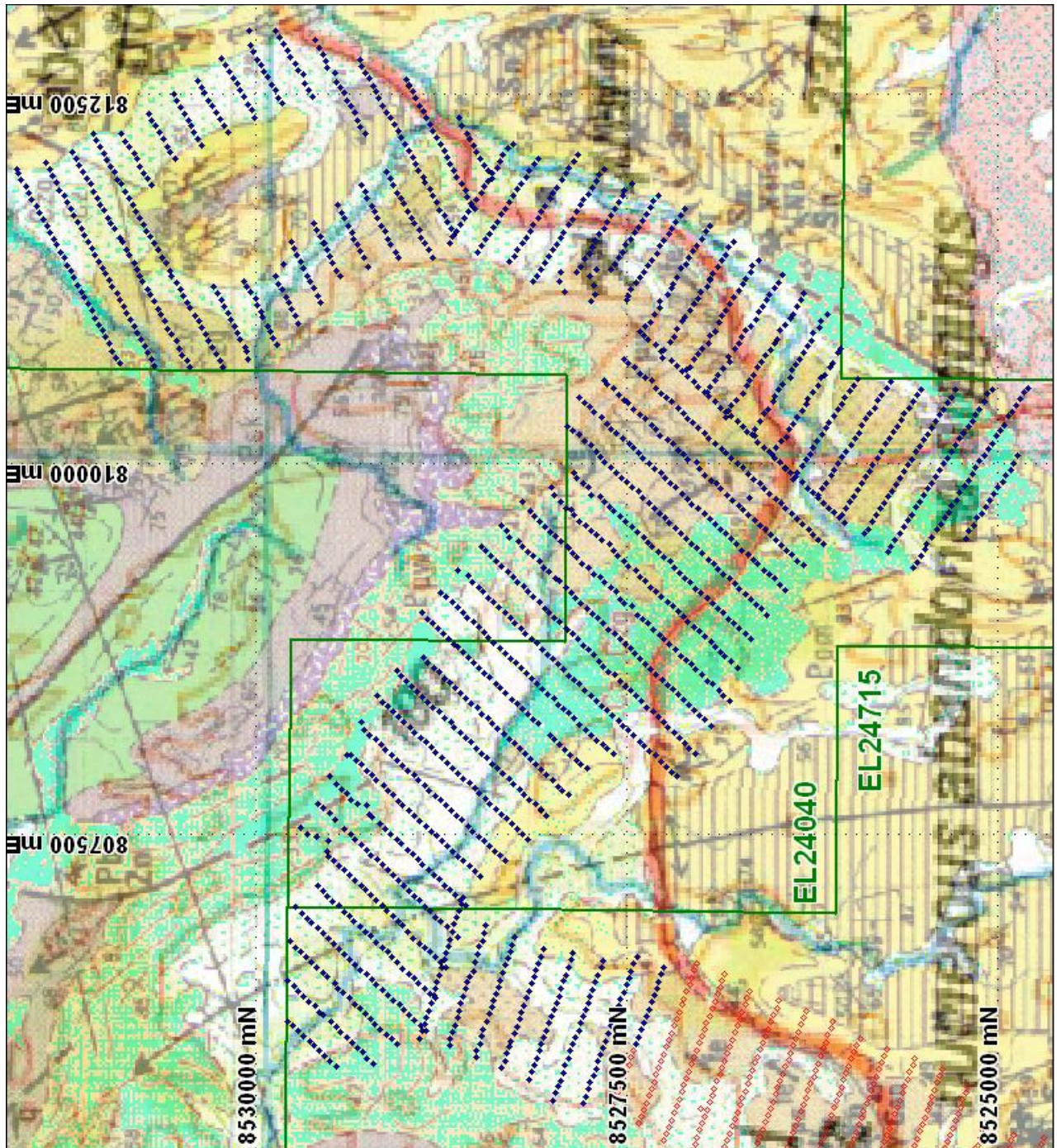


Figure 1: Location of 2011 gravity survey stations (blue diamonds) overlain on 2010 survey location (open red diamonds) and regional 1:100,000 geological mapping.

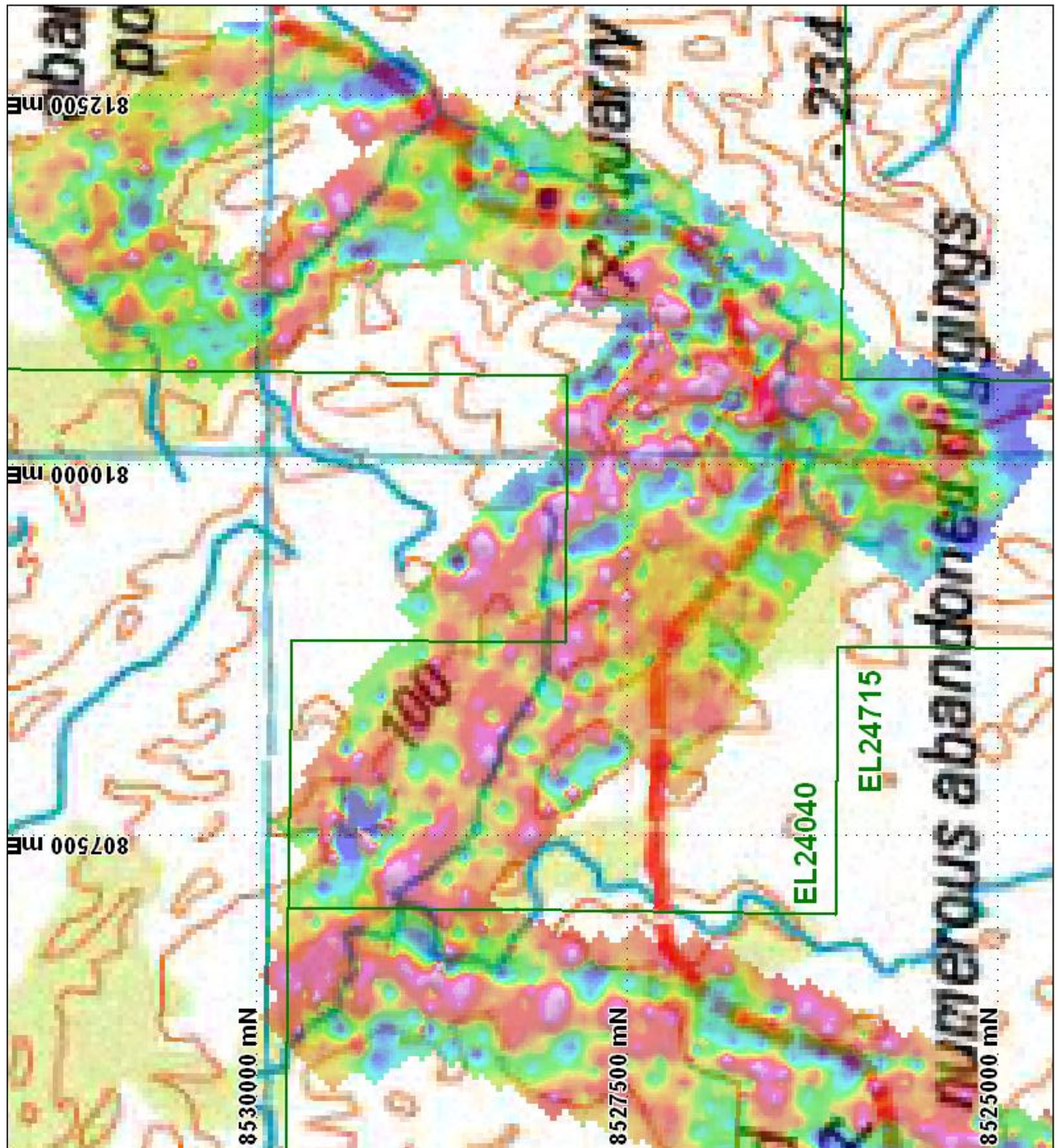


Figure 2: First vertical derivative image of combined gravity surveys in the Frances Creek North survey area.

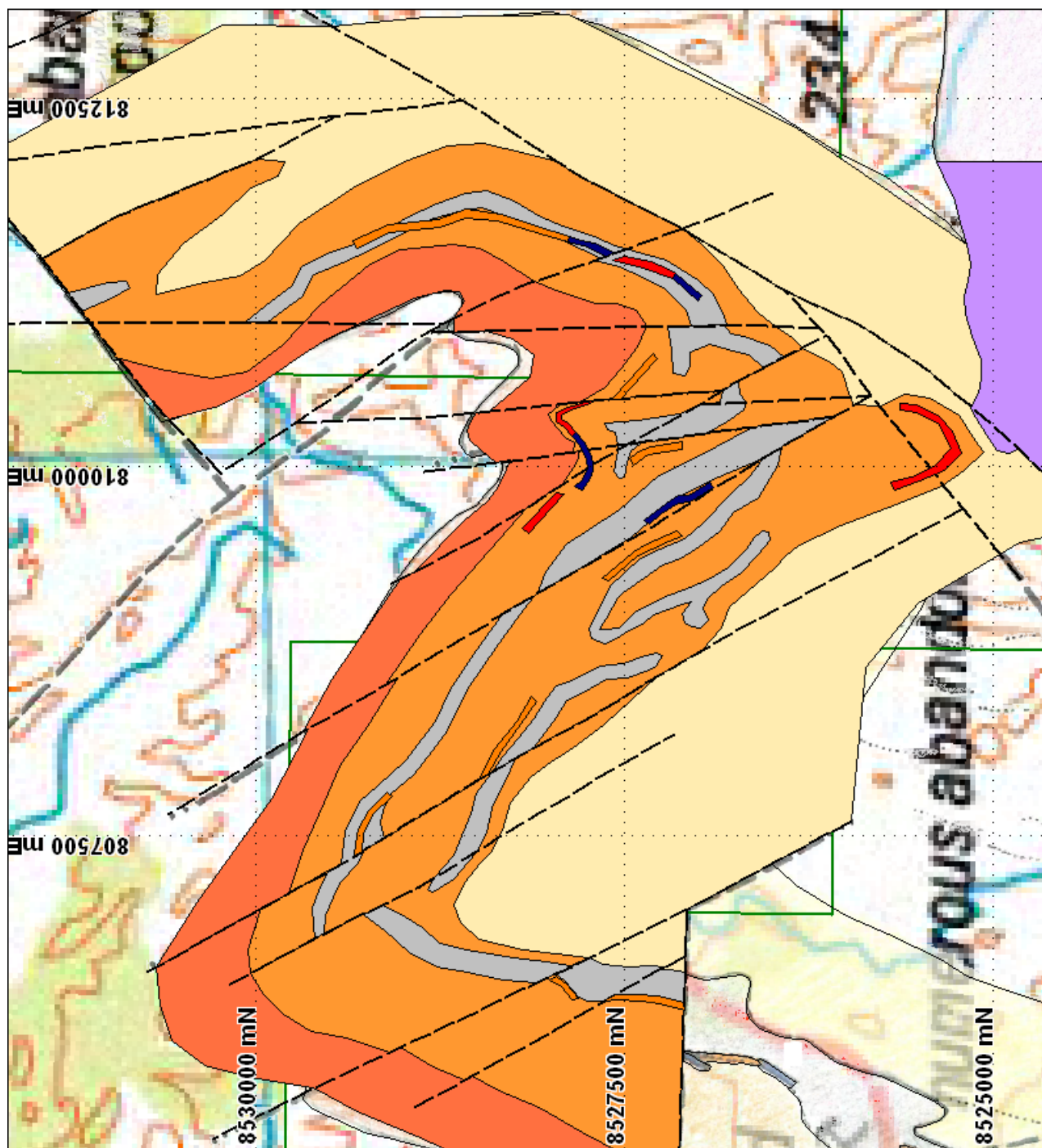


Figure 3: Basement geology interpreted map for the Frances Creek interpretation. Geologic legend discussed in text.

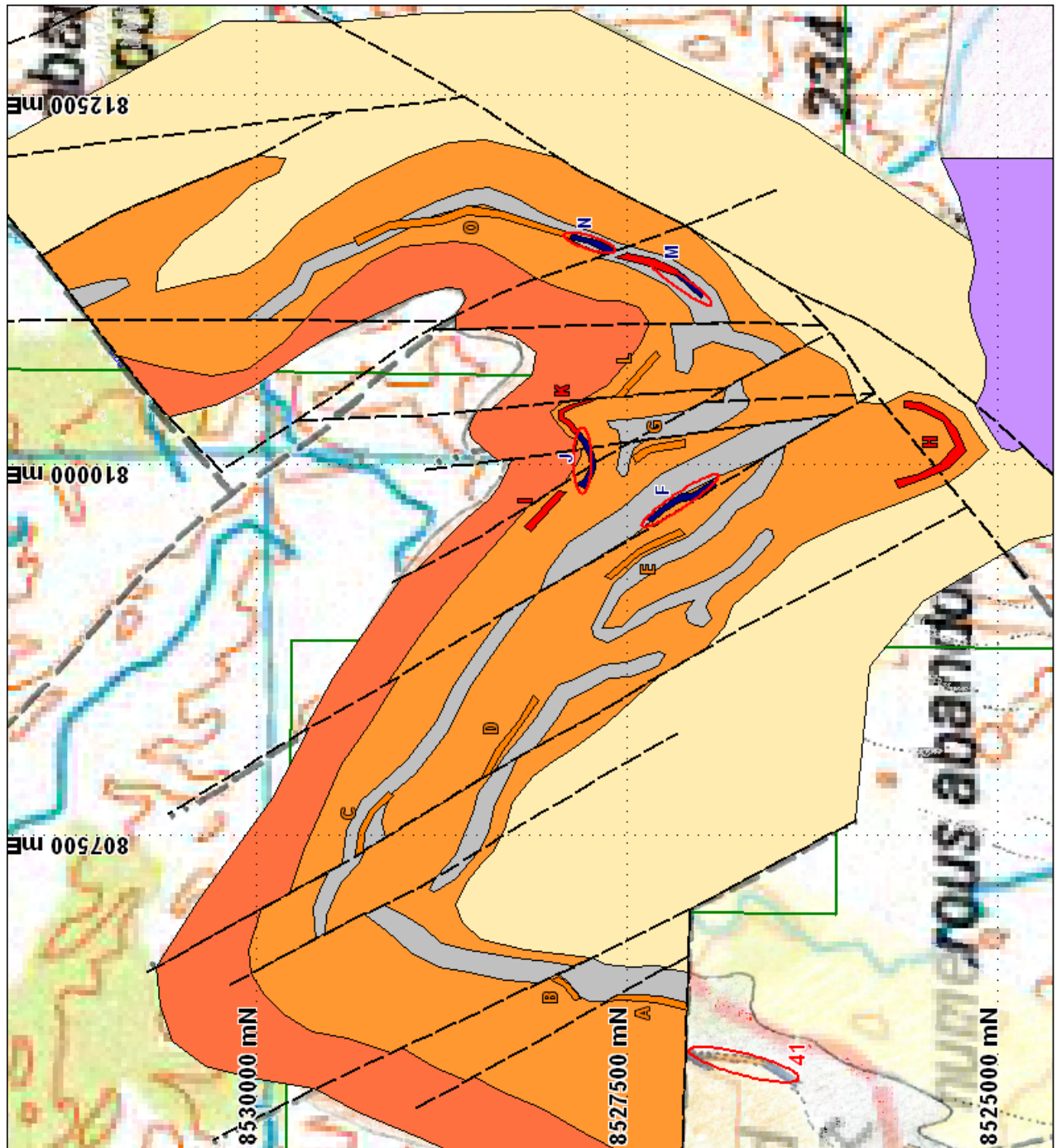


Figure 4: Locations of targets generated in the Frances Creek North project area.