1. THE SCAMANDER REGION

An image (Figure 3) and contour map (Figure 4) of the area requested for examination suggests the nature of the magnetic field in the area west of Scamander and Beaumaris. This area is mineralised and has been described by Groves (1972).

The image provides an indication of the texture of the magnetic field responses in the region and the fine texture in the northern part of the selected area does not differentiate Mathinna Beds, part of the batholith or the metamorphosed halo (compare with geological map – McClenaghan *et al*, 1987 – north and west of 600 000 mE/5420 000 mN). The strong features across an axis centred about 5415 000 mN are within Mathinna Beds. These responses are very localised and a large area south of 5410 000 mN displays very low magnetic relief. The differences are quite striking. The image also displays strong transverse features, mainly trending NE-SW, which can occasionally, and very, locally be correlated with exposed (and/or mapped) dykes of dolerite.

The contour version (Figure 4) is, in many ways, much clearer with its absolute display of character and amplitude. The long linear features are much disrupted with definite offsets (see especially east and north of 602 000 mE/5418 000 mN). The much more subtle features near 602 000 mE/5406 000 mN can be assessed in context although these appear as relatively strong magnetic features in the image.

The Skyline Granodiorite

Both image and contours indicate the anomalous character of the field (and geology) in the region of the Skyline granodiorite: the rift-like axis extending north-south near 603 000 mE/5415 000 mN. Although the image suggests a change in character across the southernmost dyke crossing this zone (at 5416 000 mN) a close examination of the contours, field intensity and geological boundaries shows that the magnetic field simply maps the offsets in this intrusion and the alteration halo about the granite boundary south of St Helens. See Figure 5 for details.
The reduced magnetic field intensity near the granodiorite is not directly related to its exposure or any aspect of the mapped alteration about it. Indeed, the magnetic boundaries are either some hundreds of metres east of the granodiorite exposures, or up to a kilometre west of them. The lowest field intensity is generally, however, associated with the exposures of the granodiorite. This interesting observation suggests either that this lithology is less magnetic than normal, or some other, granodiorites, but it is certainly less magnetic than the Mathinna Beds rocks either directly adjacent to the intrusion, or beyond the immediate zone.

It may also be observed that the dyke-like features are absent within the axis occupied by the Skyline Granodiorite and associated rocks (SW of Brookes Hill), although there are steps in field intensity, and some age, origin or depth of intrusion differences must apply. Differences in sequence and age within this block of Mathinna Beds may also apply. The alignment of unit terminations, as marked by high amplitude effects, is approximately ENE-WSW and trends to both a dyke deflection (at 595 500 mE/5409 000 mN) and a kink in structure west of Catos Creek Dyke (at 593 000 mE/5408 000 mN). This trend, and character change in the field, can be best seen in contour form and the trend is replicated fragmentally further north within the granites west of St Helens. A major structure within the Mathinna Beds may be implied on this basis.

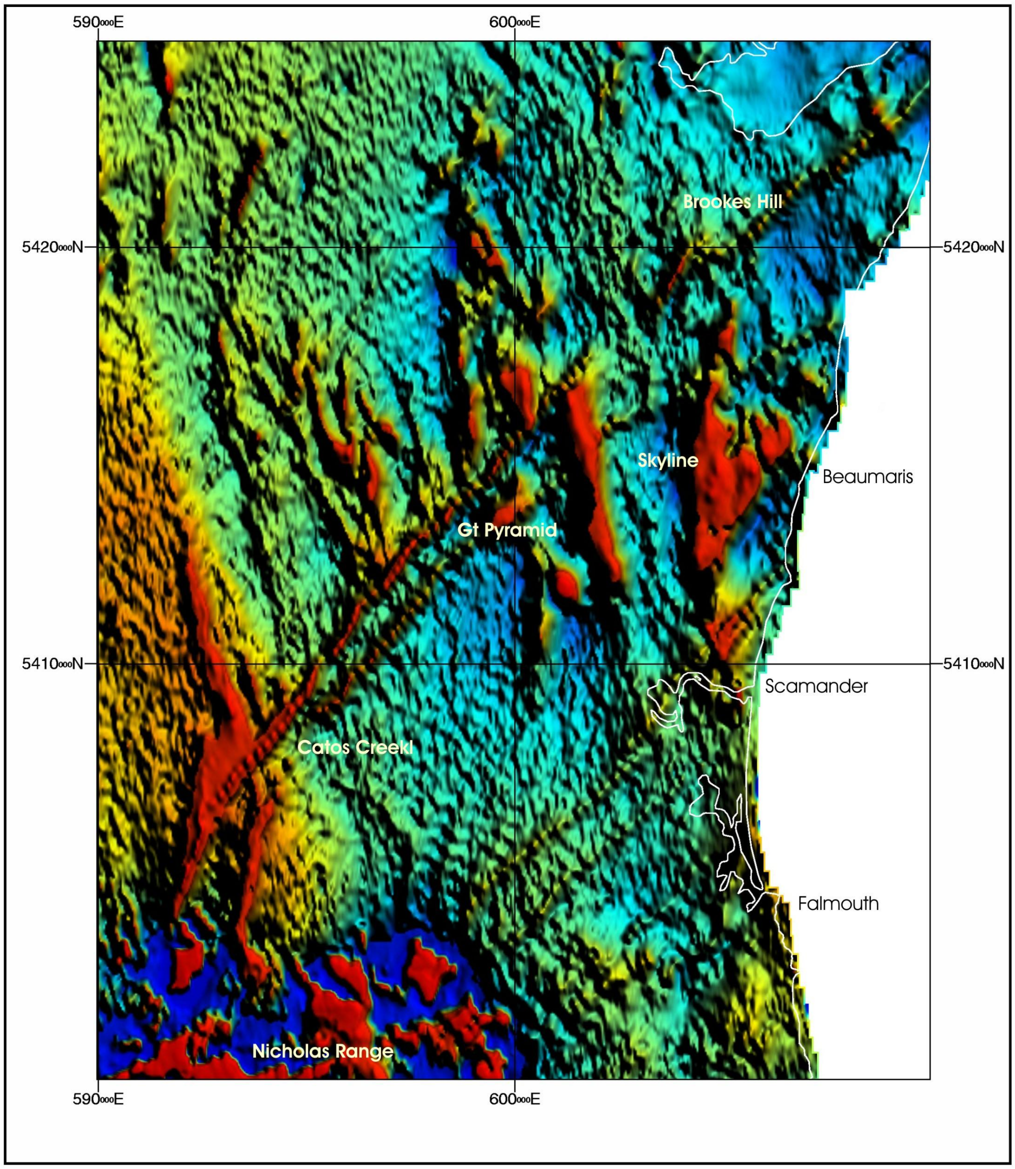

Figure 3: Image of Magnetic Field Intensity, Scamander west area.

A similar feature can be recognised in both image and contours west of Falmouth at 603 000 mE/5403 000 mN – and the more recent covering rocks of the Nicholas Range and the St Marys Porphyrite.

Mineralisation

Responses related to mineralised sites are neither systematic nor conclusive.
Magnetic character near the Scamander Mine may be due to local interference effects. A major anomaly at North Scamander is not explained. Other prospects or mines, such as Loila Tier, South Orieco, Paul Beahrs, are on the edge of a major change in

Mathinna Beds. Any response due to mineralisation at the Great Pyramid Mine has been swamped by the effect of a dolerite dyke nearby, a dyke which fully accounts for the origin of at least one transverse feature. Similar character occurs at East Pinnacle. There is no magnetic association, based on this survey, with other workings. See also Figures 5 and 6.

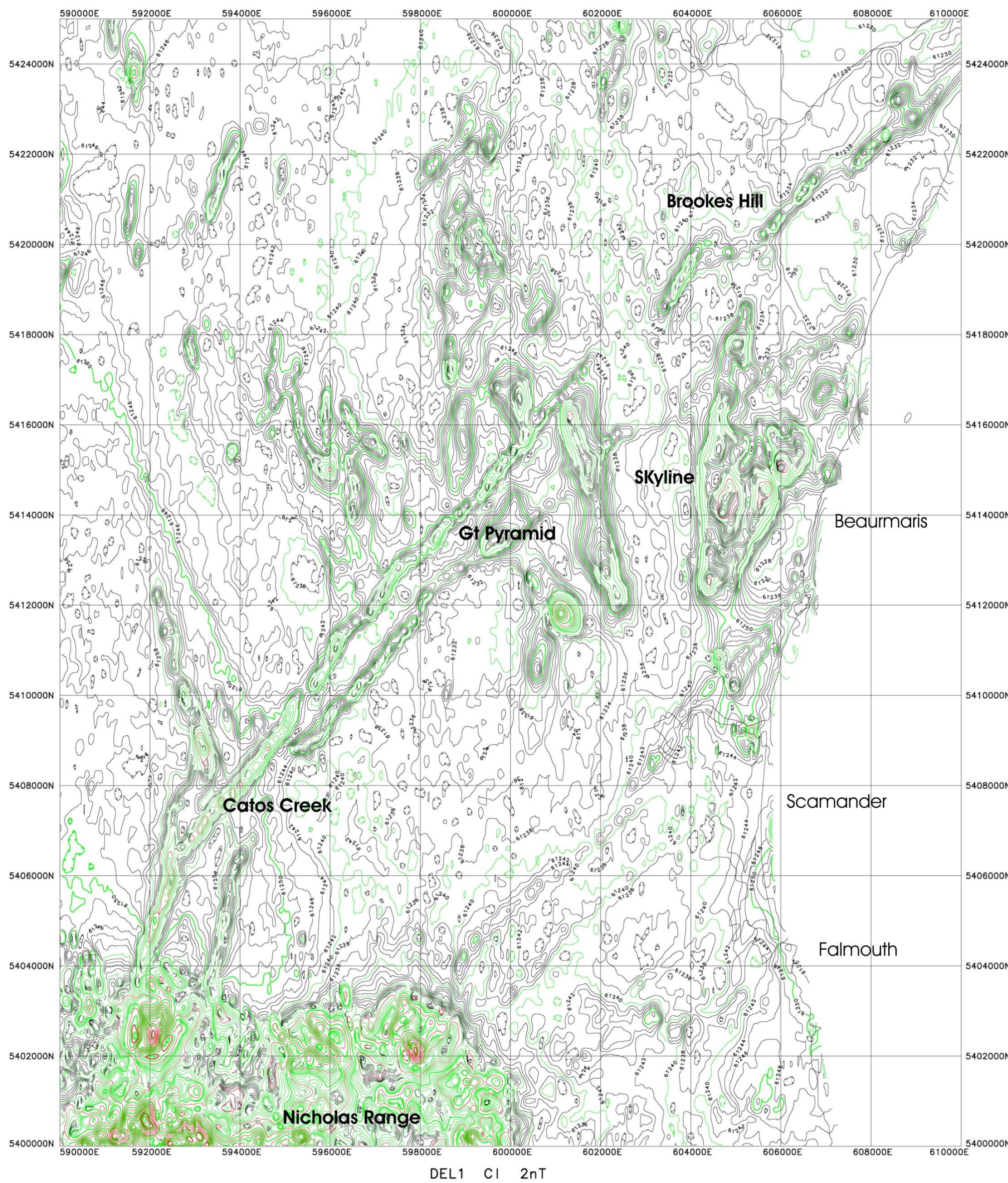

Figure 4: Contours of Magnetic Field Intensity, Scamander west area.

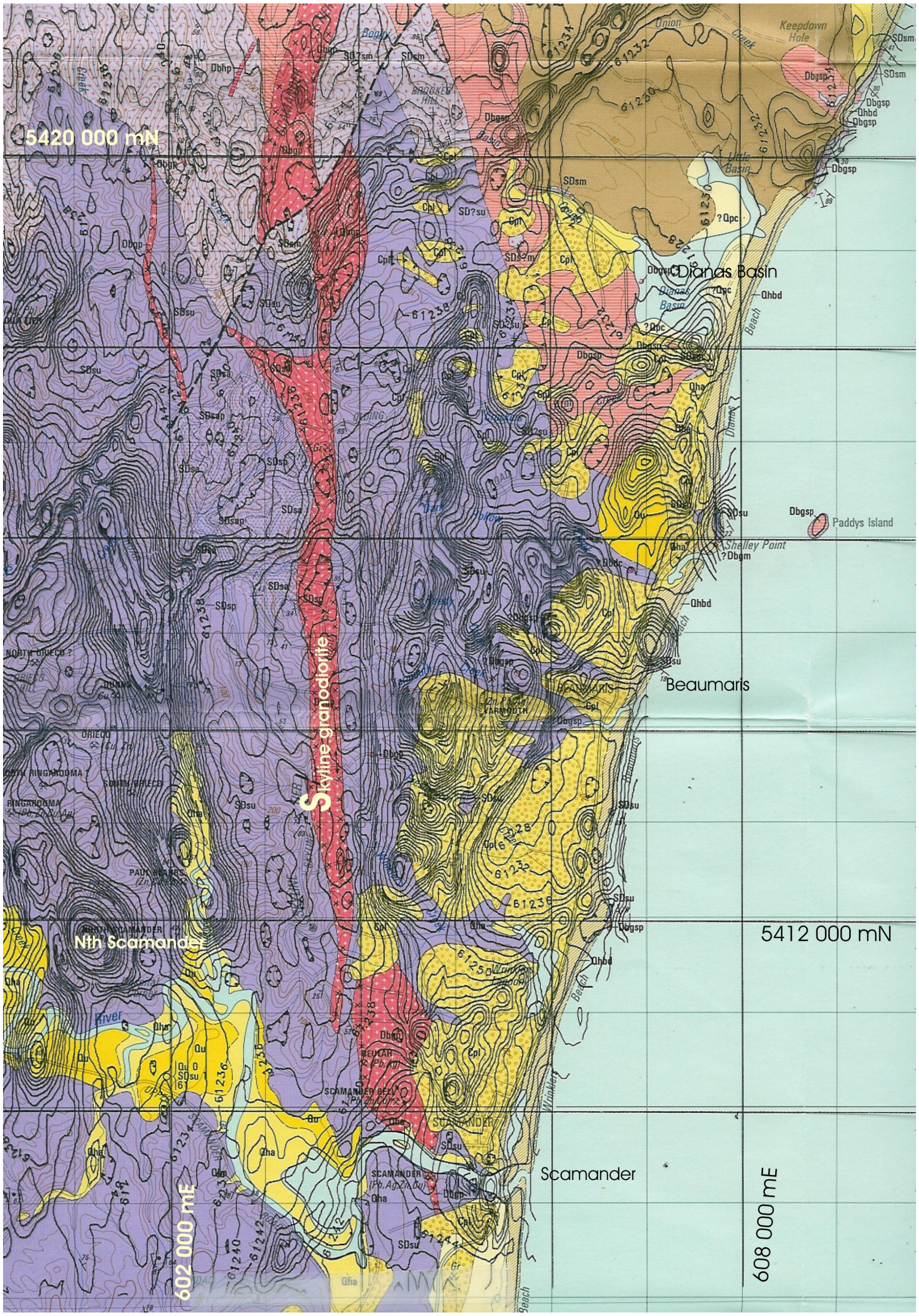

Figure 5. Magnetic field intensity and relationships to Skyline Granodiorite. The locally intense and variable nature of the field near some mineralised sites and parts of the Mathinna Beds is also evident. (Basemap: McClenaghan *et al*, 1987)

Structures near Hogans Road and Catos Creek

The structures near Hogans Road and Catos Creek Dyke are displayed in Figure 6.

The alteration west of the intrusives, which have also been faulted on their eastern face (see geological map), implies a modest dip to the west for the igneous package. It is not clear from the mapping which granitoid is responsible for the alteration, or whether all have contributed.

The distribution of transverse structures is, however, most irregular and not readily explained. The marked NE-SW features have been associated with dykes at Great Pyramid and near the coast.
The analysis below considers the probable magnetic properties of such dykes.
The southern dyke is terminated by, or at, the intersection with the granodiorite member of the sequence and its associated alteration near the faulted eastern face of the intrusion. This body does not continue, but may be restored west of the alteration – where it then trends almost north-south. There are two principal, feasible explanations for this behaviour; either thermal alteration and later weathering has destroyed the magnetic contrast, or this dyke never intruded at least one member of the intrusive package.

The northern dyke, although locally disjointed with a clear en-echelon character east of the Catos Creek intrusions, is continuous across the entire intrusive package. In contrast to its character further east within the Mathinna Beds, this continuity is emphatic. About one kilometre west of the intrusives, and contact alteration, this dyke either terminates or simply changes trend – as does the southern dyke. They remain essentially parallel.
The site of termination is complex and the magnetic field shows that an additional dyke is present, trending first north, then northeast, and then, with persistence, NNW along the approximate limit of mapped thermal alteration. The pattern of dykes poses a question: are these dykes of slightly different age with respect to one or all of the granitoid members.

A change in magnetic field intensity along the western contact of granitic rocks shows that the alteration has a slightly higher magnetic contrast – at least north of the Avenue River.

Figure 6 also shows the variable nature of magnetic responses near the old workings of the region.

Dykes

Dyke effects have been examined at various northings and locations and some examples are shown in Figures 7, 8 and 9.

In Figure 7, at 5405 000 mN, where the two dykes which cross the Catos Creek structure trend southward – and thus best meet the criteria for a reliable model using E-W data lines - an adequate solution can be obtained simply with properties expected of dolerite (upper model). The contrast for the western dyke is of the order of 0.042 SI and that of the eastern dyke about 0.019 SI.

When, however, many dykes or other structures are considered it is evident that the magnetic base level for the survey is somewhat less and that the adjustment required between observed (true residual zero) and calculated model zero should be less than 3 nT. When this condition is applied a slab of west-dipping granodiorite (0.0025 SI) is required, and which may terminate the depth extent of the dykes (lower model).

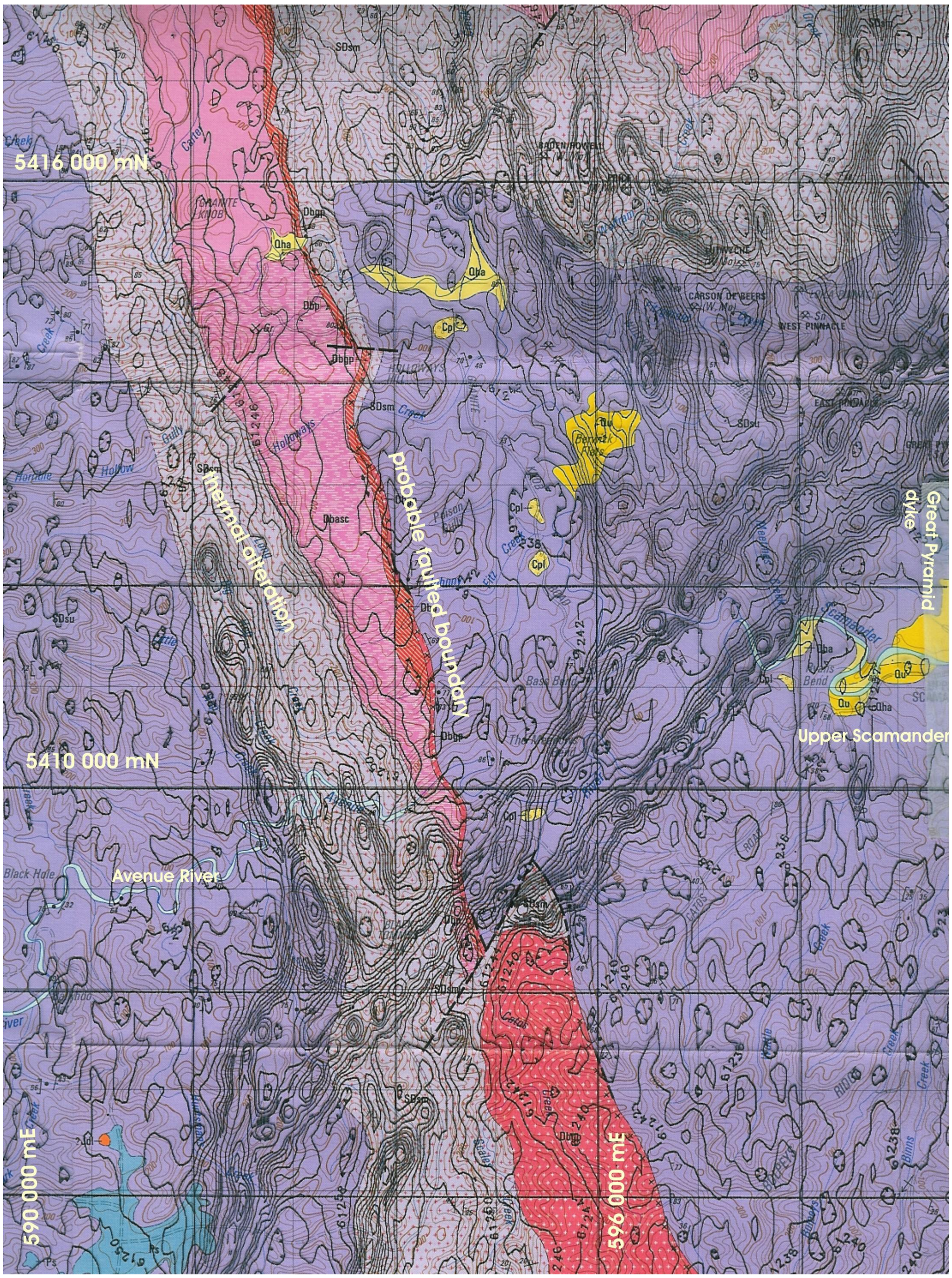

Figure 6: Structure and magnetic field intensity in the region of Catos Creek dyke. Note the different behaviour of the two dykes and the changes in trend west of the structure. (Basemap: McClenaghan *et al*, 1987)

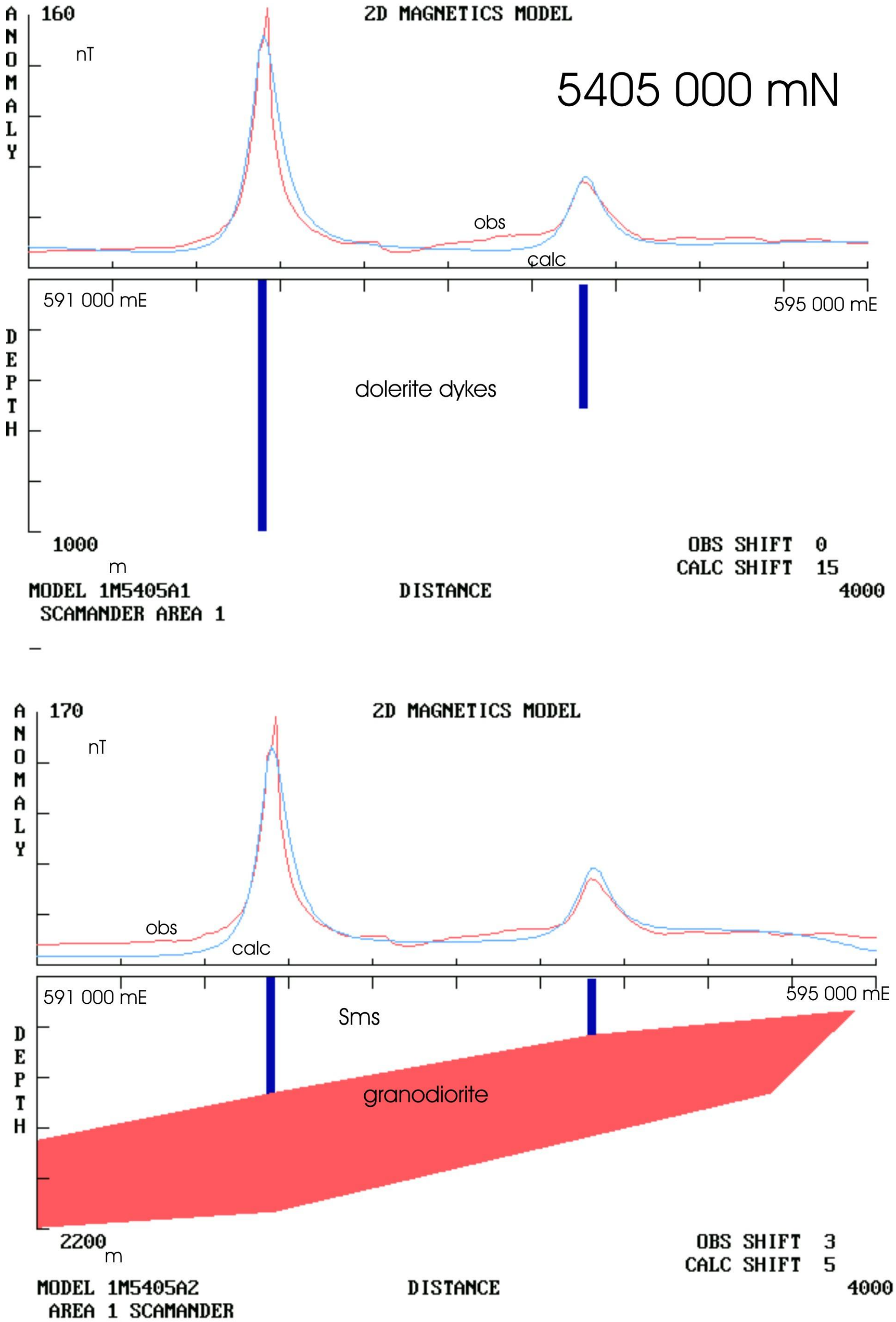

Figure 7: Models at 5405 000 mN (from 591 -595 000 mE) showing need to consider all significant contributors to the magnetic field. For full discussion of the essential criteria for reliable, consistent and comprehensive interpretation see Leaman (1994). Survey line 112891.

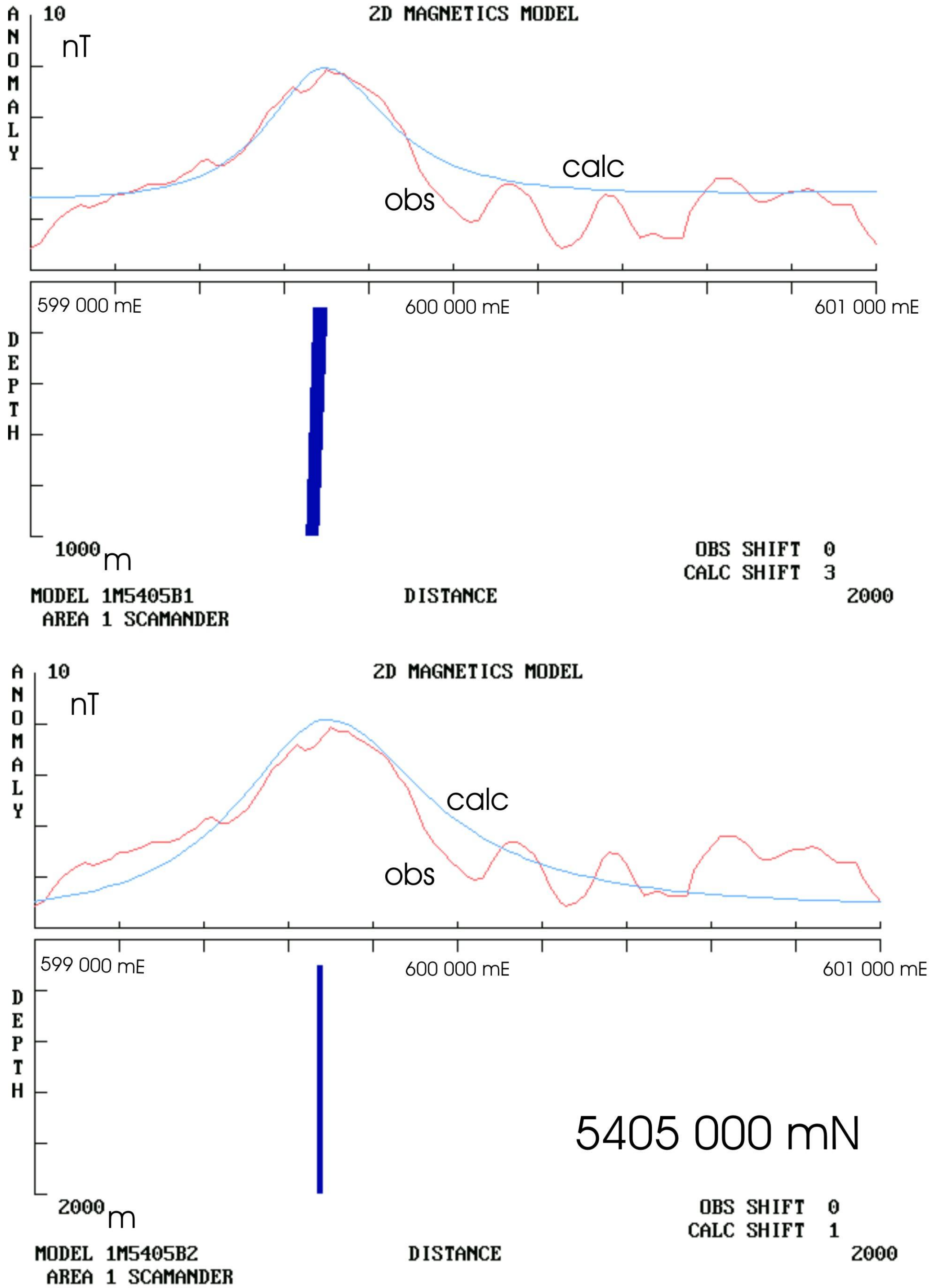

Figure 8. Interpretation of the more subtle dyke responses west of Falmouth.

A large number of dykes have been modelled.
Comparison of Figures 7 and 8 indicates some of the possible variations and issues.

As described in the second section of this report there are many reasons for variations in the responses observed from the dykes of the region. Modelling in this zone suggested a typical maximum body width of 10 to 30 metres but a depth to upper contrasting surface of nearly zero to almost 100 metres. This variation accounts for the, often, patchy nature of display given that the magnetometer is already removed by 70 to 90 metres from the land surface.

The two models in Figure 8 provide an indication of the thickness-contrast product which may apply. The upper dyke is 30 m wide, has a top surface at 100 m depth and a contrast of 0.004 SI. The lower dyke is 10 m wide, has a top surface at 200 m depth and a contrast of 0.026 SI. These calculations embody several unknowns whilst satisfying the observed profiles and more information of properties from sampling is required to resolve these issues.
The inferred values are, however, consistent with observed values for various types of mafic dykes in the region (see Section 2: Blue Tier).

Figure 9 considers the implications and requirements of the field and structure across the Skyline Granodiorite at 5414 000 mN.

The two dykes (blue) have contrasts of some 0.026 and 0.013 SI respectively (west, east) while the major magnetic variations in the region are associated with thick members of the Mathinna Beds. The granodiorite is not magnetically significant. The Mathinna units, from west to east, have contrasts of 0.0012, 0.0024, 0.003 SI respectively. A fold is implied by the eastern anomaly.

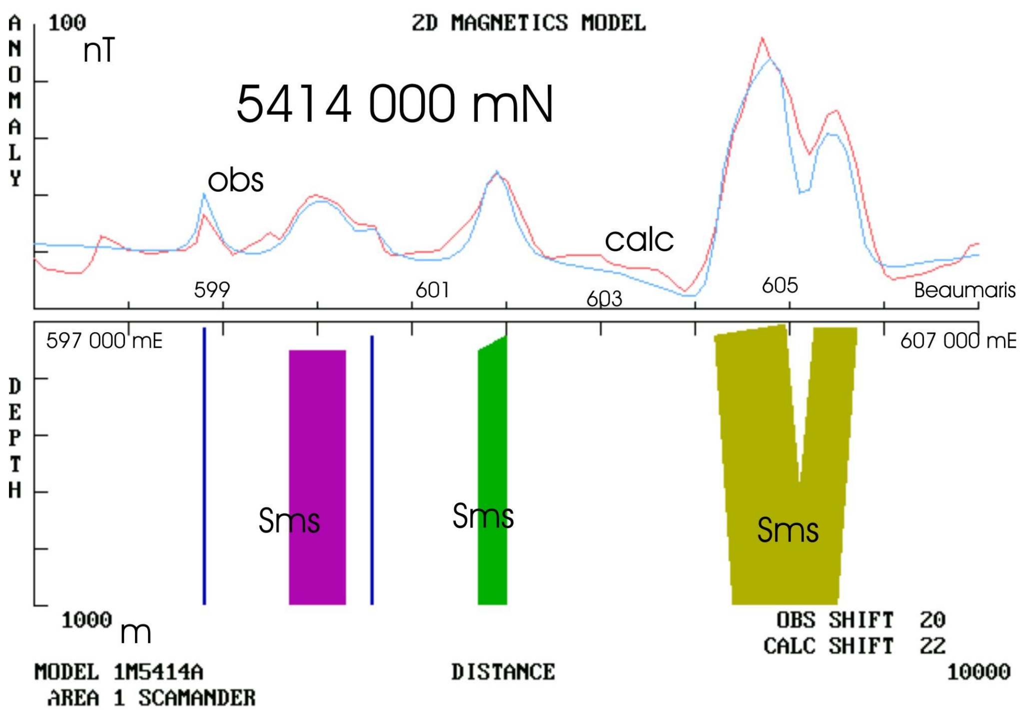

Figure 9. Regional interpretation across Skyline intrusion and intensely magnetised Mathinna Beds.