DEPARTMENT OF MINES
SOUTH AUSTRALIA

GEOLOGICAL SURVEY
METALLIC RESOURCES DIVISION

GEOCHEMICAL EXPLORATION OF THE CAMBRAI 1:63,360 SHEET COMPLETION REPORT.

by

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Rept.Bk.No. 76/25
G.S. No. 5702
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ABSTRACT

From July 1973 to February 1975 a stream sediment sampling survey was undertaken to the western half of the Cambrai 1:63 360 sheet. About 1600 samples were analysed for Cu, Pb, Zn, Au, W, Mo, Nb, Co and Mn. Rolling means, correlation coefficients and mean values for formations were computed for Cu, Pb, Zn and Mn to help define anomalous areas. Two areas of potential mineralisation of Au, one of Cu, and one of Cu, Pb and Zn were found. More detailed geochemical work is required to further assess the potential of these areas.

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INTRODUCTION

From July 1973 to February 1975, a reconnaissance stream sediment sampling survey was undertaken on the western half of the Cambrai 1:63,360 sheet (Figure 1) which is the Cambrai 1:50 000 geological sheet area, and covers the Cambrai A and Cambrai C subdivisions . The survey is part of a programme to provide geochemical information and to pinpoint areas suitable for follow up work, on the closely populated ADELAIDE 1:250,000 sheet. Preliminary work for this project is described in a report by Sibenaler & Rogers (1974). The sparsely drained eastern half of the Cambrai sheet, covered mainly by Tertiary and Recent sands and clays, was not sampled.

About sixteen hundred samples were taken just above stream junctions and at intervals of five hundred metres, at a depth of twenty centimetres. The samples were then sent to AMDEL where the -80 mesh B.S.S. fraction was analysed for Cu, Pb, Zn and Au using atomic absorption analysis, and W, Mo, Nb, Co and Mn using semi quantitative emission spectroscopy. To help designate anomalous areas, the results were statistically analysed and computerized to produce rolling mean maps for Cu, Pb and Zn, showing local deviations from the regional trend.

All analytical and location data are contained in the Department of Mines computer file MIANALYSIS.

TOPOGRAPHY AND GEOLOGY

The topography of the Cambrai A and C sheets consists of gently rolling hills and broad valleys in the west, and rugged terrain in the east, characterised by north south trending ridges and steep sided valleys. The stream pattern is dendritic with the major streams generally reflecting the north south trend of the geology. The meandering Marne and Saunders Rivers however, flow in an easterly direction through the rugged terrain of the east towards the Murray Basin. All creeks on the survey area are ephemeral and stream sediments collected from the more rugged areas were coarser than those from gentler terrain.

The geology of the area is shown on Figures 2 and 3. The predominant rock types are metamorphosed silts, greywackes and limestones of the Kanmantoo Group. This Group is unconformably underlain by quartzites, marbles and shales of the Adelaidean and Hawker Group Equivalent in the Angaston area, and by the Heatherdale Shale (Hawker Group Equivalent), in the east. Minor outcrops of the Truro Volcanics occur within the Heatherdale Shale in the north east of the Cambrai sheet. An elongated north south trending outcrop of Palmer Granite and several smaller outcrops occur within the Kanmantoo Group. These are associated with the granitic Rathjen Gneiss and other gneissic rocks, which locally grade into granitic gneiss. Minor basic to intermediate

dykes intrude rocks of the Kanmantoo Group in the north west of the Cambrai A sheet.

Figure 4 shows the areal distribution of metamorphic minerals in the Survey area (after Aquitaine Australia Pty. Ltd., 1973). The degree of metamorphism decreases towards the north-east and south west, away from a large outcrop of Palmer Granite in the centre of Cambrai C. There is a discontinuity across a fault line in the south east to low grade metamorphic rocks of the Strangway Hill Formation.

The Palmer Fault on the eastern boundary of the area separates the Palaeozoic Groups from the Tertiary and Recent sediments of the Murray Basin. Faulting is a common feature, especially in the eastern part of the area where there are many minor faults, which are not shown on the map. Another major fault zone, the Bremer Fault, occurs in the west, as well as a major crush zone, which extends past Springton in the south to Angaston in the north.

MINERALISATION

In order of importance, Cu, Ag, Pb, Au and Zn have all been mined in the Cambrai area. The mines were developed on a small scale and all have been abandoned since the early part of the century.

After a geological and geochemical investigation of mines and workings on the eastern half of the Cambrai A sheet, Ognar (Aquitaine Australia Pty. Ltd., 1973) concluded that

"Cu/Pb/Zn mineralisation always seems to be associated with faults and quartz veins. Tourmaline is commonly present as a result of metasomatism, especially in the eastern areas. Higher Pb and Zn values are generally associated with the mineralised faults, while higher Cu values usually occur in the quartz veins, but are sometimes associated with basic volcanics".

Copper mineralisation occurs within interbeds of mica schists at the Kanappa Mine and is probably associated with a pegmatite dyke intruding the area. At the North Rhine Mine, there are two lodes running almost parallel to a NNW trending fault in a feldspathic gneiss. The lodes appear to have been secondarily enriched at each of the two mines, which were the largest in the area. The only other copper mine is the Hope Mine, where mineralisation occurs within a skarn/gossan at the faulted contact of the Milendella Limestone Member and siltstones of the Strangway Hill Formation. The North Mount Rhine, Royal Keyneton and Rhineberg Silver Lead mines also occur within Milendella Limestone interbeds in mica schists of the Strangway Hill Formation.

At the Golden Gate Mine, gold is found in numerous small gritty ferruginous quartz seams in kaolinised material of a large crush zone.

PREVIOUS WORK

In 1965 Australian Selection Pty. Ltd. collected about 400 stream sediment and some soil samples over an area of 5 square miles around the Kanappa Mine. Soil samples on one reconnaissance line showed an increase in copper associated with interbedded

marbles.

Carpentaria Exploration Pty. Ltd. collected 383 stream sediment samples in the Kanappa area in 1970, with disappointing results. Soil samples were also collected at 100' intervals over a granite-calc silicate contact to determine whether metasomatic enrichment had occurred; however all copper values were low and uniform. A spectrographic multi-element scan of composite rock chip samples from a granite in the same area, did not show any unusual metal contents. Four stream sediment samples were similarly scanned, but no correlation with copper mineralisation was detected. Over a hundred rock chip samples were taken across strike at quarter mile intervals in the Milendella Limestone Unit as high metal values were detected in a gossanous sample from that member; however Cu, Pb, and Zn values were generally low with only a few slightly higher values.

In 1973, Aquitaine Australia Minerals Pty. Ltd. collected 660 soil samples over twenty six lines in the eastern half of Cambrai A. The geochemical results were generally low, but slightly higher near the contact between the Milendella Limestone Member and the Strangway Hill Formation, particularly where the Milendella Limestone Member with adjacent Truro Volcanics had undergone metamorphism. Copper values within the Strangway Hill Formation in the eastern part of the area have a north south trend parallel to the strike of the rocks and were consistently higher than the uniform low values found in the west. In the eastern part copper values increased from north to south, and this was

related to the increasing grade of metamorphism. However, lead and zinc values showed strong structural control, with higher values located over fault zones. (Aquitaine Australian Pty. Ltd., 1973).

Copper, Lead and Zinc

Cu, Pb and Zn contents in stream sediments are shown on Figure 5. Table 1 shows statistical data for these elements. A small number of values greater than 500 ppm were excluded from statistical calculations, as these had a disproportionate effect on values of mean and standard deviation.

TABLE 1(all values ppm)

STATISTICAL RESULTS FOR CAMBRAI A AND C.

	Cambrai A				Cambrai C			
	Cu	Pb	Zn	Mn	Cu	Pb	Zn	Mn
No. of samples	711	711	711	711	874	874	874	874
Mean	28	17	31	112	12	4	28	91
Standard Deviation	188	272	109	360	13	11	200	79
Mean(ignoring values >500)	14	7	27	94	11	4	20	91
Standard Deviation	22	16	26	72	13	11	21	79
Mean + 2 S.D.	58	39	79	238	37	26	62	248
Top 2.5% value	> 50	>30	>80	>195	> 40	> 20	>65	>195
Threshold to 2nd population	50	20	-	80	45	Between 20 & 35	-	60
Threshold to 3rd population		70				60		
Chosen Threshold value	50	20	80		45	20	70	
No of anomalous values	23	35	34		13	7	16	

Cumulative frequency curves of log normal populations become straight lines when plotted on log probability paper, thus making it easier to distinguish between discrete but overlapping populations. Such plots for Cu and Pb on Cambrai A and C (Figure 6) indicate separate populations. The second order populations for Cu and Pb are very small and are regarded as a mineralised population superimposed upon the regional distribution of the area. The thresholds to the second order populations have therefore been taken as the threshold anomalous value for Cu and Pb. Lead has a third population which may be due to secondary enrichment of existing mineralisation. Plots for Zn however, approximate to a single straight line, and any values which may be associated with mineralisation, cannot be separated from the regional distribution of the entire area. Accordingly, the top 2½% of the Zn values have been regarded as anomalous, as this is roughly the size of the copper and lead populations which may belong to mineralised populations.

The chosen threshold values for Cu and Zn have a strong contrast with the rolling mean on all parts of Cambrai, and Pb has a strong contrast over the western part.

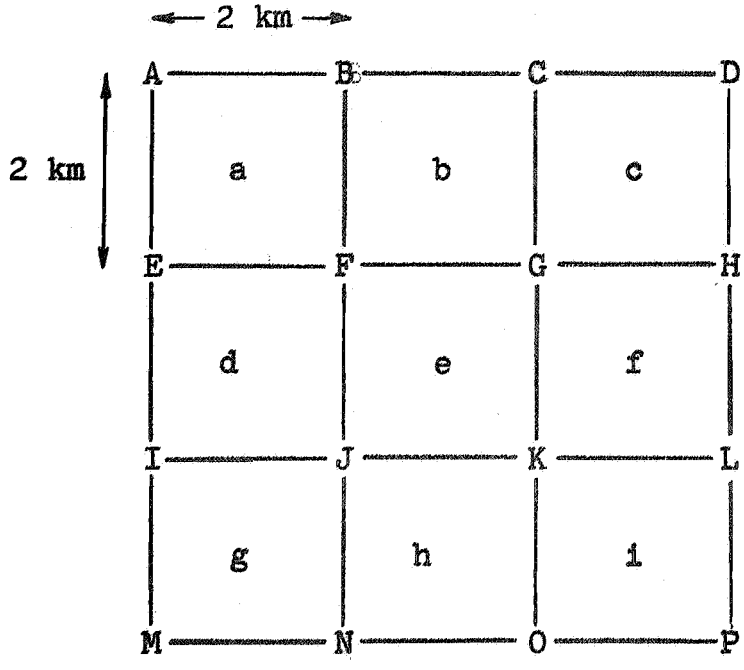
Anomalous values for Cu, Pb and Zn are shown on figure 7. Over half of the anomalous Pb and Zn values and a little under half of the anomalous Cu values occur over the Strangway Hill Formation to the east, and a large proportion of the anomalous Pb and Zn values are within a small area in the north east around and north of the Royal Keyneton Mine. The anomalous values delineate each of the known mines, apart from the Hope Mine, and, except at the

Royal Keyneton and Rhineberg Mines, these anomalous values are of a high order. However, soil samples taken near the Hope Mine by Aquitaine Australia Minerals Pty. Ltd. in 1973 also gave very low results.

Away from the known mines, there is a cluster of five anomalous Cu values two kilometres west of the Royal Keyneton Mine, and an area of anomalous Cu, Pb and Zn values south of Angaston on Cambrai A. On Cambrai C there is a small area of low order anomalous Zn values two kilometres north of the Mt. Rhine Mine, and a slightly scattered multi-element anomaly within the Rathjen Gneiss south of Springton. Most of the anomalous values however are single, isolated and generally of a low order, making it difficult to pinpoint other specific areas of interest.

Figure 13

Calculation of Rolling Mean



Rolling mean values A,B,C, etc are plotted on the corners

of a two kilometre grid. In figure 13, the values a,b,c etc, are the geometric mean of values within the square they are contained in. Rolling mean values A, B, C, etc are derived from a, b, c etc in the following way. e.g. $F = \sqrt[4]{a \times b \times c \times d}$. It can be seen that areas represented by the rolling means overlap, and that each raw value is used in computing four rolling mean values. Where possible, rolling mean values for the edges of the map used geochemical information from adjoining one mile sheets.

On figures 9, 10 and 11, rolling geometric means for Cu, Pb and Zn are shown along with significantly large positive and negative residuals. Within the Kanmantoo Group trends are essentially similar; there is a broad area of low values in the west and a continuous increase in values towards the east. On Cambrai A the higher values for Cu and Zn exhibit a north south trend parallel to the strike of the rocks. Around Angaston there is a high corresponding to the Hawker Group and older sediments; this pattern is best delineated on the Cu rolling mean and is least distinct for Pb. The Cu rolling mean also shows a moderate high in an area east of Springton, where granites and gneisses crop out.

The pattern of positive and negative residuals is similar to that of anomalous values except that there are scattered positive residuals for Cu and Zn within the Angaston Marble, and in the general area around Springton. The positive Zn residuals around Springton are situated within a background high for Cu, and the Cu residuals themselves are situated further out from the centre of the area. Significant deviations from Zn background values

also occur within the Inman Hill Formation, near small outcrops of Palmer Granite southwest of Eden Valley. Three kilometres to the west of Eden Valley, an east west trending line of positive Zn residuals is not related to any known geological feature.

Means (disregarding anomalous values) for different formations in the Cambrai area are shown on Table 2. Geochemical results from stream sediments collected within a half kilometre downstream from the boundary of any formation were not used in calculations to allow for the dispersion train of the elements. Because of this a mean could not be caluclated for the narrow outcrops of Palmer Granite and Milendella Limestone Member. However, values over outcrops of these rocks do not differ appreciably from surrounding values. Means for geological units that crop out in both the east and west differ appreciably.

TABLE 2

Mean Values for Formations on Cambrai

				West			East		
	Cu	Pb	Zn	Cu	Pb	Zn	Cu	Pb	Zn
Tertiary	6	3.4	13.5						
Granitic and gneissic rocks	8.5	1.4	14.5						
Brukunga Formation	2.4	2.1	10						
Inman Hill Formation	9	4	22	6	1.2	14.5	11.3	5.6	24
Strangway Hill Formation	15	4.9	19.7	9.7	2.8	18	20	8	23
Hawker Group	25	7.3	27	23	8	20	28	6.8	48
Adelaidean	21	5	22						

Correlation coefficients computed for Cu, Pb, Zn and Mn are shown on Table 3. In this study one percent will be taken as the upper limit for significance between elements (significance is the percent probability that the correlation coefficient resulted by chance from an uncorrelatable population). The correlation of Pb with Zn emphasizes the strong association of these two elements.

TABLE 3 (significant correlations underlined)

Correlation Coefficients for Cambrai A and C.

	Cu-Zn	Cu-Zn	Cu-Mn	Pb-Zn	Pb-Mn	Zn-Mn
Cambrai A	.04	.13	.08	.42	-.02	-0.1
Cambrai C	.30	.11	.37	.56	.22	.02

Gold, Molybdenum, Bismuth, Niobium and Manganese *

As there are few results and most values are near detection limit, statistical analysis of all these elements, except Mn is impractical.

Manganese has a second population, above 80 ppm on Cambrai A and 60 ppm on Cambrai C, consisting of about half of the values (Figure 6). The distribution of Mn is shown on its rolling mean (Figure 12) and it is similar to the distribution of Cu, Pb and Zn on the eastern third of the survey area but not the west. The thirty five values of Mn with values greater than 250 ppm are plotted on the rolling mean maps. All of these values are found

*N.B. Values for W all less than detection limit (50 ppm)
Co values contained in Department of Mines computer file MIANALYSIS

on Cambrai A where Mn has no correlation with Cu, Pb or Zn. However, eleven of these are associated with anomalous Cu, Pb or Zn values, and are denoted by asterisks on Figure 12.

There are scattered gold anomalies throughout Cambrai A and a few on Cambrai C. However, the analytical method used is inadequate for a proper survey as the sample analysed is too small (1 gram) to ensure a reliable result, because of the low level of anomalous values (background values are of the order of 10 ppb). For example one spherical grain of gold with a diameter one tenth of the -80 B.S. mesh size, in the analysed sample will give a value for gold of 50 ppb. which is at the detection limit. Therefore, geochemical exploration for gold in this survey has limitations, with the possibility of many anomalous values remaining undetected.

Discrete areas of gold anomalies occur two kilometres south of the Royal Keyneton Mine, three kilometres west of Angaston, and three kilometres north east of Keyneton. In addition many other anomalous values near the detection limit are scattered over a large area. The only gold mine within the area, the Golden Gate Mine, is delineated by a single point anomaly of 0.5 ppm. There are only five other higher order anomalies on Cambrai A and C; a value of 7.8 ppm gold at the North Rhine Mine, two values of 2.15 ppm and 0.45 ppm in the far east of Cambrai C, a value of 0.65 ppm gold four kilometres north east of Keyneton, and a value of 0.35 ppm gold five kilometres south of Angaston.

Of the remaining elements, only niobium has a wide distribution. The most concentrated area of anomalies is in the area around and north of the Royal Keyneton Mine. The only molybdenum values were found at the Royal Keyneton and Hope Mines and

in an area three kilometres north west of the Mount Rhine Mine.

SUMMARY AND RECOMMENDATIONS

In general, metal values assigned to a mineralised population correspond with highs in the regional trend, and this relationship emphasizes the importance of the eastern portion especially the Strangway Hill Formation in mineralisation.

The basic trend within the Kanmantoo Group, of low values in the west and higher values in the east, has no obvious relation to metamorphism or to a rock type, but rather to the rugged topography and complex structure of the east. However highs for Cu, Pb and Zn correlate with the distribution of Adelaidean rocks and the Angaston Marble around Angaston, and similarly may explain a Cu high, centred east of Springton, where the Kanmantoo Group is intruded by the Palmer Granite and Rathjen Gneiss. Stream sediment values over the Palmer Granite however, are generally low, and all the significant positive deviations from the regional trend occur in the Kanmantoo Group around the intrusions.

In the eastern part of Cambrai A the north south trend of higher values for copper and zinc may be related to the strike of the sediments. In this area, soil and rock chip sampling by private companies has established an association of mineralisation with interbedded limestones of the Milendella Limestone, especially near outcrops of basic volcanics. Previous work has also noted metasomatic minerals near mine, a strong structural control on

Pb-Zn mineralisation and an association of Cu mineralisation with quartz veins.

Geochemical anomalies located all mines but the Hope Mine. Away from known mines specific areas of interest are difficult to delineate because of the scattering of anomalies, but four areas of potential mineralisation are indicated. These are: 1) An area of low order anomalous copper values two kilometres east of the Royal Keyneton Mine, within the Inman Hill Formation.

2) A group of multi element anomalies two kilometres south of Angaston, within the Angaston Marble. Since this area is covered by vineyards, anomalous values might possibly be due to contamination from fertilizers and sprays. These sprays, however, contain mainly copper with minor zinc, whereas in this area lead anomalies have the greatest contrast with background values.

3) Two anomalies of 2.15 ppm and 0.45 ppm gold in stream sediments above the Palmer Fault, in the northeast of the Cambrai C sheet.

4) A value of 0.65 ppm Au four kilometres north east of Keyneton within a diffuse area of scattered low Au anomalies.

More detailed geochemical work over these areas is required to further assess their potential. A geochemical investigation of the Truro volcanics within the area could also be carried out to test a postulated association with mineralisation.

A number of significant positive deviations from the regional trend within the Angaston Marble suggests that further work on this unit may identify an association with mineralisation similar to that of the Milendella Limestone Member.

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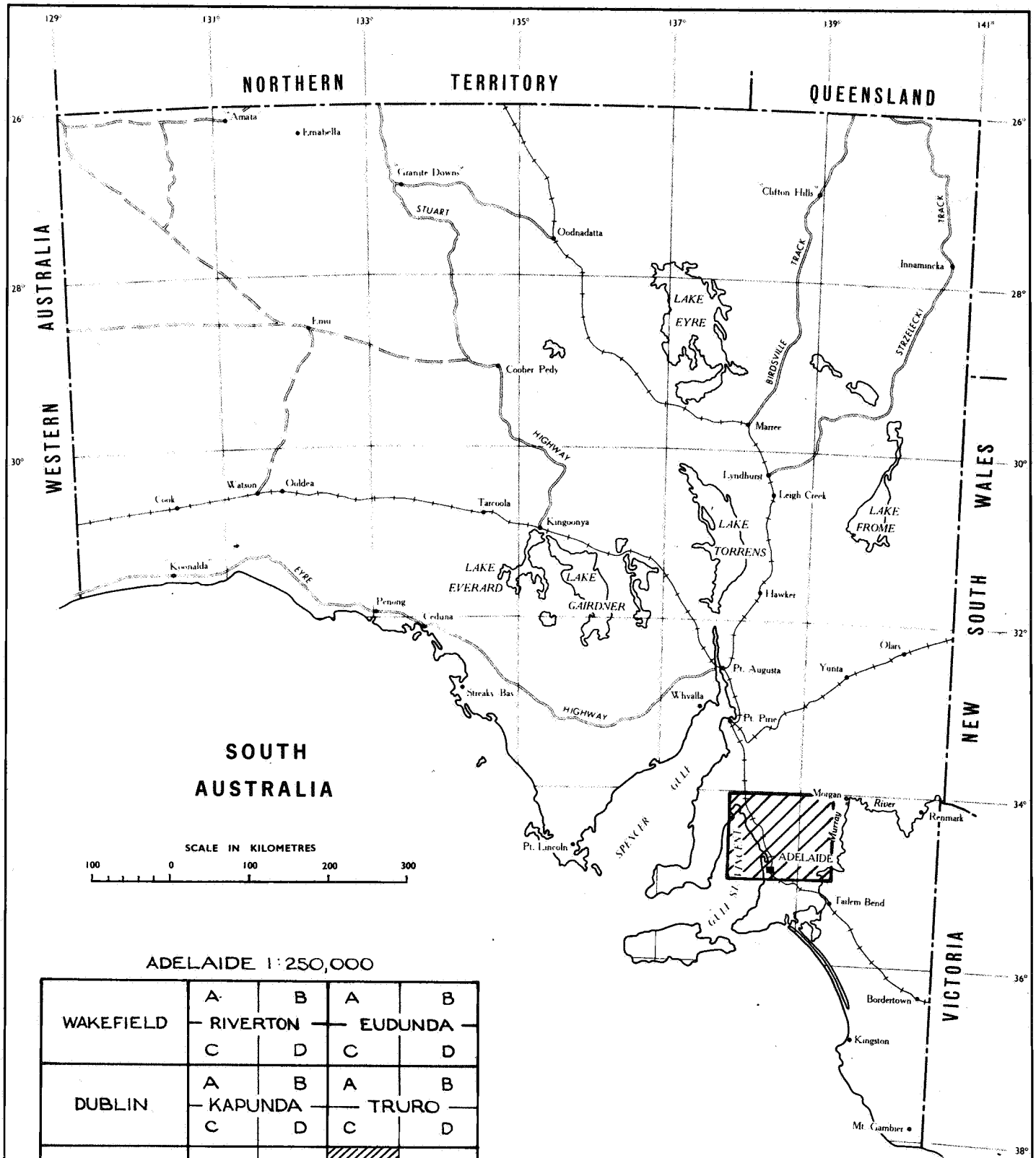


ADELAIDE 1:250,000

WAKEFIELD	A B RIVERTON C D		A B EUDUNDA C D	
DUBLIN	A B KAPUNDA C D		A B TRURO C D	
VINCENT	A B GAWLER C D		A B CAMBRAI C D	
SEMAPHORE	A B ADELAIDE C D		A B MANNUM C D	

FIG. 1

DEPARTMENT OF MINES — SOUTH AUSTRALIA

Compiled.	ADELAIDE STREAM SAMPLING CAMBRAI A & C LOCALITY PLAN	Date. Feb 1976
Drn. A. F. Ckd.		Drg. No. S12050

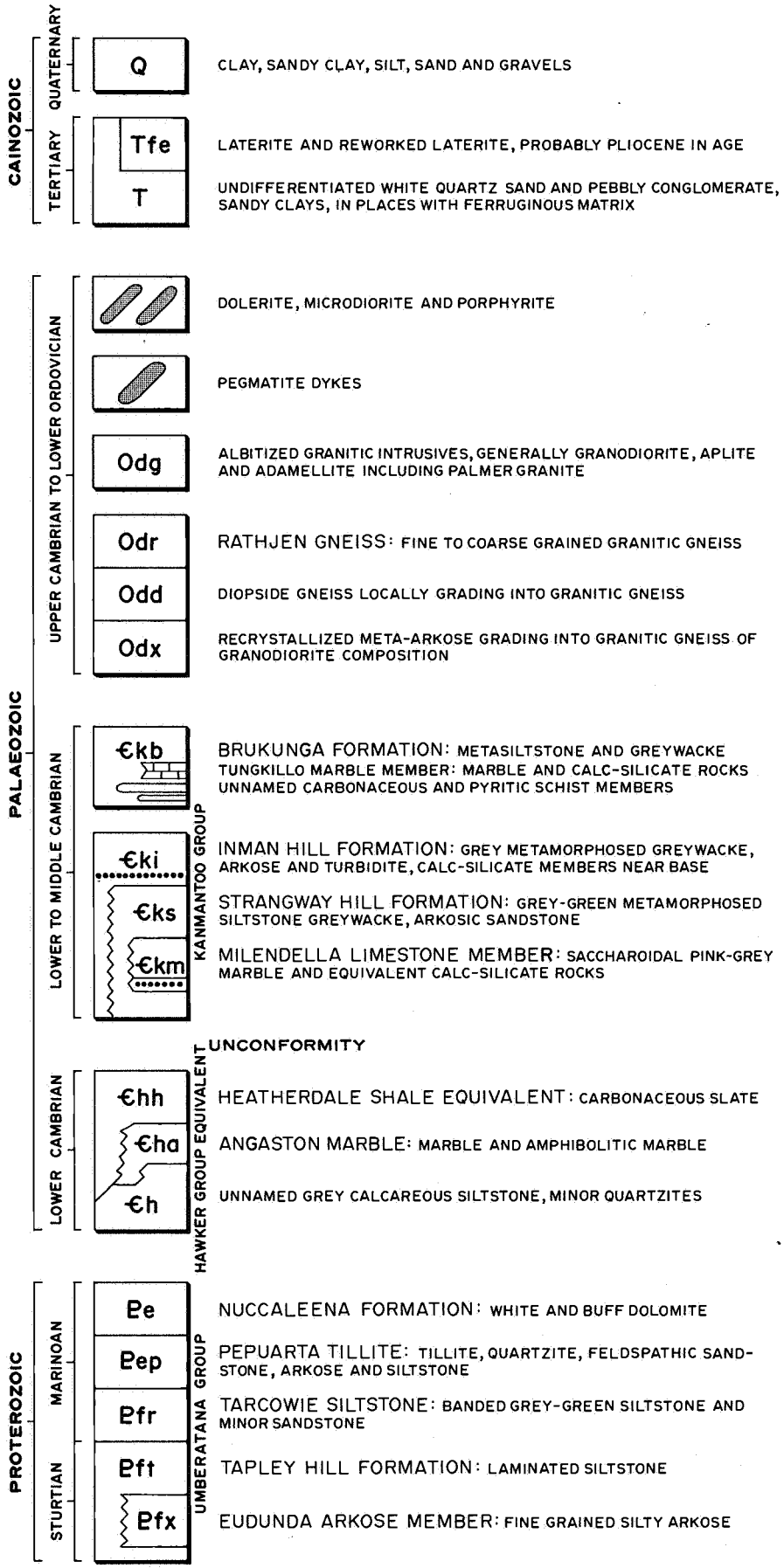
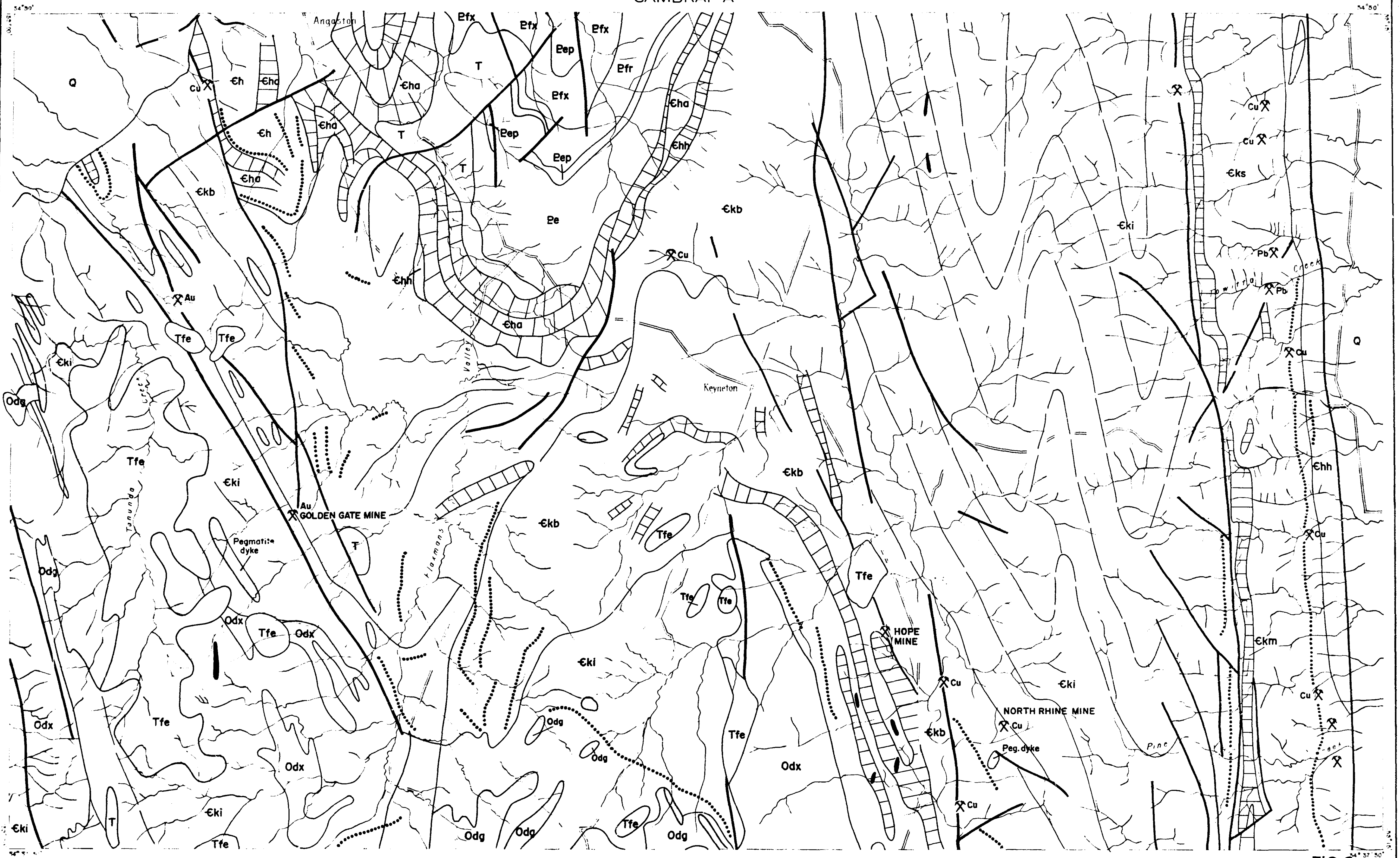


FIG. 2

	DEPARTMENT OF MINES — SOUTH AUSTRALIA	
COMPILED: B.A.E.	CAMBRAI A & C	DATE: NOV. '75
DRN: R.G. CKD. AF.	GEOLOGICAL REFERENCE	DRG. Nº S12049

CAMBRAI-A



SCALE 1:50000

METRES 1000 0 1 2 3 KILOMETRES
YARDS 1000 0 1 2 MILES

Enlargement of D.M. Cambrai 60 chain base **FIG. 3**

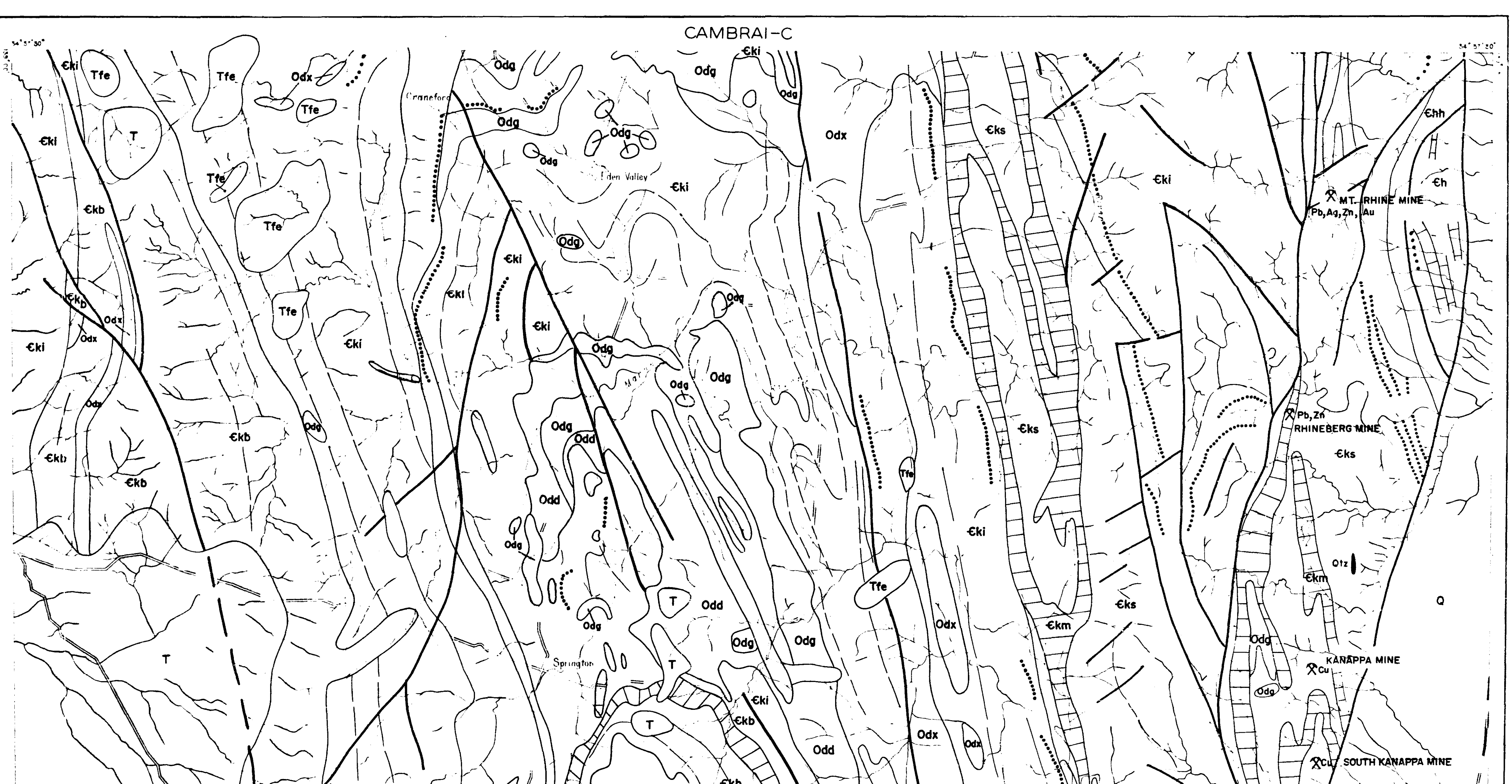
INDEX TO ADJOINING SHEETS	
A B GAWLER C D	A B CAMBRAI C D
A B ADELAIDE C D	A B MANNUM C D

DEPARTMENT OF MINES — SOUTH AUSTRALIA

CAMBRAI 'A'
GEOLOGICAL MAP

GEOCHEMICAL EXPLORATION SECTION	GEOLOGIST	Drn. B.E.	SCALE: 1:50000
Director of Mines		Trd. R.G.	76-123
		Ckd.	
		Exd.	DATE: NOV. '75

CAMBRAI-C



SCALE 1:50000

METRES 1000 0 1 2 3 KILOMETRES
YARDS 1000 0 1 2 MILES

.......................FAULT
···GEOLOGICAL BOUNDARY
·········TREND OF BEDDING

GEOLOGICAL SEQUENCE····SEE FIG.2

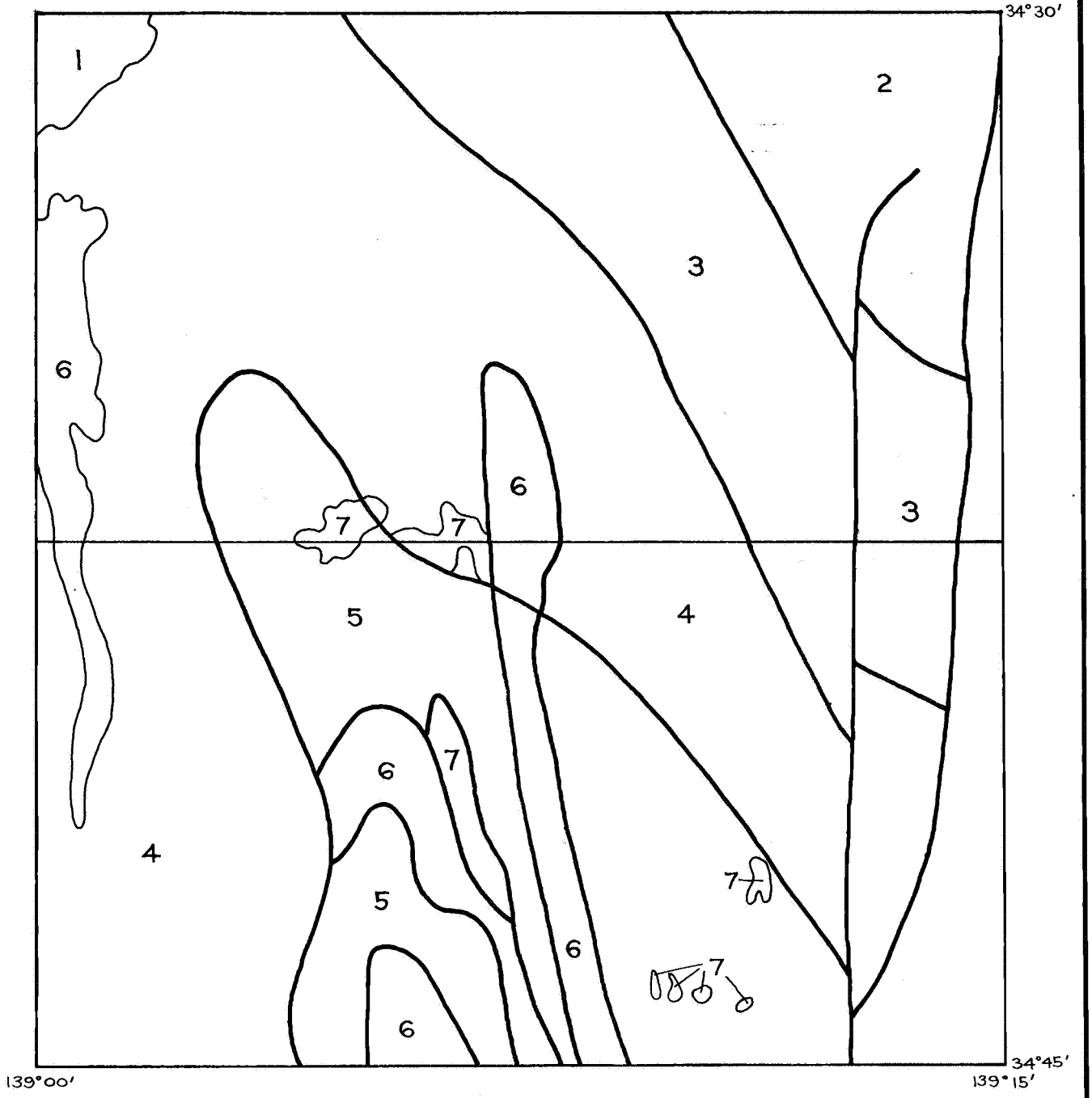
Enlargement of D.M. Cambrai 60 chain base **FIG. 3**

INDEX TO ADJOINING SHEETS	
A B GAWLER C D	A B CAMBRAI C D
A B ADELAIDE C D	A B MANNUM C D

DEPARTMENT OF MINES — SOUTH AUSTRALIA

CAMBRAI 'C'
GEOLOGICAL MAP

GEOCHEMICAL EXPLORATION SECTION	GEOLOGIST	Drn. B.E.	SCALE: 1:50000
Director of Mines		Trd. R.G.	76-123
		Ckd. A.F.	
		Exd.	DATE: NOV. '75



1 Alluvium.
2 Biotite zone.
3 Andalusite staurolite zone.
4 Sillimanite zone.
5 Migmatite.
6 Granite gneiss.
7 Granite.

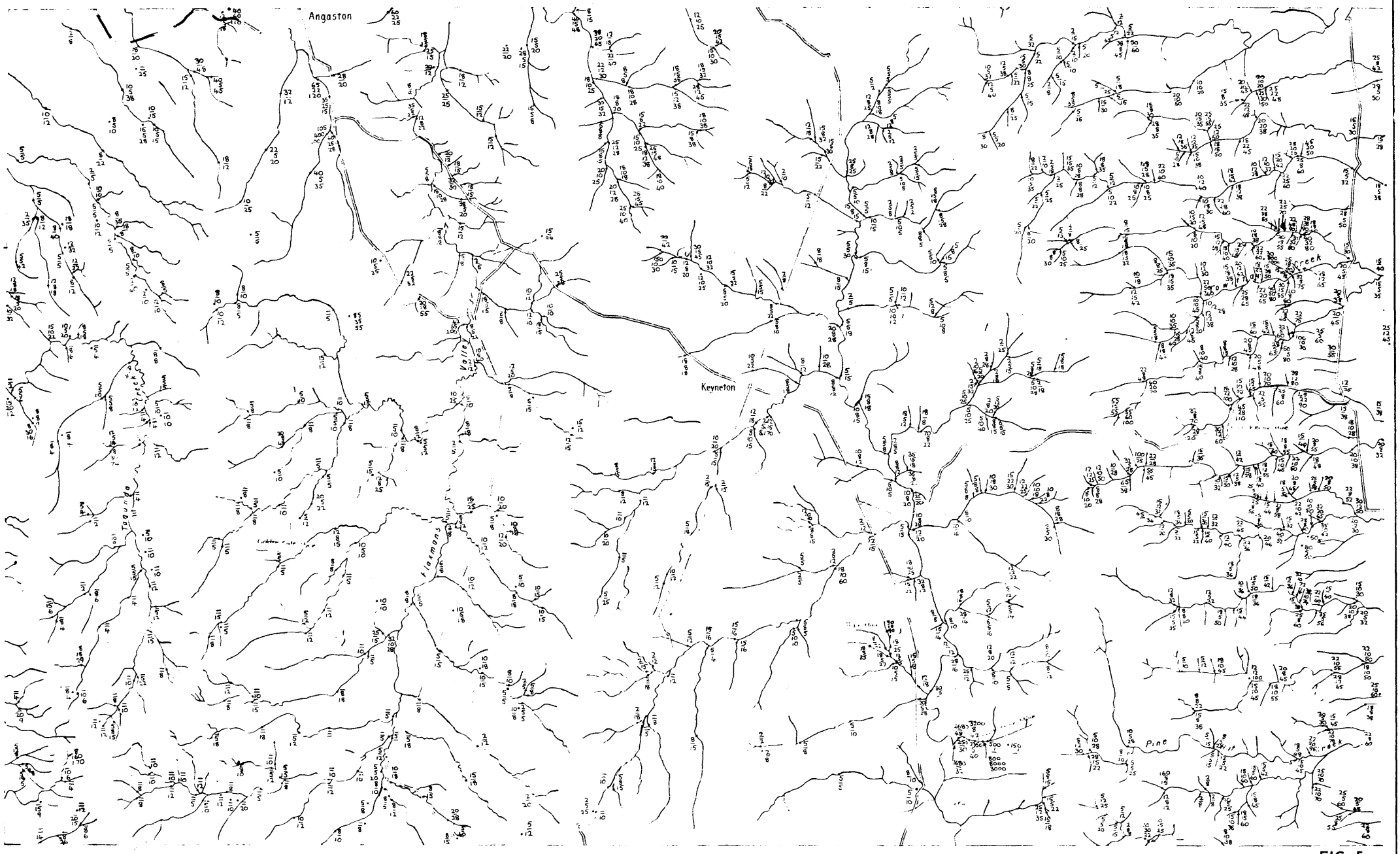
From Aquitane Australia Pty. Ltd. (1973)

FIG. 4

	DEPARTMENT OF MINES — SOUTH AUSTRALIA	Scale : 1:150 000 Approx
Compiled : B.Eberhard	ADELAIDE STREAM SAMPLING	Date :
Drn. A.F. / Ckd A.F.	METAMORPHIC ZONES ON CAMBRAI	Drg. No. S12051

750—8.74 F332 O

CAMBRAI-A



SCALE 1 50 000

METRES 1000 0 1 2 KILOMETRES

YARDS 1000 0 1 2 MILES

Stream sediment sample location

Copper content in ppm

Lead

Zinc

Detection limits
Cu..... 2ppm.
Pb..... 5ppm.
Zn..... 2ppm.

INDEX TO ADJOINING SHEETS

A B / GAWLER / C D	A B / CAMBRAI / C D
A B / ADELAIDE / C D	A B / MANNUM / C D

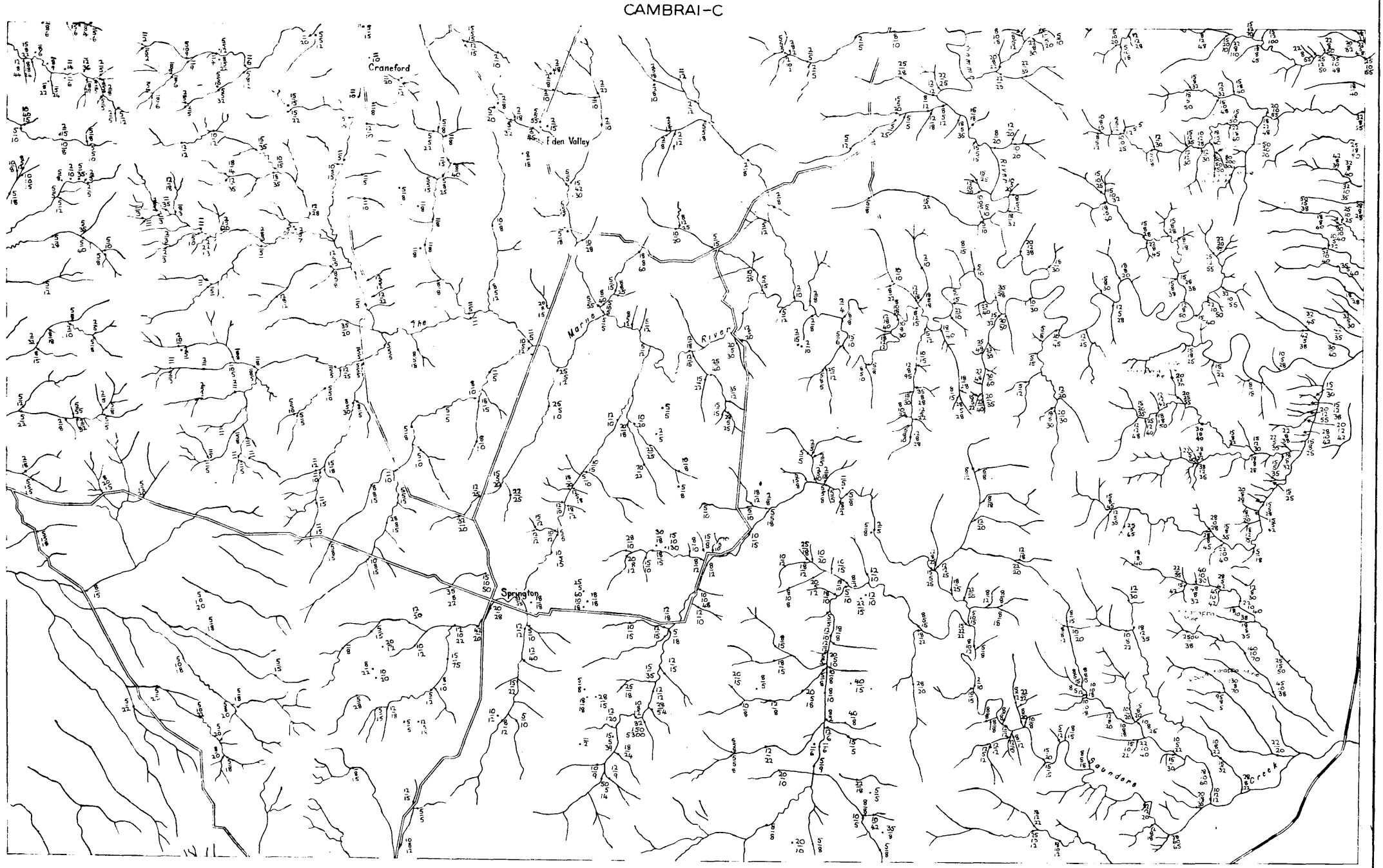
Enlargement of DTM Cambrai 60 chain base FIG. 5

DEPARTMENT OF MINES — SOUTH AUSTRALIA

ADELAIDE STREAM SAMPLING
COPPER LEAD & ZINC VALUES
CAMBRAI - A

GEOCHEMICAL EXPLORATION SECTION	GEOLOGIST	Dm. B.E.	SCALE: 1:50 000
		Tot. A.F.	76-124
Director of Mines		Chk.	
		Encl.	DATE:

CAMBRAI-C



SCALE 1:50000

METRES 1000 0 1 2 3 KILOMETRES

YARDS 1000 0 1 2 MILES

Stream sediment sample location

Copper content in ppm

Lead

Zinc

Detection limits
Cu..... 2ppm.
Pb..... 5ppm.
Zn..... 2ppm.

INDEX TO ADJOINING SHEETS

A B / GAWLER / C D	A B / CAMBRAI / C D
A B / ADELAIDE / C D	A B / MANNUM / C D

Enlargement of DTM Cambrai 60 chain base FIG. 5

DEPARTMENT OF MINES — SOUTH AUSTRALIA

ADELAIDE STREAM SAMPLING
COPPER LEAD & ZINC VALUES
CAMBRAI - C

GEOCHEMICAL EXPLORATION SECTION	GEOLOGIST	Dm. B.E.	SCALE: 1:50 000
		Tot. A.F.	76-124
Director of Mines		Chk. A.F.	
		Encl.	DATE: JULY 1975

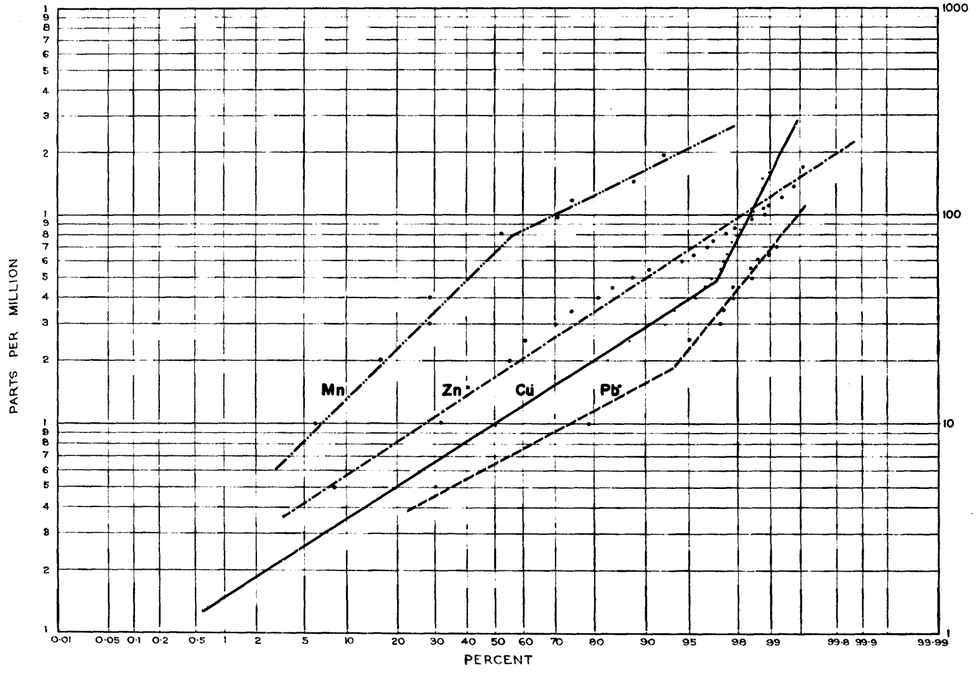


FIG. 6

DEPARTMENT OF MINES — SOUTH AUSTRALIA

CAMBRAI 'A'

CUMULATIVE FREQUENCY PLOT

Cu, Pb, Zn, Mn

GEOCHEMICAL EXPLORATION SECTION		Drn. B.E.	SCALE :
		Tcd. R.G.	76 – 122
Director of Mines		Ckd. A.F.	
		Exd.	DATE : DEC. '75

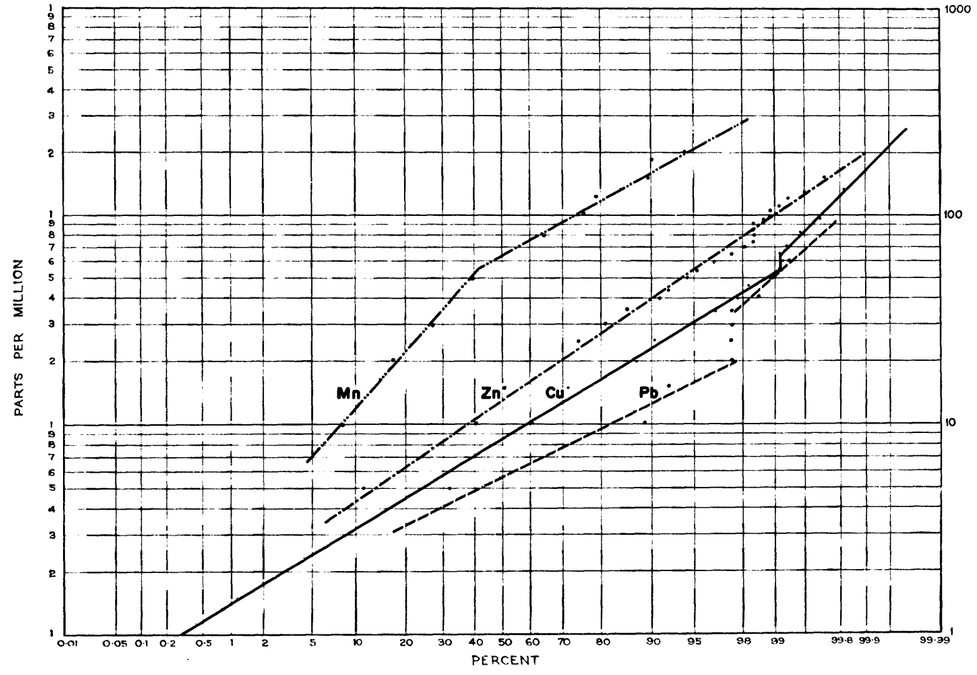


FIG. 6

DEPARTMENT OF MINES — SOUTH AUSTRALIA

CAMBRAI 'C'

CUMULATIVE FREQUENCY PLOT

Cu, Pb, Zn, Mn

GEOCHEMICAL EXPLORATION SECTION		Drn. B.E.	SCALE :
		Tcd. R.G.	76 – 122
Director of Mines		Ckd. A.F.	
		Exd.	DATE : DEC. '75

CAMBRAI-A

Angaston
Keyneton
Tanunda Creek
Flaxmans Valley
Pine Hut Creek
Torrens Creek

Pb 60 Zn 110
Cu 60
Cu 65 Pb 22 Zn 120
Pb 25
Cu 105 Pb 40 Zn 100
Pb 40
Cu 150
Cu 85 Pb 35
Pb 65 Zn 200
Zn 140
Pb 22
Pb 30
Pb 22
Pb 25
Pb 28
Pb 25 Zn 70
Pb 38 Zn 85
Pb 43 Zn 90
Pb 38 Zn 90
Pb 32 Zn 80
Pb 32 Zn 85
Pb 80 Zn 1000
Pb 22
Pb 38
Zn 75
Zn 60
Pb 50 Zn 340
Pb 28
Pb 50 Zn 80
Pb 28
Zn 75
Cu 100
Cu 50 Zn 80
Zn 70
Zn 70
Zn 80
Pb 22 Zn 90
Cu 55
Cu 55 Pb 60 Zn 100
Pb 22 Zn 100
Pb 29 Zn 110
Zn 70 Zn 120
Zn 170
Cu 70
Cu 140
Cu 65
Pb 22
Pb 22
Pb 30
Pb 30 Zn 74
Pb 70
Cu 50
Cu 80
Zn 72
Zn 74
Zn 100
Cu 3200
Cu 2680
Cu 2350
Cu 1680
Cu 2150
Cu 500
Cu 800 Pb 8000 Zn 3000
Zn 70
Zn 95
Cu 160
Zn 70
Zn 70
Pb 160 Zn 170
Pb 30

SCALE 1 50000
METRES 1000 0 1 2 3 KILOMETRES
YARDS 1000 0 1 2 MILES

Enlargement of D.M. Cambrai 60 chain base FIG. 7

INDEX TO ADJOINING SHEETS

A B GAWLER C D	A B CAMBRAI C D
A B ADELAIDE C D	A B MANNUM C D

DEPARTMENT OF MINES — SOUTH AUSTRALIA

ADELAIDE STREAM SAMPLING

ANOMALOUS Cu, Pb, Zn, VALUES

CAMBRAI - A

GEOCHEMICAL EXPLORATION SECTION	B. Eberhard GEOLOGIST	Drn. B.E.	SCALE: 1 50000
		Trd. A.F.	76-125
Director of Mines		Chd.	
		Encl.	DATE: FEB 1976

CAMBRAI-C

Craneford
Eden Valley
The Marne River
Somme River
Springton
Saunders Creek

Pb 42 Zn 130
Pb 28
Cu 70
Zn 130
Zn 120
Pb 150 Zn 5300
Cu 50
Zn 70
Zn 100
Zn 110
Cu 50
Cu 80 Pb 300 Zn 3400
Cu 50 Pb 150 Zn 150
Zn 80
Cu 50
Zn 95
Zn 70
Pb 25
Zn 70
Zn 75
Cu 48
Cu 45
Cu 2500
Cu 160 Zn 70
Cu 130 Zn 70
Cu 45
Cu 95
Pb 60

SCALE 1:50000
METRES 1000 0 1 2 3 KILOMETRES
YARDS 1000 0 1 2 MILES

Enlargement of D.M. Cambrai 60 chain base FIG. 7

INDEX TO ADJOINING SHEETS

A B GAWLER C D	A B CAMBRAI C D
A B ADELAIDE C D	A B MANNUM C D

DEPARTMENT OF MINES — SOUTH AUSTRALIA

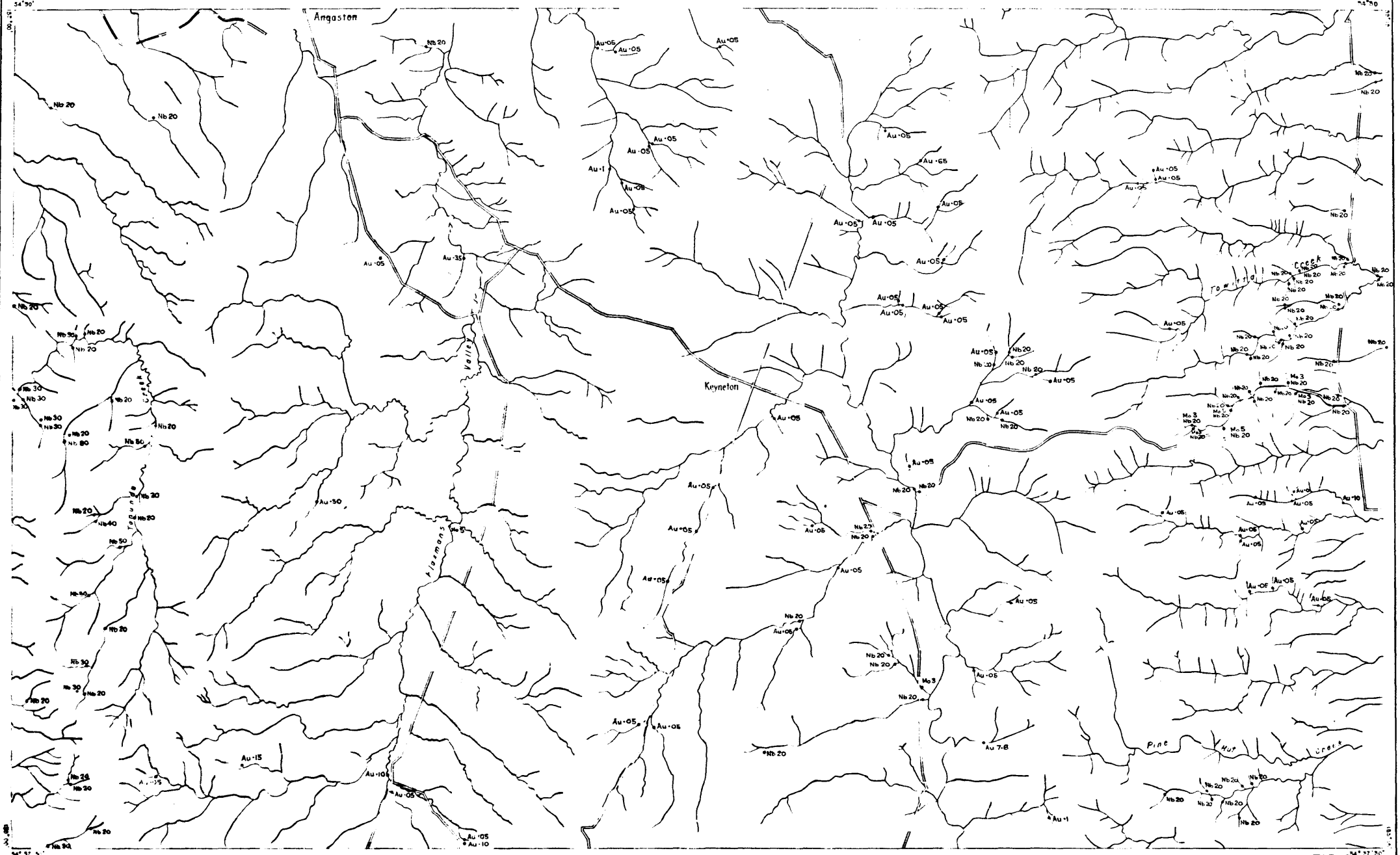
ADELAIDE STREAM SAMPLING

ANOMALOUS Cu, Pb, Zn, VALUES

CAMBRAI - C

GEOCHEMICAL EXPLORATION SECTION	B. Eberhard GEOLOGIST	Drn. B.E.	SCALE: 1 50000
		Trd. A.F.	76-125
Director of Mines		Chd. A.F.	
		Encl.	DATE: FEB 1976

CAMBRAI-A



SCALE 1:25 000

METRES 1000 0 1 2 3 KILOMETRES

YARDS 1 MILES

Detection limits
Au ..... ·05
Bi 10
Mo 3
Nb 20

INDEX TO ADJOINING SHEETS

BARLEE	CAMBRAI
ADELAIDE	MANNUM

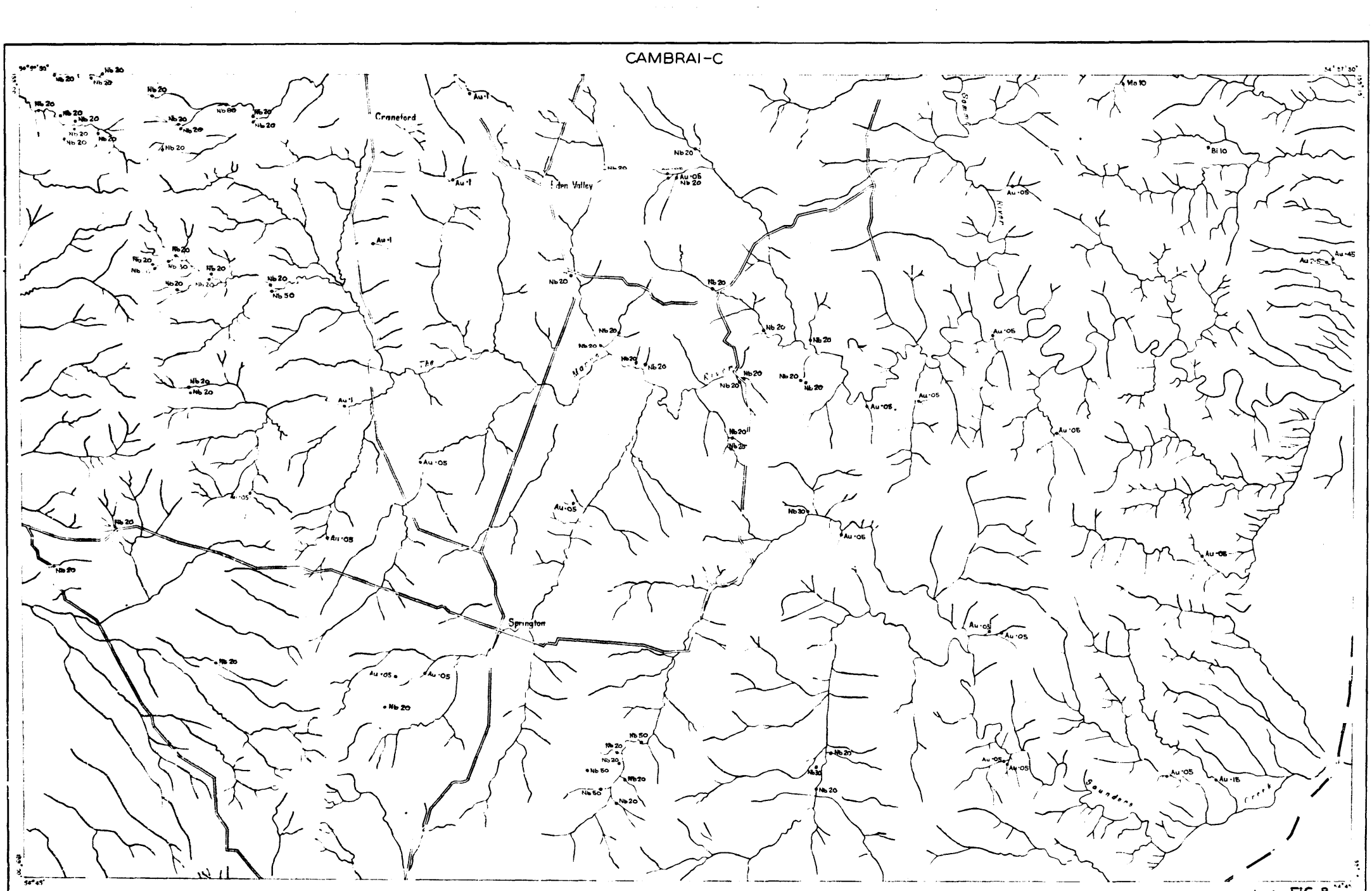
Enlargement of 1:M Cambrai sp chain base FIG. 8

DEPARTMENT OF MINES — SOUTH AUSTRALIA

ADELAIDE STREAM SAMPLING
GOLD BISMUTH MOLYBDENUM NIOBIUM VALUES
CAMBRAI - A

GEOCHEMICAL EXPLORATION SECTION — GEOLOGIST — Drn. B.E. — Tel. A.F. — Chk. — Engr. — Director of Mines — SCALE: 1:25 000 — 76-126 — DATE: FEB 1976

CAMBRAI-C



SCALE 1:25 000

METRES 1000 0 1 2 3 KILOMETRES

YARDS 1 MILES

Detection limits
Au ..... ·05
Bi 10
Mo 3
Nb 20

INDEX TO ADJOINING SHEETS

BARLEE	CAMBRAI
ADELAIDE	MANNUM

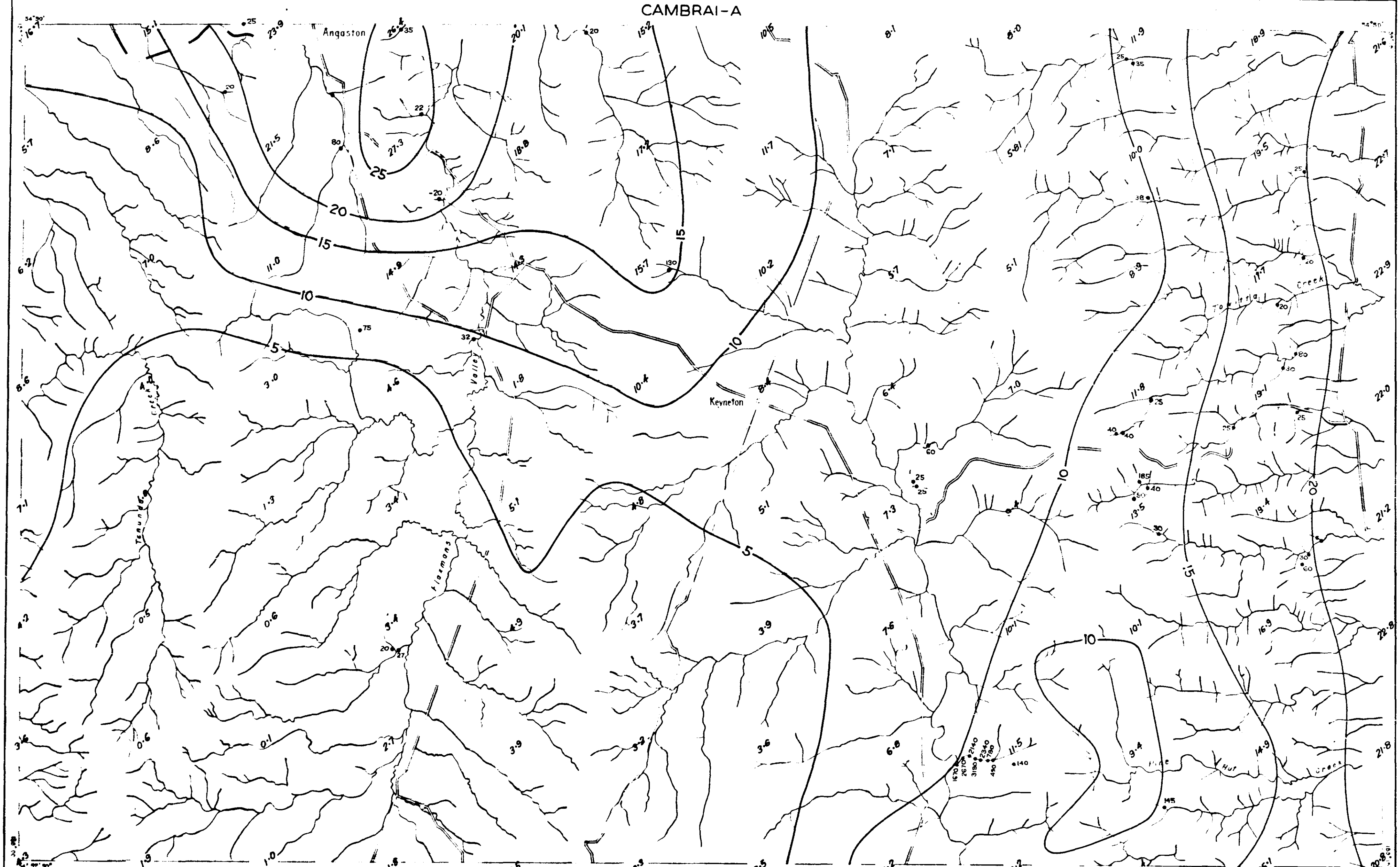
Enlargement of 1:M Cambrai sp chain base FIG. 8

DEPARTMENT OF MINES — SOUTH AUSTRALIA

ADELAIDE STREAM SAMPLING
GOLD BISMUTH MOLYBDENUM NIOBIUM VALUES
CAMBRAI - C

GEOCHEMICAL EXPLORATION SECTION — GEOLOGIST — Drn. B.E. — Tel. A.F. — Chk. A.F. — Engr. — Director of Mines — SCALE: 1:25 000 — 76-126 — DATE: FEB 1976

CAMBRAI-A



SCALE 1:50000

METRES 1000 0 1 2 3 KILOMETRES
YARDS 1000 0 1 2 MILES

Residuals ≥ ± 25 p.p.m. are shown.

Enlargement of DM Cambrai chain base FIG. 9

INDEX TO ADJOINING SHEETS

GAWLER	CAMBRAI
ADELAIDE	MANNUM

DEPARTMENT OF MINES – SOUTH AUSTRALIA

ADELAIDE STREAM SAMPLING

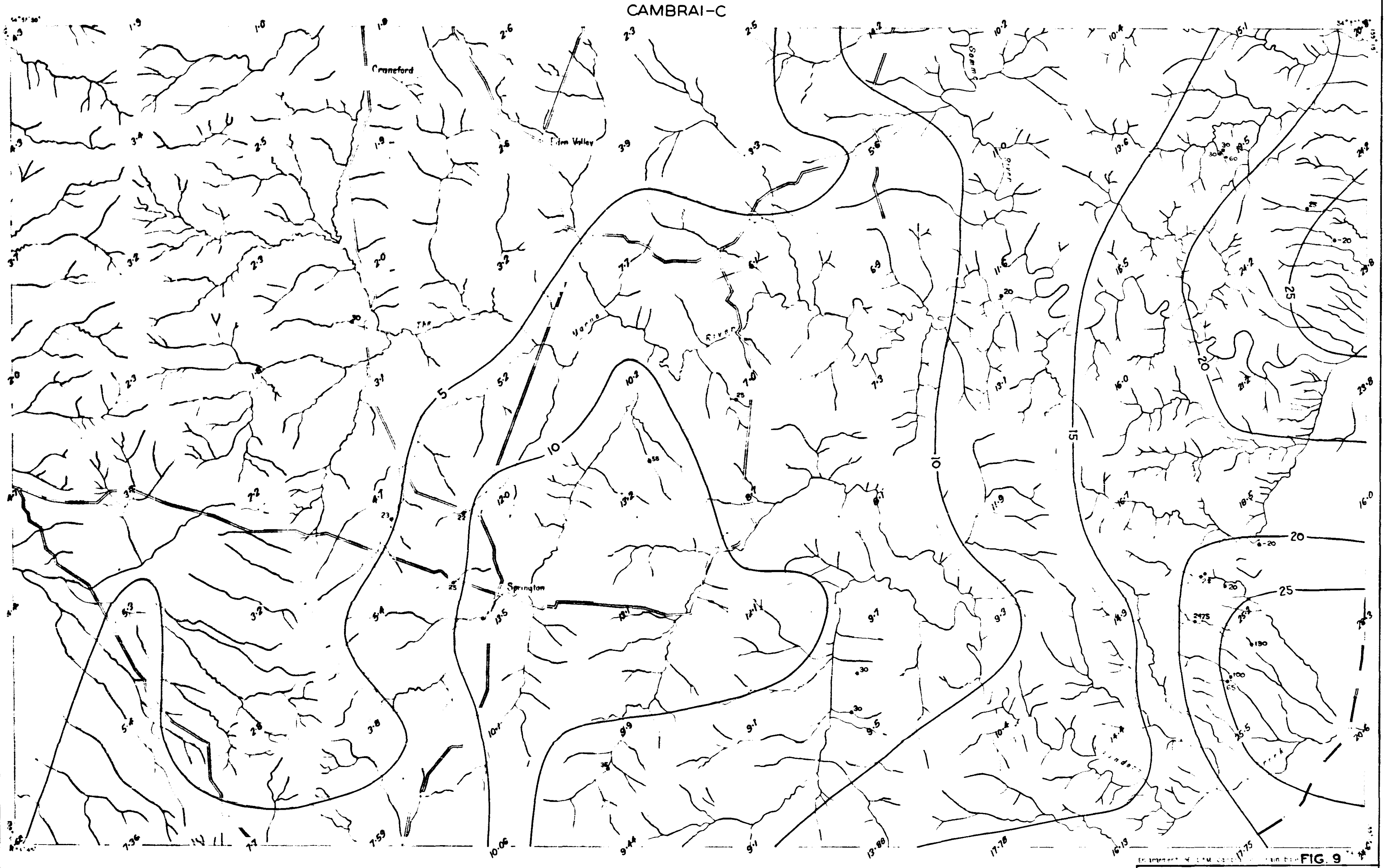
GEOMETRIC ROLLING MEAN OF COPPER

CAMBRAI - A

GEOCHEMICAL EXPLORATION SECTION | B Eberhard GEOLOGIST | Drn. B.E. | Trd. A.F. | SCALE 1:50000 | 76-127 | DATE FEB 1976

Director of Mines

CAMBRAI-C



SCALE 1:50000

METRES 1000 0 1 2 3 KILOMETRES
YARDS 1000 0 1 2 MILES

Residuals ≥±20 ppm are shown

Enlargement of DM Cambrai chain base FIG. 9

INDEX TO ADJOINING SHEETS

GAWLER	CAMBRAI
ADELAIDE	MANNUM

DEPARTMENT OF MINES – SOUTH AUSTRALIA

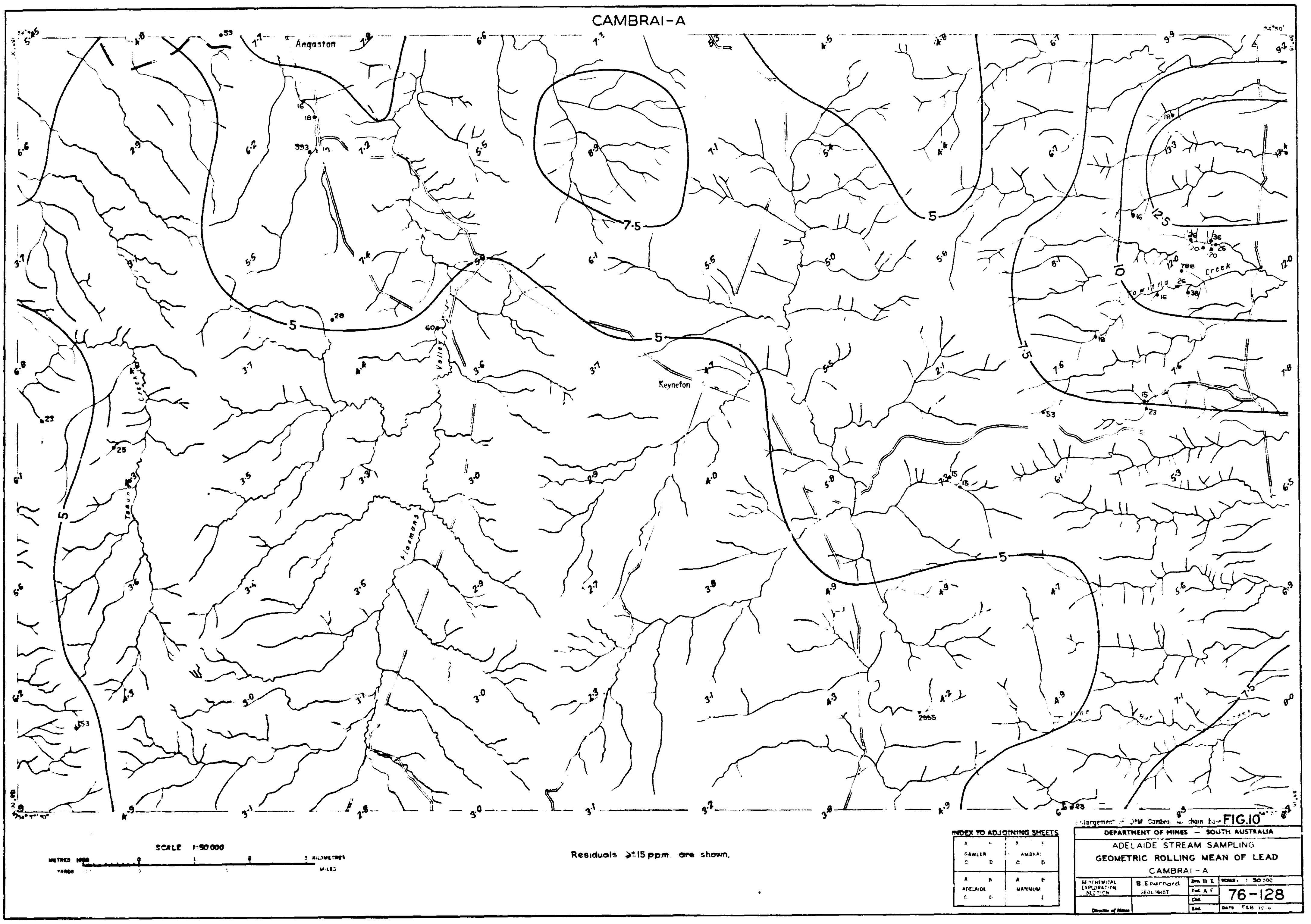
ADELAIDE STREAM SAMPLING

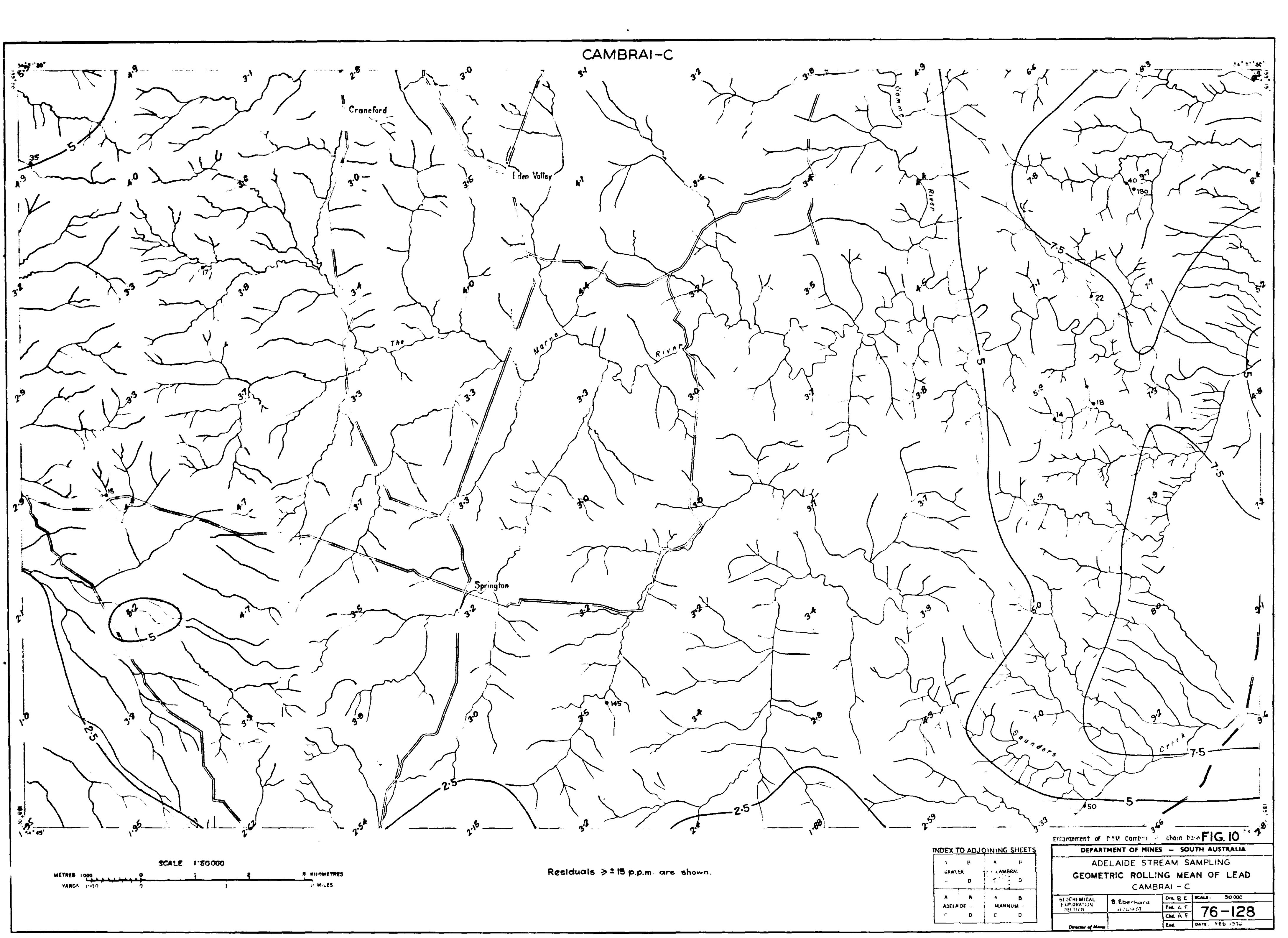
GEOMETRIC ROLLING MEAN OF COPPER

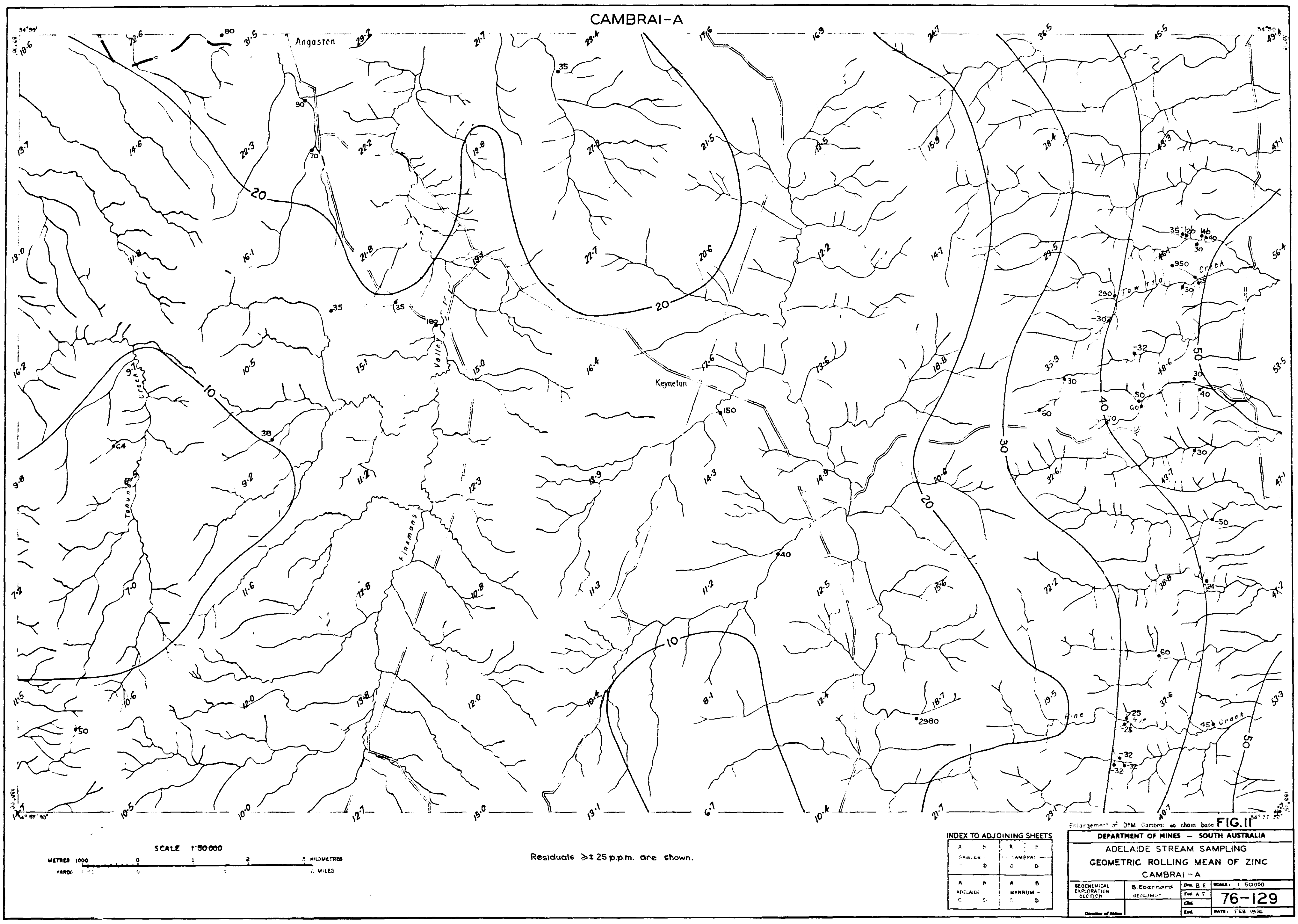
CAMBRAI - C

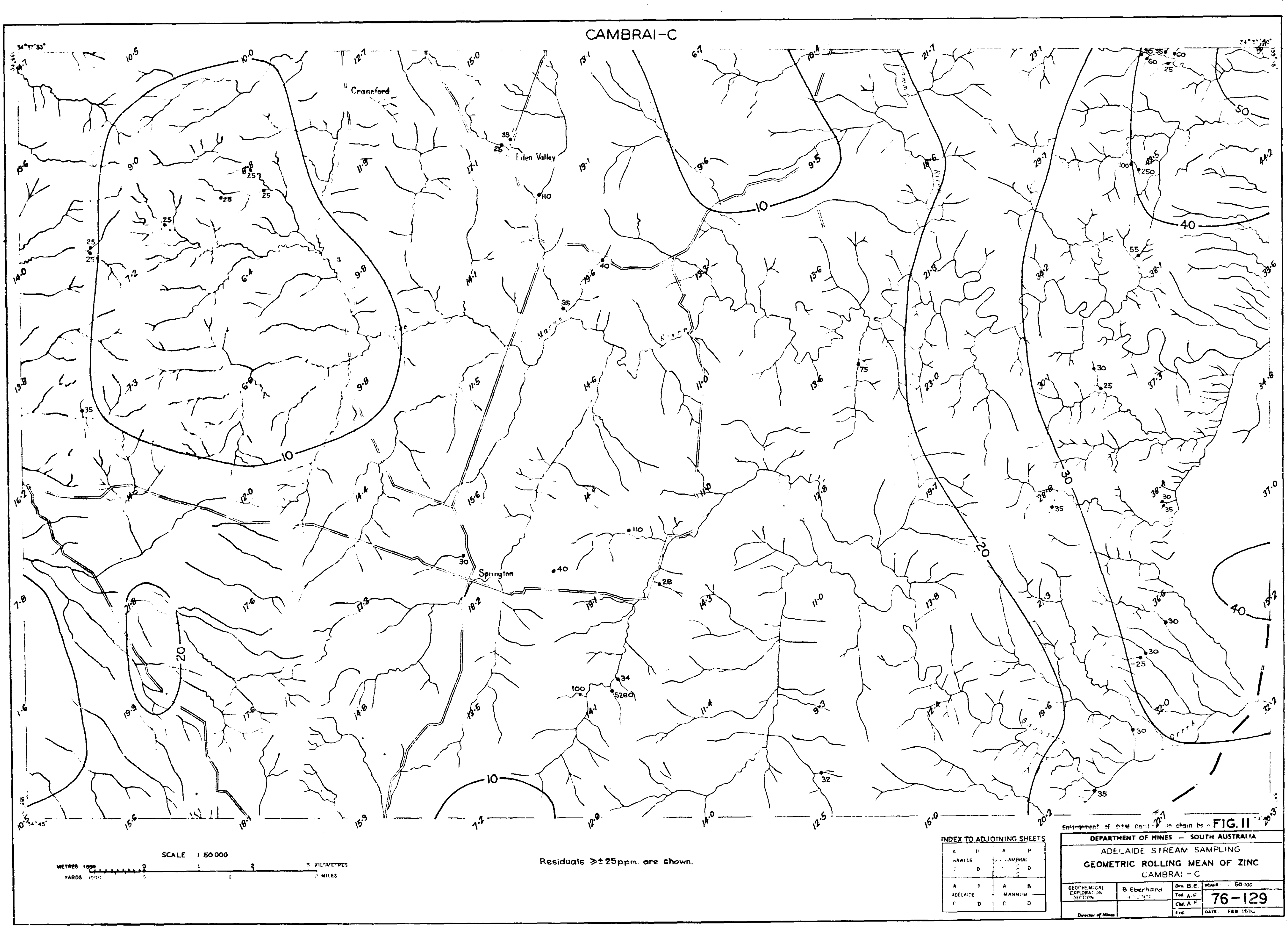
GEOCHEMICAL EXPLORATION SECTION | B Eberhard | Drn. B.E. | Trd. A.F. | Chd. A.F. | SCALE 1:50000 | 76-127 | DATE FEB 1976

Director of Mines

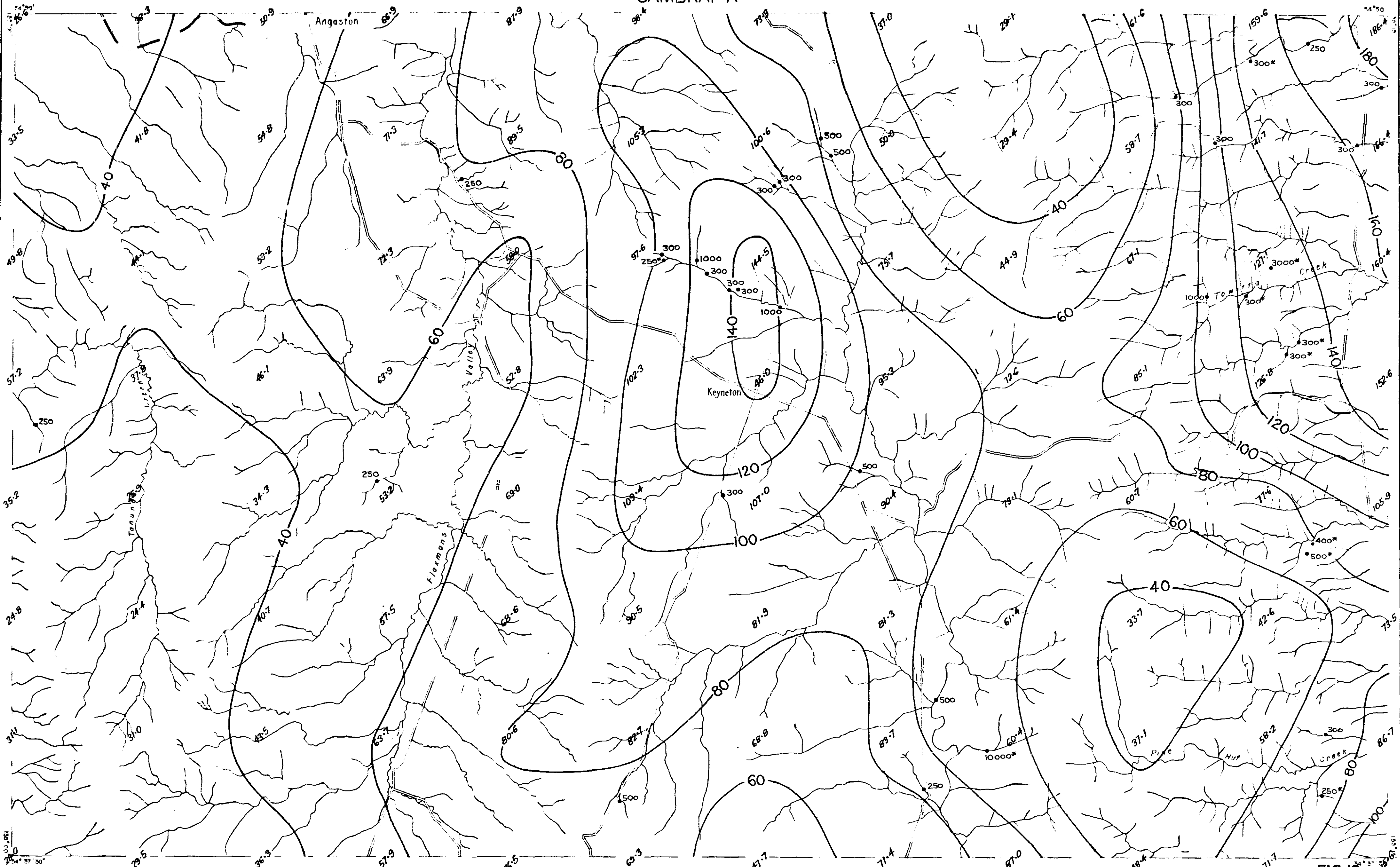

CAMBRAI-A
Angaston
Keyneton
SCALE 1:50 000
Residuals ≥ 15 p.p.m. are shown.
INDEX TO ADJOINING SHEETS
FIG.10
DEPARTMENT OF MINES — SOUTH AUSTRALIA
ADELAIDE STREAM SAMPLING
GEOMETRIC ROLLING MEAN OF LEAD
CAMBRAI-A
GEOCHEMICAL EXPLORATION SECTION
76-128


CAMBRAI-C
Craneford
Eden Valley
Springton
SCALE 1:50 000
Residuals ≥ 15 p.p.m. are shown.
INDEX TO ADJOINING SHEETS
FIG. 10
DEPARTMENT OF MINES — SOUTH AUSTRALIA
ADELAIDE STREAM SAMPLING
GEOMETRIC ROLLING MEAN OF LEAD
CAMBRAI-C
GEOCHEMICAL EXPLORATION SECTION
76-128


CAMBRAI-A
Angaston
Keyneton
Towitta Creek
Pine Hut Creek
Flaxmans Valley
Tanunda Creek
SCALE 1:50 000
METRES 1000 0 1 2 3 KILOMETRES
YARDS 1000 0 1 2 MILES
Residuals ≥±25 p.p.m. are shown.
INDEX TO ADJOINING SHEETS
GAWLER
CAMBRAI
ADELAIDE
MANNUM
Enlargement of D.M. Cambrai 40 chain base
FIG. 11
DEPARTMENT OF MINES – SOUTH AUSTRALIA
ADELAIDE STREAM SAMPLING
GEOMETRIC ROLLING MEAN OF ZINC
CAMBRAI - A
GEOCHEMICAL EXPLORATION SECTION
B. Eberhard GEOLOGIST
Director of Mines
Drn. B.E.
Tcd. A.F.
SCALE: 1:50 000
76-129
DATE: FEB 1976


CAMBRAI-C
Craneford
Eden Valley
Springton
Marne River
Saunders Creek
SCALE 1:50 000
METRES 1000 0 1 2 3 KILOMETRES
YARDS 1000 0 1 2 MILES
Residuals ≥±25 p.p.m. are shown.
INDEX TO ADJOINING SHEETS
GAWLER
CAMBRAI
ADELAIDE
MANNUM
FIG. 11
DEPARTMENT OF MINES – SOUTH AUSTRALIA
ADELAIDE STREAM SAMPLING
GEOMETRIC ROLLING MEAN OF ZINC
CAMBRAI - C
GEOCHEMICAL EXPLORATION SECTION
B. Eberhard
Director of Mines
Drn. B.E.
Tcd. A.F.
Chd. A.F.
76-129
DATE: FEB 1976

CAMBRAI-A



Enlargement of D*M Cambrai 80 chain base FIG. 12

SCALE 1:50000

METRES 1000 0 1 2 3 KILOMETRES

YARDS 1000 0 1 2 MILES

Sample points assaying >250 ppm. Manganese are shown

INDEX TO ADJOINING SHEETS

A B GAWLER C D	A B CAMBRAI C D
A B ADELAIDE C D	A B MANNUM C D

DEPARTMENT OF MINES – SOUTH AUSTRALIA

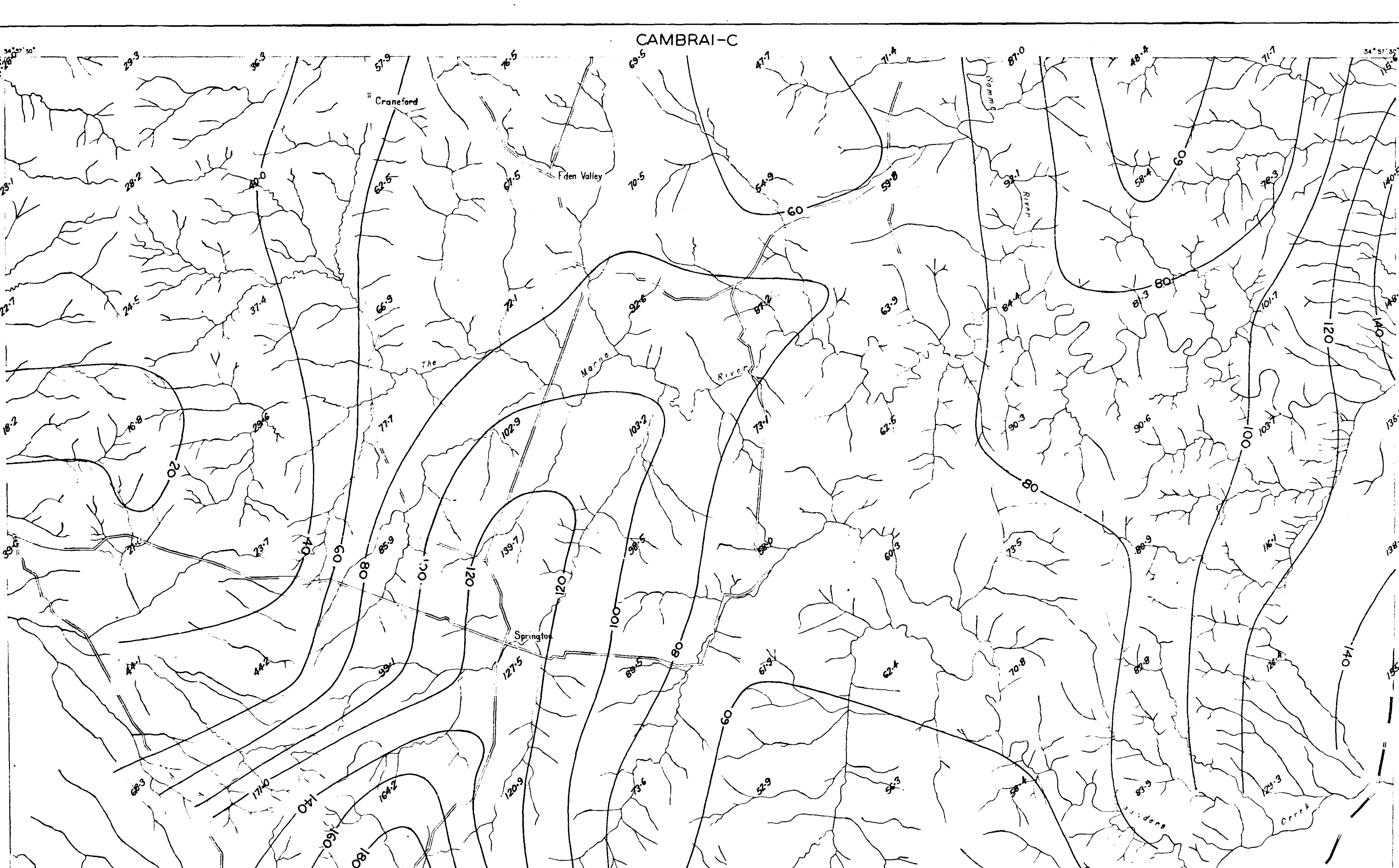
ADELAIDE STREAM SAMPLING

GEOMETRIC ROLLING MEAN OF MANGANESE

CAMBRAI – A

GEOCHEMICAL EXPLORATION SECTION	B. Eberhard GEOLOGIST	Drn. B.E.	SCALE: 1:50000
		Tcd. A.F.	76–130
		Ckd.	
Director of Mines		Exd.	DATE: FEB 1976

CAMBRAI-C



Enlargement of D*M Cambrai 80 chain base FIG. 12

SCALE 1:50000

METRES 1000 0 1 2 3 KILOMETRES

YARDS 1000 0 1 2 MILES

Sample points assaying > 250 p.p.m. Manganese are shown.

INDEX TO ADJOINING SHEETS

A B GAWLER C D	A B CAMBRAI C D
A B ADELAIDE C D	A B MANNUM C D

DEPARTMENT OF MINES – SOUTH AUSTRALIA

ADELAIDE STREAM SAMPLING

GEOMETRIC ROLLING MEAN OF MANGANESE

CAMBRAI – C

GEOCHEMICAL EXPLORATION SECTION	B. Eberhard GEOLOGIST	Drn. B.E.	SCALE: 1:50000
		Tcd. A.F.	76–130
		Ckd. A.F.	
Director of Mines		Exd.	DATE: JULY 1975

CAMBRAI-A

34°30'

34°50'

35°15'

34°57'30"

Angaston

Keyneton

Valley

Creek

Tarrun

Flaxmans

Pine

SCALE 1:25 000

METRES 1000 0 1 2 3 KILOMETRES

YARDS 1000 0 1 2 MILES

4122 ..... SHOULD READ G 4122/73

1850 ..... SHOULD READ G 1850/76

2121* ..... SHOULD READ G 2221/75

INDEX TO ADJOINING SHEETS

A | B		A | B	
GAWLER		CAMBRAI	
C | D		C | D	
A | B		A | B	
ADELAIDE		MANNUM	
C | D		C | D	

Enlargement of D&M Cambrai 80 chain base

DEPARTMENT OF MINES — SOUTH AUSTRALIA

ADELAIDE STREAM SAMPLING

G. Nos

CAMBRAI-A

GEOCHEMICAL EXPLORATION SECTION	GEOLOGIST	Drn.	SCALE 1:25 000
		Tcd.	76-416
Director of Mines		Chd.	
		Exd.	DATE

CAMBRAI-C

34°37'30"

139°00'

139°15'

Craneford

Eden Valley

Springton

The Marne River

Somme River

Saunders Creek

34°45'

SCALE 1:25 000

METRES 1000 0 1 2 3 KILOMETRES

YARDS 2000 0 1 2 MILES

f 2733 ..... SHOULD READ G 2733/73

f 3439 ..... SHOULD READ G 3439/74

f 2112* ..... SHOULD READ G 2112/75

INDEX TO ADJOINING SHEETS

A | B		A | B	
GAWLER		CAMBRAI	
C | D		C | D	
A | B		A | B	
ADELAIDE		MANNUM	
C | D		C | D	

Enlargement of D.T.M. Cambrai 80 chain base

DEPARTMENT OF MINES — SOUTH AUSTRALIA

ADELAIDE STREAM SAMPLING

G. Nos.

CAMBRAI - C

GEOCHEMICAL EXPLORATION SECTION	GEOLOGIST	Drn.	SCALE: 1 25 000
		Tcd.	76-417
Director of Mines		Ckd.	
		Exd	DATE