COMSTAFF PROPRIETARY LIMITED

EXPLORATION LICENCE 5/63

1971/1972 SUMMER FIELD SEASON REPORT

COLDSTREAM - HATFIELD - QUE REGIONAL RECONNAISSANCE PROJECT

AUSTRALIAN ANGLO AMERICAN LIMITED

Incorporated in the State of Victoria

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1971/1972 SUMMER FIELD SEASON REPORT

Contents

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RECONNAISSANCE PROJECT

1. GENERAL

1.1. Location

The area under consideration lies 10-12 miles south of Mount Bischoff, the main camp being located at the junction of the Coldstream and Hatfield rivers, forming part of exploration licence 5/63 (see location map TAS 2-271).

1.2. Physical Features

The area is typical of the west of Tasmania in that it has deeply incised rejuvenated drainage resulting in a rugged, densely vegetated terrain.

1.3. Access

Access was provided by a rough four-wheel drive track starting from near Waratah and ending at the main camp-site. Access to other parts of the area was mainly by foot.

1.4. Previous Work

Other than regional geological mapping by the Mines Department and geological mapping and stream-sediment sampling of the Coldstream, during the 1969/70 field season, there has been no intensive regional exploratory work in this area.

1.5. Objectives

The objectives of the project were fourfold, viz:-

a) to complete a regional geochemical investigation, involving stream sediment sampling, heavy concentrate collection and soil sampling of the lower Hatfield and Que river systems;

b) to complete the regional geological mapping of the area and thus gain information which would assist in the structural interpretation of the region as a whole;

c) to follow-up previously located geochemical anomalies in the lower Coldstream and its tributaries;

2/ d) to heavy concentrate ...

d) to heavy concentrate sample and geologically appraise the mica peridotite located in the lower section of the Coldstream river.

All four objectives were achieved.

1.6. Exploration Methods

Primarily, exploration methods combined stream-sediment sampling of the active stream material with a sound collection of geological data from the area.

Stream sediment samples and soil samples were collected at 500' intervals on all waterways and access tracks respectively (see TAS 2-272). The soil sample interval was reduced to 100' where geological considerations deemed this to be advisable.

Both stream sediment and soil samples were dried and sieved to a -80 mesh fraction in Waratah. After processing, the samples were despatched to the Australian Mineral Development Laboratories in Adelaide for analysis as follows:

Atomic absorption spectrometry: Cu, Zn, Ag, Ni, Bi.

X-Ray fluorescence: Sb, Sn.

Samples having anomalous values were then re-analysed by spectrographic scan for Co, Mo, Rh, W, V, Ge, As, Cd, Hg, and in some cases Mn.

Heavy concentrates were taken at one mile intervals on the main streams and at the mouth of all major tributaries. The concentrate was despatched to the Australian Mineral Development Laboratories for spectrographic scan for the following elements: Cr, V, W, Mo, Ta, Nb, Sn, Cd, Au, and Ge (three concentrates draining an ultrabasic were further analysed for Pt, Pd, Os, and Ir). In addition, all concentrates were cleaned using tetrabromethane prior to a brief mineral grain identification (not including opaques).

Geophysical applications were limited to a magnetometer traverse over the mica peridotite in the Coldstream area and to scintillometer traversing of the lower Coldstream, Hatfield and Que rivers (TAS 2-273).

2. GEOLOGY

2.1. Stratigraphy (see TAS 2-274)

The rocks of the area may be grouped into three major successions and one minor succession whose relationships are somewhat obscure as each is confined by a specific structural feature, viz,:

Structural feature	Succession	Comment
N.Que syncline -	Hatfield quartzites	Stratigraphic relationships unknown in this area.
S.Que syncline -	Reid volcanic group	
Owen Shear zone -	f - f - f - f	
NE-SW Hatfield anticline -	Hatfield greywacke	Stratigraphic relationships unknown in this area.
N-S Just-in-Time antiform -	Ramsay group	

2.1.1. Ramsay group

These are believed to be the oldest beds in the area, possibly lower Cambrian or younger Pre-Cambrian and are thought to have been part of a geanticlinal(?) block at the time of deposition of the overlying Hatfield Greywacke Succession.

The Ramsay group is essentially miogeosynclinal and is folded complexly, as opposed to the relatively simple folding of the overlying, possibly eugeosynclinal, rocks.

Basically, the succession comprises a thinly bedded sequence of grey quartzites, meta-sandstones, grey shales and grey slaty siltstones.

The most interesting rock crops out along the main Coldstream track and is a pure white "sandstone". This "sandstone" contains a considerable proportion of hydrothermal quartz infilling vugs and as a replacement mineral after calcite.

Apart from signs of brecciation in part, the "sandstone" is without definite structural features so its structural setting is obscure. It is suggested that this "sandstone", of apparently limited extent, could represent a confined ancient beach deposit, possibly much younger than the Ramsay group and thus related to the basal Hatfield Succession.

In close association with this "sandstone", two features with possible gossan affinities occur (see TAS 2-277) which are thought to comprise chalcopyrite, bornite, and tetrahedrite boxworks.

The dimensions of these gossanous(?) zones are not known although interesting geochemical anomalies in copper, zinc, nickel, lead, and antimony would appear to be directly related (see later under Geochemical Anomalies).

4/ 2.1.2. Hatfield .....

2.1.2. Hatfield Greywacke Succession

The dominant part of this succession is a thick, basal, rhythmically-bedded sequence of greywackes and mudstones. A typical unit of the rhythmic sequence ranges from coarse greywacke conglomerate, through greywacke grit, greywacke, ferruginous siltstone to very fine grained siltstone. Occasionally, the finest member is shale.

The greywackes are very variable in grain-size and their individual composition changes accordingly, since the finer material tends to be comprised of mineral rather than rock grains. The lithic components of the coarser rocks include finer greywacke, sub-arkose, siltstone, cherts, microdiorite, trachyte(?), metaquartzite, sericite schist, and hematitic siltstone. The composition of the finer greywackes is quartz, plagioclase and aggregates of muscovite and chlorite; aggregates of the latter possibly result from the breakdown of serpentine. Occasional grains of tourmaline and garnet were seen in thin section.

The ferruginous siltstones are the common finer grained facies of the sequence. The rocks have, on a microscopic scale, distinct graded bedding. Indeed, one thin section shows at least eight distinctly graded beds. Within these micro-beds, siltstones grade into silty claystones, having a corresponding variation in ratio between quartz and mica-clay minerals. The usual components are quartz, muscovite and chlorite flakes, plagioclase, chert, ferruginous grains and clays.

The Hatfield Greywacke Succession is believed to "lap" or "feather-edge" against the older Ramsay succession (see structure TAS 2-274 and 275). Near this interface, limestones are present within the greywacke sequence which would suggest relatively shallow water conditions near the Ramsay geanticline, notwithstanding proximal fine-grained facies of the greywacke sequence. This leads to the conclusion that this shore-line is in the main non-generative.

The direction of sedimentation is believed to be from the NE and thus the succession becomes finer-grained to the south.

The Hatfield Greywacke Succession may be summarised in tabulate form as follows:

deeper water / further south

shales with occasional tuffs
sandstone and shales (occasional thin conglomerates)
mudstone and tuffs with minor sandstone
sandstone and grey siltstones (occasional conglomerate lenses)
greywackes and mudstones
graded greywacke conglomerate sequences.

5/ It is possible .....

007

It is possible that the coarser fractions occuring towards the top of the above succession represent periodic inflows of sediment from a direction other than NE, i.e., from the west (geanticline) or east. However, it is thought that the Ramsay 'island' was a minor source of sediment, mainly because of its apparently limited size.

2.1.3. Reid Volcanic group

The representatives of the Reid Volcanic group are found in the Que river towards the eastern margin of the area covered during this field season (1971/72).

Broadly, the group comprises grey-green siltstones and mudstones with interbedded tuffs and greywackes.

At least two distinct types of tuffs were identified. The one is a greyish-pink, coarse-grained, crystal and lithic tuff containing 5%-7% magnetic opaques and is in fact noticeably magnetic in hand specimen. Also, chlorite is abundant in this type and lithic fragments (possibly sodic trachytes) make up 7%-10% of the rock.

The other type is a brown, medium-grained, sodic, acid crystal tuff. This rock consists of xenocrysts of sodic (albite-oligoclase) feldspar and rare quartz in a groundmass of fine-grained chloritised ashy material of similar composition. Crystals make up 50% of the rock and there is no evidence of sorting. Accessory apatite and zircon were noted.

It seems probable that the first variety of tuff is simply a coarse-grained equivalent of thelatter.

The greywackes have a different composition to the Hatfield greywackes, and are correlated broadly, with those mapped previously in the Bulgobac area (see Summer Report 1970/71).

The Reid greywackes are characterised by a high volcanic lithic content; rock types include rhyolite, rhyodacite, and porphyritic dacite, and tuffs similar in appearance to the Reid tuffs mentioned above. Some of the greywackes are magnetic in hand specimen and some contain traces of chalcopyrite, apparently in association with pink crystal/vitric tuff fragments.

2.1.4. Hatfield quartzites

Only the basal member of this formation was mapped this year. This member consists of two white, coarse, quartzite conglomerates separated by grey-green siltstones and minor greywacke of total thickness 290'. The relationship to the underlying Reid Volcanic group is not clear but would appear to be conformable.

6/ In the upper .....

003

In the upper Hatfield area the conglomerate is apparently overlain by a thick quartzite (see Hatfield report, Winter 1971), which formation is cut off in the Que river by the Owen Shear.

2.2. Mineralisation

No mineralisation of economic significance was encountered. It is possible that the pure "sandstone" of the Coldstream track might have some economic significance.

2.3. Igneous activity

Both basic and ultrabasic rocks were observed in the area.

Dolerite, andesine-norite, and pre-Tertiary porphyritic basalt are minor intrusives/extrusives in the Hatfield river.

Ultrabasic rocks are confined to the Coldstream river. Mica peridotite boulders were located 9,000' from the mouth of the Coldstream during the 1969/70 field season. This year an attempt was made to establish the actual limits of these rocks. This failed but careful study of the boulders and their positions delimited a 330' long linear (030° mag.) zone lying beneath the river gravels. Whereas this has not been proven it would appear that the intrusion has been injected into the Hatfield Greywacke Succession very near to the Coldstream unconformity.

The mica peridotite is a complex rock comprised essentially of serpentine through which is distributed relict crystals of a clinopyroxene, abundant flakes of biotite (or perhaps phlogopite(?)), and altered opaque mineral crystals. AMDEL considers the primary rock to be ultrabasic: "There is no evidence of feldspar minerals or for their replacement products which, with the comparative abundance of clinopyroxene and serpentine, supports this interpretation."

Deformation during intrusion and serpentinisation and subsequent calcium metasomatism have altered the primary rock considerably. Specimens have been sent to A.A.R.L., Johannesburg, for comment.

Apparently, closely associated with the mica peridotite boulders is an outcrop of oligoclase trachyte, thought to be extrusive.

2.4. Metamorphism

The metamorphic grade would appear to be of a low order. The sediments tend to be weakly sericitised and chloritised, especially in the finer fractions. There is evidence of tight compaction (possibly due to load) in some specimens.

7/ Basic and ultrabasic .....

009

Basic and ultrabasic rocks, relative to the sediments, are more susceptible to metamorphic effects and chloritisation is most common.

Therefore, regional metamorphism could not exceed that of the lower greenschist facies grade.

2.5. Structure (see TAS 2-274 and 2-275)

The structure of the area is complex and it is possible to draw differing conclusions from the known facts. However, after much deliberation, the structural interpretation presented would seem to most satisfactorily comply with the facts and integrate with structures in adjoining areas.

The dominant structural feature in the area would appear to be the oldest, i.e., the N-S trending Just-in-Time anticline of complexly folded rocks. The structure is considered dominant because overlying NE-SW structures appear to swing N-S when in close proximity to it. The example depicted is the Que syncline axial bend south of Ross creek (see TAS 2-274). This would imply that older structural features have a considerable influence upon younger structural and certainly depositional trends in this part of the Tasman geosyncline.

The N-S trend is believed to be a pre-Tabberabberan trend whilst the NE-SW trends are regarded as late Tabberabberan.

The Hatfield Greywackes appear to overlap unconformably upon the Ramsay group and the presence of limestones and an extrusive oligoclase trachyte near the interface lends additional support to this idea.

The Hatfield Greywackes form an apparently symmetrical anticline (with a sharp apex) plunging to the SW at about 25°. Near to the Coldstream unconformity the structure merges into a minor synform (see TAS 2-275) which creates the "overlap" or "feather-edge" unconformity envisaged rather than a sharp angular unconformity.

The termination of the Hatfield anticline at the Coldstream unconformity is due as much to the structural confinement as to the cessation of sedimentation of the greywackes at that point.

Folding within the Hatfield Greywackes appears to be simple and strike directions are generally aligned NE-SW within the Hatfield and lower Que rivers. Consistant graded-bedding (both on a large and small scale) shows the beds to "young" away from the anticlinal core and are thus the right-way-up.

The Owen Shear zone separates the Hatfield Greywackes from the Reid Volcanic group and thus precludes

an understanding of their stratigraphic relationship.

To the north of Ross creek (Silver Falls) the trend of the Owen Shear has changed from NNW-SSE to NE-SW. Further, the Owen Shear has apparently become a narrow zone of brecciation rather than a broad zone of shearing where it is thought to be a faulted contact between the Hatfield Quartzites and the Hatfield Greywackes to the NE of the area.

The throw of the Owen Shear is unknown along its entire length.

As the Owen Shear appears to be the result of contrasting plunges in the two adjacent major structures, viz., Que syncline, Just-in-Time anticline, (see Huskisson reports 1970/71) to the south, it would be expected to be just as well developed to the north as the Hatfield anticline plunge directly opposes the northern Que syncline plunge. This, in fact, is not so (see above).

The Que anticline and Que syncline both plunge to the north and the anticline axis would appear to be faulted out on the Owen Shear south of Ross creek.

In the Que river the plunge of the Que syncline seems to be no greater than its recorded plunge at the Pinnacles to the south (i.e. 25-30°).

Tertiary basalt blankets everything in the far north of the area.

3. GEOCHEMICAL SUMMARY

3.1. Copper

3.1.1. Stream sediment

Range:	less than 5 to more than 70 ppm.
Population peak:	11-15 ppm.
Possibly anomalous:	more than 49 ppm.

The histogram will tend to indicate three definite populations with peaks at 0-5 ppm., 11-15 ppm., and 41-45 ppm. The threshold has been kept low deliberately because of the high mobility of copper. Six anomalous values have been noted.

3.1.2. Soil

Range:	less than 5 to 150 ppm.
Population peak:	0-5 ppm.
Possibly anomalous:	more than 49 ppm.

The histogram shows a confused pattern with possibly five or six populations. It is known that the greywackes tend to have a higher background in copper and values greater than 100 ppm. are probably truly

 anomalous. .....

011

anomalous. Notwithstanding, the threshold has been kept low so as to accommodate low value anomalies from non-greywacke rocks.

3.2. Zinc

3.2.1. Stream sediment

Range:	5 to 840 ppm.
Population peak:	100-150 ppm.
Possibly anomalous:	more than 299 ppm.

The histogram shows a uniform population tailing off at 350 ppm. First order anomalies may be considered to be over 400 ppm. There are ten anomalous values including seven first order anomalies.

3.2.2. Soil

Range:	less than 5 to 440 ppm.
Population peak:	0-50 ppm.
Possibly anomalous:	more than 149 ppm.

The histogram reveals an apparently simple decay curve tailing off at 149 ppm. Of four anomalies, first order anomalies of 430 and 440 ppm were isolated.

3.3. Nickel

3.3.1. Stream sediment

Range:	less than 10 to 160 ppm.
Population peak:	0-10 ppm.
Possibly anomalous:	more than 109 ppm.

The histogram seems to show four populations peaking at 0-10 ppm., 30-40 ppm., 60-70 ppm., and 80-90 ppm. 15 anomalies were noted but none are considered first order.

3.3.2. Soil

Range:	less than 10 to 210 ppm.
Population peak:	0-10 ppm.
Possibly anomalous:	more than 99 ppm.

The histogram indicates a steady decay tailing off at 100 ppm. but the small number of soil samples taken (compared to stream sediment samples) makes the soil histogram for nickel (and also copper/zinc) less reliable statistically. However, four anomalies have been realised none of which is regarded as first order.

3.4. Silver

3.4.1. Stream sediment

All values less than 1 ppm. No anomalous values.

10/ 3.4.2. Soil

012

3.4.2. Soil

All values less than 1 ppm. No anomalous values.

3.5. Bismuth

3.5.1. Stream sediment

All values 10 ppm or less. No anomalous values.

3.5.2. Soil

All values 10 ppm or less. No anomalous values.

3.6. Antimony

3.6.1. Stream sediment

All values 30 ppm or less. No anomalous values.

3.6.2. Soil

All values 20 ppm or less, except two values of 200 ppm and 50 ppm, both regarded as anomalous.

3.7. Tin

3.7.1. Stream sediment

All values 20 ppm or less. No anomalous values.

3.7.2. Soil

All values 20 ppm or less. No anomalous values.

3.8. General

All anomalous samples have been sent for spectrographic scan (see previously under section 1.6.) and results are awaited.

4. GEOCHEMICAL ANOMALIES

4.1. General

Many of the geochemical anomalies are of low order and rather numerous (see TAS 2-276). They have been arbitrarily grouped to clarify their designation.

4.2. Anomalies C1 (see TAS 2-277)

Anomalous soil values in copper/zinc, nickel and antimony and stream sediment anomalies in lead and zinc in Tim's creek (a tributary of the Coldstream) appear to be directly related to the two gossanous areas mentioned previously (see section 2.1.1.).

11/ Immediate follow-up .....

Immediate follow-up work is recommended in the form of a soil grid. However, as further related anomalies lie within the Ramsay Report area no definite grid will be outlined until this extra information has been assessed.

4.3. Anomalies C2 (seven anomalous zinc results)

These would appear to be directly related to a ridge of Hatfield Quartzite and it's basal conglomerate. It is worth noting that sphalerite was found associated with calcite veining in the rocks further to the north in the upper Hatfield area (see Winter Report 1971). Close-spaced stream sediment sampling prior to gridding is recommended on a non-priority basis only.

4.4. Anomalies C3

This anomalous area encompasses soil and stream sediment copper anomalies and stream sediment anomalies in nickel.

Both the copper and the nickel anomalies are possibly attributable to higher backgrounds in the grey-wackes of this area.

Normal follow-up procedures are recommended only on a very low priority basis.

4.5. Anomalies C4

Generally, low order anomalies in zinc, nickel, and copper, not attributable as a group to any particular cause. However, the most northern nickel anomalies are possibly attributable to the nearby Tertiary basalt plateau. Follow-up work is not recommended at this time.

5. HEAVY MINERAL CONCENTRATES

5.1. Coldstream Area

16 panned concentrates were taken in the vicinity and downstream of the mica peridotite locality.

5.2. Regional Heavy Concentrates

The heavy concentrate was despatched to the Australian Mineral Development Laboratories for spectrographic scan (see section 1.6.). Results are awaited.

12/ 6. GEOPHYSICS

6. GEOPHYSICS

6.1. Magnetometer

A magnetometer traverse in the vicinity of the mica peridotite boulders in the Coldstream did not realise anything significant.

6.2. Scintillometer

No anomalies were located by a regional scintillometer survey of conglomerate beds encompassing the lower Que, Hatfield and Coldstream rivers (see TAS 2-273).

M.P.EVERETT

March 1972

MAPS - COLDSTREAM-HATFIELD-QUE REGIONAL PROJECT

TAS	2-271	Location plan.
	2-272	Geochemical coverage.
	2-273	Geophysical coverage.
	2-274	Geology and structure.
	2-275	Geological section.
	2-276	Geochemical anomalies.
	2-277	Tim's creek area.

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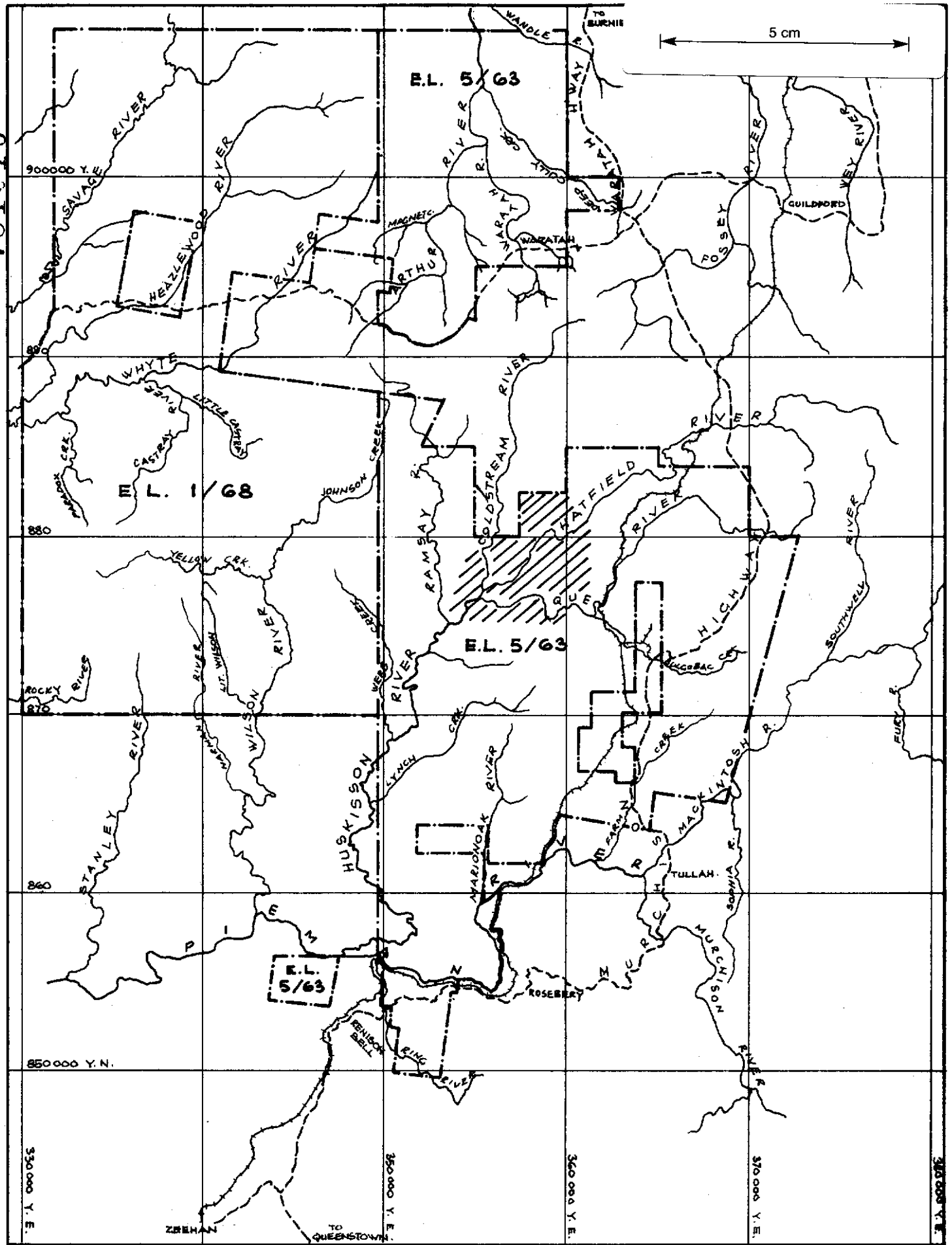

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COLDSTREAM-HATFIELD-QUE

LOCATION PLAN

REGIONAL PROJECT SUMMER 1972

DRAWN	COMPILED	SCALE	
G.C.		1:250.000.	TAS-2-271

016

781017

365000 Y.E.

360000 Y.E.

355000 Y.E.

350000 Y.E.

885000 Y.N.

880000 Y.N.

875000 Y.N.

870000 Y.N.

CREEKS SAMPLED PREVIOUSLY.

CREEKS SAMPLED INC. HEAVY CONCENTRATE

CREEKS SAMPLED PREVIOUSLY & RE-SAMPLED

TRACKS

TRACKS SAMPLED

5 cm

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COLDSTREAM - HATFIELD - QUE REGIONAL PROJECT 1971-72.

GEOCHEMICAL COVERAGE

SCALE 1:50000 | DWN G E C | Nº TAS. 2-272

017

365000 Y.E.

360000 Y.E.

355000 Y.E.

350000 Y.E.

885000 Y.N.

880 000 Y.N.

875000 Y.N.

870000 Y.N.

SCINTILLOMETER TRAVERSE

MAGNETOMETER TRAVERSE

5 cm

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COLDSTREAM - HATFIELD - QUE REGIONAL PROJECT 1971-72.

GEOPHYSICAL COVERAGE

SCALE	DWN.	Nº
1: 50,000	G.E.C.	TAS. 2-273

781C19

018

365000 Y. E.

885000 Y. N.

880000 Y. N.

875000 Y. N.

870000 Y. N.

360000 Y E

355000 Y. E.

350000 Y. E.

5 cm

UPPER HATFIELD

POSSIBLE FLATTENING of PLUNGE

BULGOBAC

QUE ANTICLINE

QUE SYNCLINE

HATFIELD ANTICLINE

OWEN SHEAR

COLDSTREAM UNCONFORMITY

JUST IN TIME ANTICLINE

AREA GEOLOGISED THIS PROJECT

"PINNACLES"

"RAMSAY"

"HUSKISSON"

FOR SECTION SEE TAS 2-275

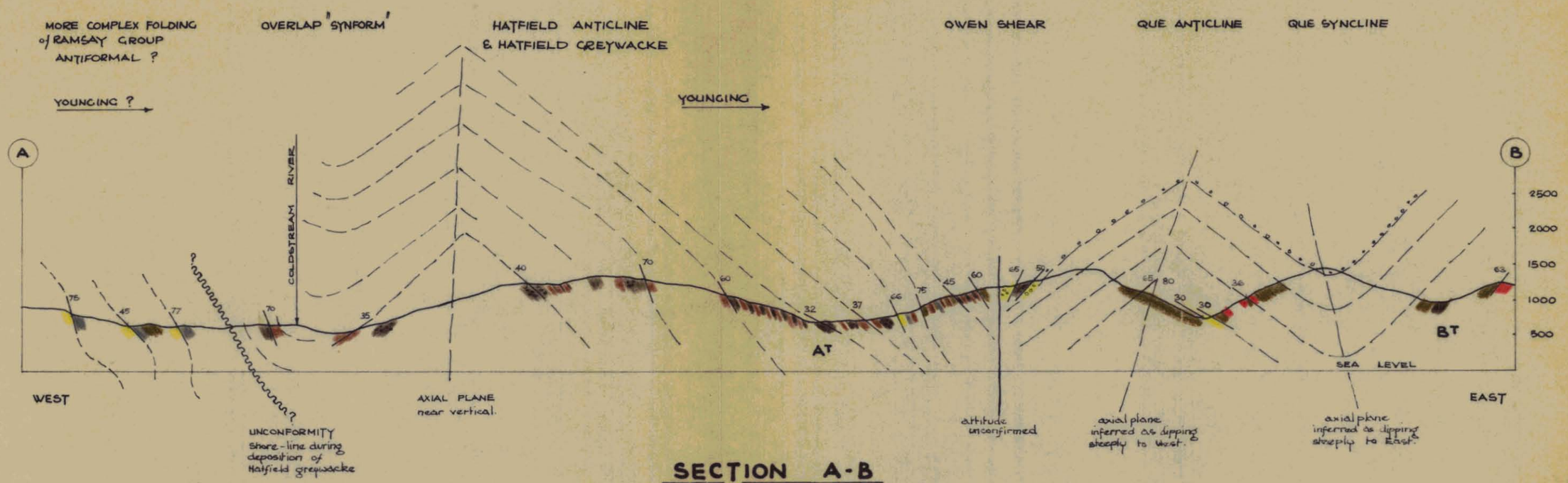
SANDSTONE / QUARTZITE
SILTSTONE
MUDSTONE
BLACK SHALE
GREY SHALE
GREYWACKE
LIMESTONE / DOLOMITE
HORNFELS
GRANITE
PORPHYRY / RHYOLITE
DACITE
BASALT
DOLERITE
TUFF
GOSSAN

COMSTAFF PROPRIETARY LIMITED

COLDSTREAM HATFIELD QUE REGIONAL PROJECT 1971-72.

GEOLOGY & STRUCTURE

SCALE	DWN.	Nº
1:50.000	G.E.C.	TAS 2 - 274



SECTION A-B

SEE PLAN - DWG. TAS 2 - 274.

5 cm

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COLDSTREAM HATFIELD QUE REGIONAL PROJECT 1971-72.

SECTION

SCALE	DWN.	Nº
1:15000	G.E.C.	TAS. 2 - 275

781C21

020

365000 Y.E.

360000 Y.E.

355000 Y.E.

350000 Y.E.

885000 Y.N.

880 000 Y.N.

875000 Y.N.

870000 Y.N.

HATFIELD

EMU BAY

RAILWAY

RIVER

BULGOBAC CK.

COLDSTREAM

RIVER

QUE

RIVER

TIMS CRK.

RAMSAY

RIVER

HUSKISSON

RIVER

CREEK

LYNCH

ANOMALY C2.

ANOMALY C3.

ANOMALY C4.

ANOMALY C1.

COPPER

ZINC

NICKEL

ANTIMONY

5 cm

GEOLOGY & STRUCTURE

COMSTAFF PROPRIETARY LIMITED

COLDSTREAM - HATFIELD QUE REGIONAL PROJECT 1971-72.

GEOCHEMICAL ANOMALIES

SCALE	DWN.	Nº
1:50,000	G.E.C.	TAS. 2-276

021

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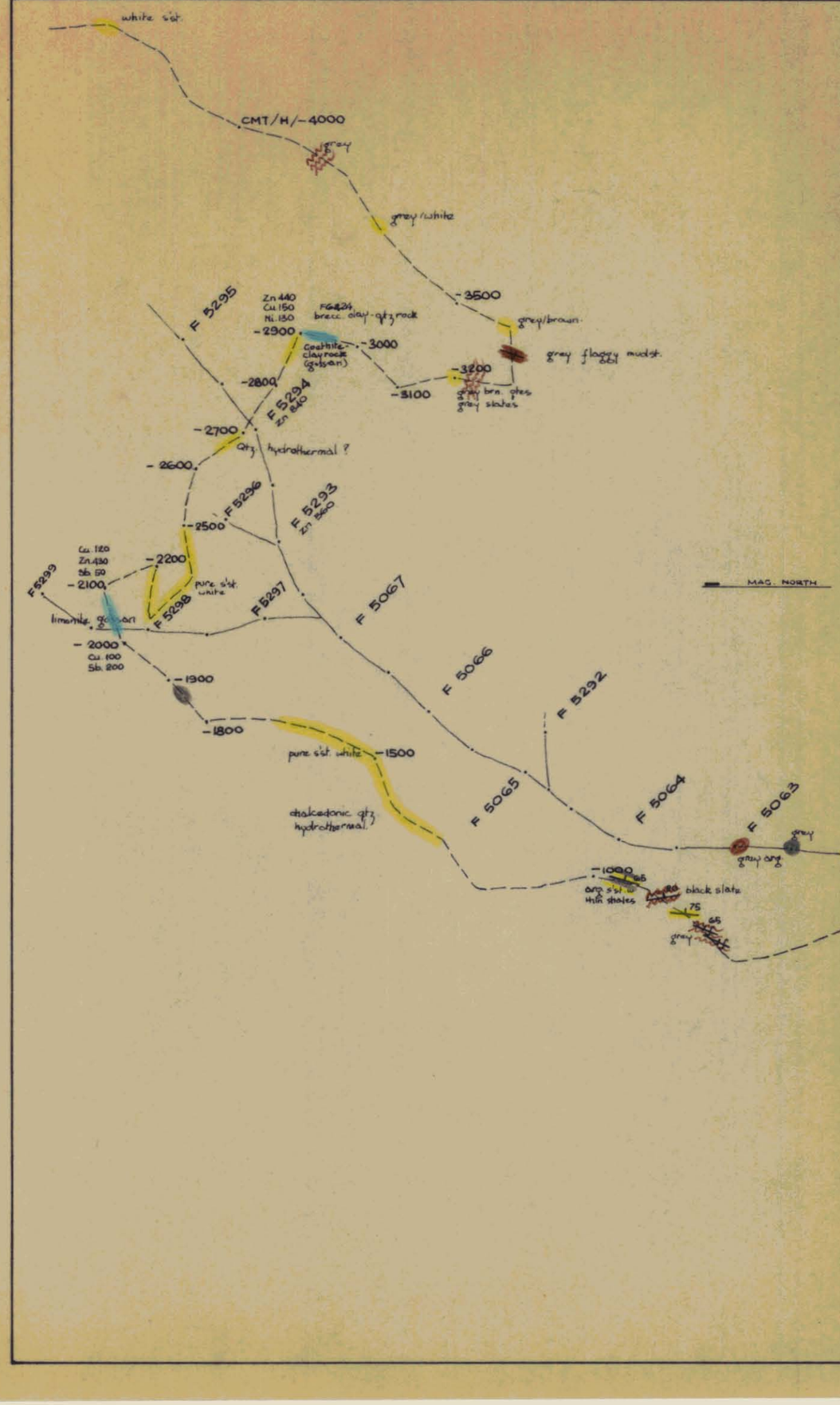

GEOLOGY

- SANDSTONE
- MUDSTONE / SLATE
- SHALE
- GOSSAN

GEOCHEMISTRY

ALL SAMPLES TESTED BY AAS. FOR - Cu. Ni. Zn. Ag. Bi. Sb. Sn.
ANOMALOUS VALUES SHOWN IN P.P.M.

SAMPLE SITES

- F 5066 ——— STREAM SED.
- CMT/H/ 1500 —— SOIL

5 cm

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COLDSTREAM HATFIELD QUE REGIONAL PROJECT 1971-72.

TIMS CREEK DETAILS

SCALE 1:2500	DWN. G.E.C.	Nº TAS 2 - 277