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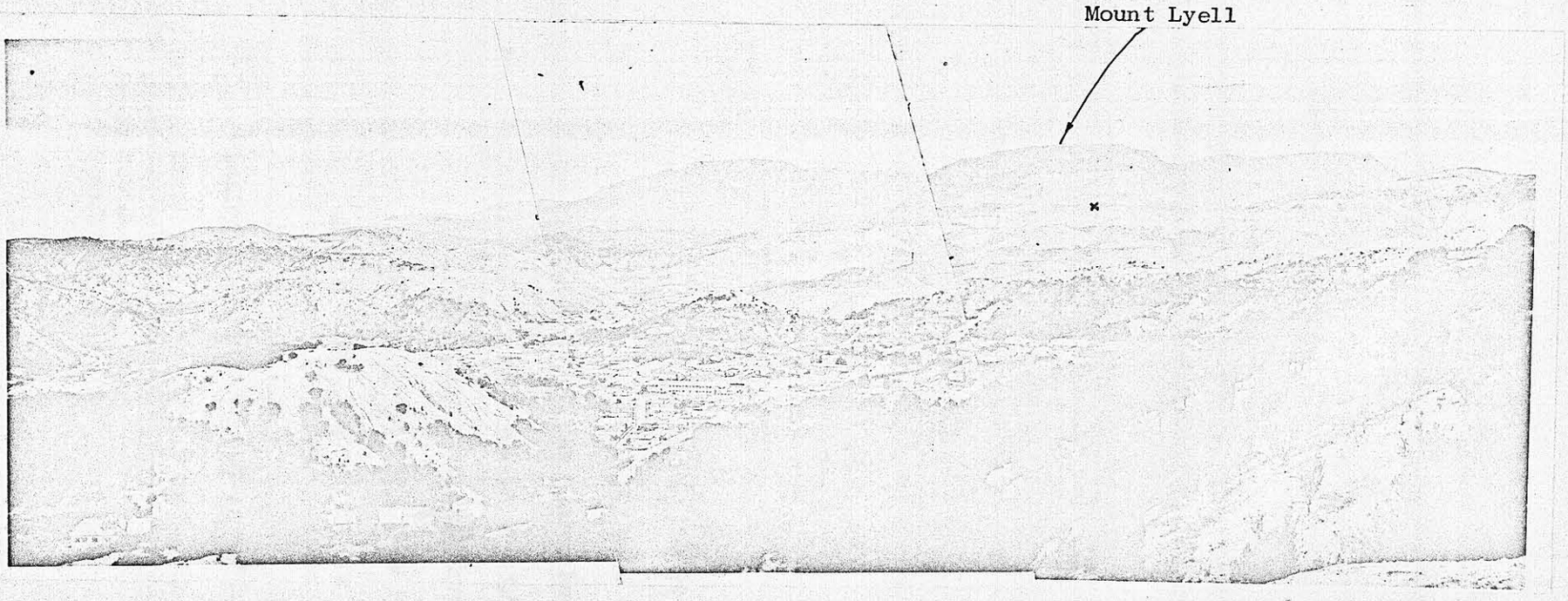
INTERIM REPORT FOR THE NORTHWEST TASMANIAN EXPLORATION PROJECT

FOR A PERIOD ENDING APRIL, 1966.

Pickands Mather & Co. International.



Mount Lyell area with Queenstown in the foreground.

x West Lyell Open Cut

SUMMARY

With almost five months of field work completed it is concluded that the Northwest Tasmanian Explorations program has been carried out in accordance with initial planning.

The exploration approach being applied is considered sound and geochemical prospecting is being applied in an ideal surficial environment (e.g. stream waters apparently persistently of pH = 6 provide an excellent medium for the formation of well defined and long dispersion trains).

Expenditures to date have not exceeded those estimated for 1966.

Progress has been hampered by lack of water in streams thus making stream travel difficult but generally more by the ruggedness of terrain and vegetation. On the whole, however, it is felt that the project is being carried out in a very able manner with rate of progress satisfactory in the circumstances. It is anticipated that efficiency will improve with time and as personnel become more familiar with conditions and the problem on hand.

During the relatively short period of investigations completed, several areas of interest have emerged. These will be examined in detail in the coming months.

1. INTRODUCTION

The following report outlines briefly the progress which has been made to date in the exploration of an area of approximately 4000 square miles located in northwestern Tasmania and held under Exploration Licence No. 12/65.

The work completed to date is part of a project which is contemplated for a 3-year period and designed to determine the mineral potential of northwestern Tasmania where occurrences of copper, lead, zinc, gold, osmiridium, iron, nickel, silver, tin and tungsten exist as well as the Savage River iron deposit, the Mt. Lyell Copper deposit, the Zeehan and Rosebery silver-lead deposits, and the Mt. Bischoff-Mt. Cleveland tin ore bodies.

So far the project has been carried out essentially in accordance with the initially proposed plan which recommended the exploration of the 4000 square mile area by reconnaissance geological and geochemical stream sediment surveys respectively, with the aim of outlining metalliferous targets which would subsequently be investigated in detail by geological mapping and one or more of soil sampling, geophysical surveys and ultimately drilling.

2. FIELD METHODS

In view of the extreme ruggedness of the Tasmanian terrain it was determined that access to areas to be investigated would most probably have to be by river travel, by foot and by helicopter transportation. River travel proved most effective during the early part of the project but as dry conditions continued to prevail during the summer, most of the rivers contained too little water to make this type of travel possible.

For river travel, both specially designed canoes and rubber boats were employed. The former proved most efficient in all cases except for larger rivers when the rubber dingy possessed the advantage of being able to carry more supplies.

Because of the extremely dry conditions during the past summer, and the fact that rivers are often choked with dead trees and dense vegetation, field work in the central and most inaccessible regions south of the Arthur River depended upon transporting field crews into an area by helicopter, establishing a fly camp and then systematically traversing along neighbouring stream courses, noting geology and taking stream sediment samples. This sequence, although effective and the only feasible, has proven to be slow and rate of progress accordingly disappointing. It has become quite clear, therefore, that the Tasmanian bush and rugged terrain do in fact remain a formidable barrier to human endeavor and that prospecting of such areas by conventional methods would involve considerable time and money. It is apparent now, that the technique of reconnaissance geochemical stream sediment sampling is probably at this time under prevailing conditions the most effective and rapid method of determining the mineral potential of the area under consideration. By and large, rock exposures have been found to be scarce and from that point of view alone, river traversing has proven to be an advantage as rocks are best exposed along stream courses.

At the moment three crews, each consisting of a geologist and field assistant (offsider) are conducting field work in the central part of the concession. A fourth crew is operating by Land Rover in the Queenstown area where reasonable access is provided by the existing road network.

3. SAMPLING AND DATA RECORDING

During the initial stages of the project and which employ reconnaissance techniques, stream sediment samples are collected on a systematic basis at intervals of approximately two miles. Originally one sample was taken from the "active" stream bed, another from the bank at each sampling point. This procedure was modified by taking a "fresh" sample only after it was found that the bank sample confirmed in most instances the metal content of the "fresh" sample and furthermore sometimes gave erratic and inconsistent results.

Whenever possible, duplicate samples are taken. One sample is for analysis by the Perth geochemical laboratory, the other is forwarded to the Tasmanian Mines Department. This system of duplicate sampling has given rise to a weight problem for crews travelling over long distances and "sleeping out" and it was decided, therefore, that one sample only be taken in those cases and a representative portion be made available to the Mines Department after the completion of analyses in Perth.

Field data, including geological information and sample locations are plotted on separate 1" = ½ mile and/or 1" = 1 mile sheets, depending upon which is available for an area. Geochemical results are plotted, again on a separate sheet, thus resulting in three sets of maps, viz. geological sheet, sample location (number sheet, metal concentrations sheet.

It may be necessary at a later stage to decide upon a standard and more convenient scale.

In recording geology in the field, special attention is paid to the following:

(a) evidence of mineralization

(b) rock types and lithologies

(c) structures including strike and dip, faulting, shearing, folding, etc.

(d) rock alteration, such as sericitization, carbonatization, chloritization, epidotization, etc.

(e) change of vegetation due to change of bed rock, etc.

4. SAMPLE PREPARATION AND METAL ANALYSES

All samples are dried in their paper bags in a drier in the Burnie office, sieved and the -80 mesh fraction in 2" x 2" envelopes forwarded to the Perth laboratory for analysis. All samples are tested for the following:

Readily extractable Cu

Total Cu

Total Pb

Total Zn

Total Ni

Total Mo

Total As

Total Sn

Readily extractable Cu, total Mo, As and Sn are determined by colorimetric techniques, whereas total Cu, Pb, Zn and Ni respectively are determined by analyzing a perchloric acid extractant with an atomic absorption spectrophotometer.

To date the tin test has been the only one accompanied by difficulties. It would appear that an ammonium iodide fusion gives rise to an incomplete sample attack and that consequently only 50% - 70% of the tin is extracted. This problem has been investigated for some time by

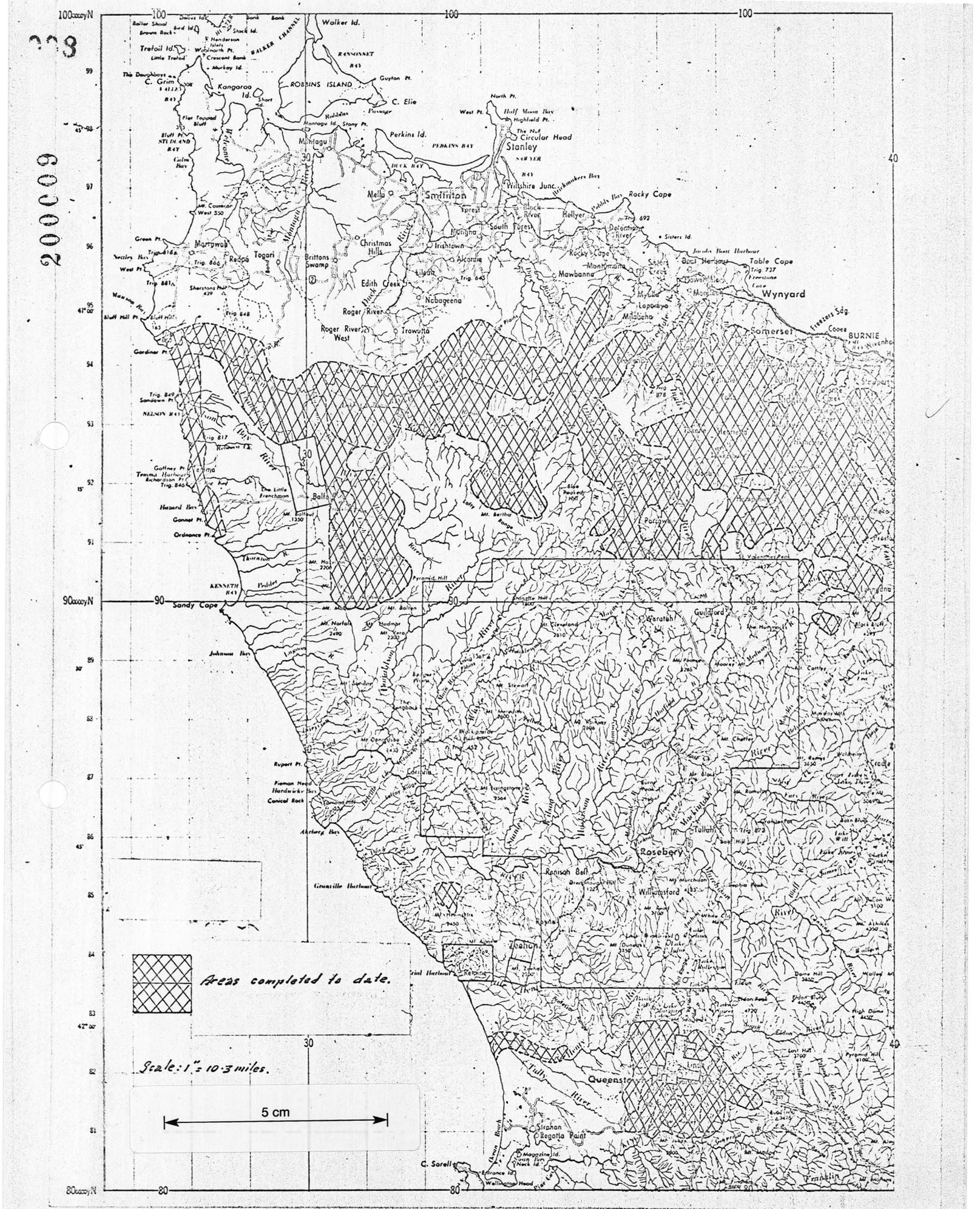
the Western Australian geochemical laboratory and it would appear that the only foolproof method of analysis, yet retaining lowest limits of detection, is by spectrograph.

Atomic absorption methods have been considered without success. In view of the advantage of the low detection limit of the colorimetric technique (0.5 ppm) it is proposed that analyses employing this technique be continued even though the total amount of Sn in a sample cannot be determined. Geochemistry is more interested in relative than absolute metal figures, and therefore, the colorimetric method should be able to outline a tin target as effectively as the spectrographic technique.

Presently it is being considered that the -80 mesh fraction of all samples be analyzed by the T.H.M. (total heavy metal method) at Burnie before their shipment to Perth. This cold test is simple, fast, effective and cheap and in the Tasmanian environment a "total Cu, Pb, Zn" figure can be very meaningful. With this in mind, it is proposed to undertake the preparation of the THM buffer in the Perth laboratory and forward it to Burnie periodically. The preparation of the buffer is the only difficult part of the THM test.

5. AREAS COMPLETED

A sketch map on the following page outlines those areas which have been covered by reconnaissance geological-geochemical surveys to date, representing more or less the end of this year's field season. In the coming winter months of abundant rainfall, it is planned to use existing highways, secondary and tertiary roads as well as logging roads for sample taking and reconnaissance geology. Areas of interest have already resulted from this year's work which means that some follow-up work in specific areas will commence shortly out of established camps. In view of


Areas completed to date.
Scale: 1" = 10·3 miles.
5 cm

the unexpected hazards encountered in the field, progress has been slowed up, in addition to which it should be remembered that the beginning of this field season saw the commencement of field work concurrent with equipment purchases and the training of inexperienced field crews. In spite of these factors undue concern is unwarranted as overall operational efficiency is bound to improve with time, thus speeding up investigations. In this respect it is worth mentioning, that all field crews, though young and inexperienced, are keen to learn and interested in the project. The geologists, in particular, should be commended for the excellent manner in which they have overcome difficulties encountered during their work.

6. AREAS OF INTEREST

From investigations completed to date, both in the field and by studies of records, etc., several areas of interest have emerged :- (see sketch map).

1. In the Natone area, where base metal mineralization is reported, occurs an isolated airborne magnetic anomaly. Unfortunately rocks which are expected to be of Cambrian age near granite intrusives are covered by basalts, thus obscuring the probable cause of the anomaly. Limited ground magnetics are planned in the hope that results may partly elucidate this anomalous situation in a favorable geological environ.

2. In the Terma area occur old workings with evidence of copper-lead-magnetite mineralization in unmetamorphosed Precambrian shales and mudstones. A low intensity airborne magnetic anomaly overlies the occurrences. Recently limited soil sampling and

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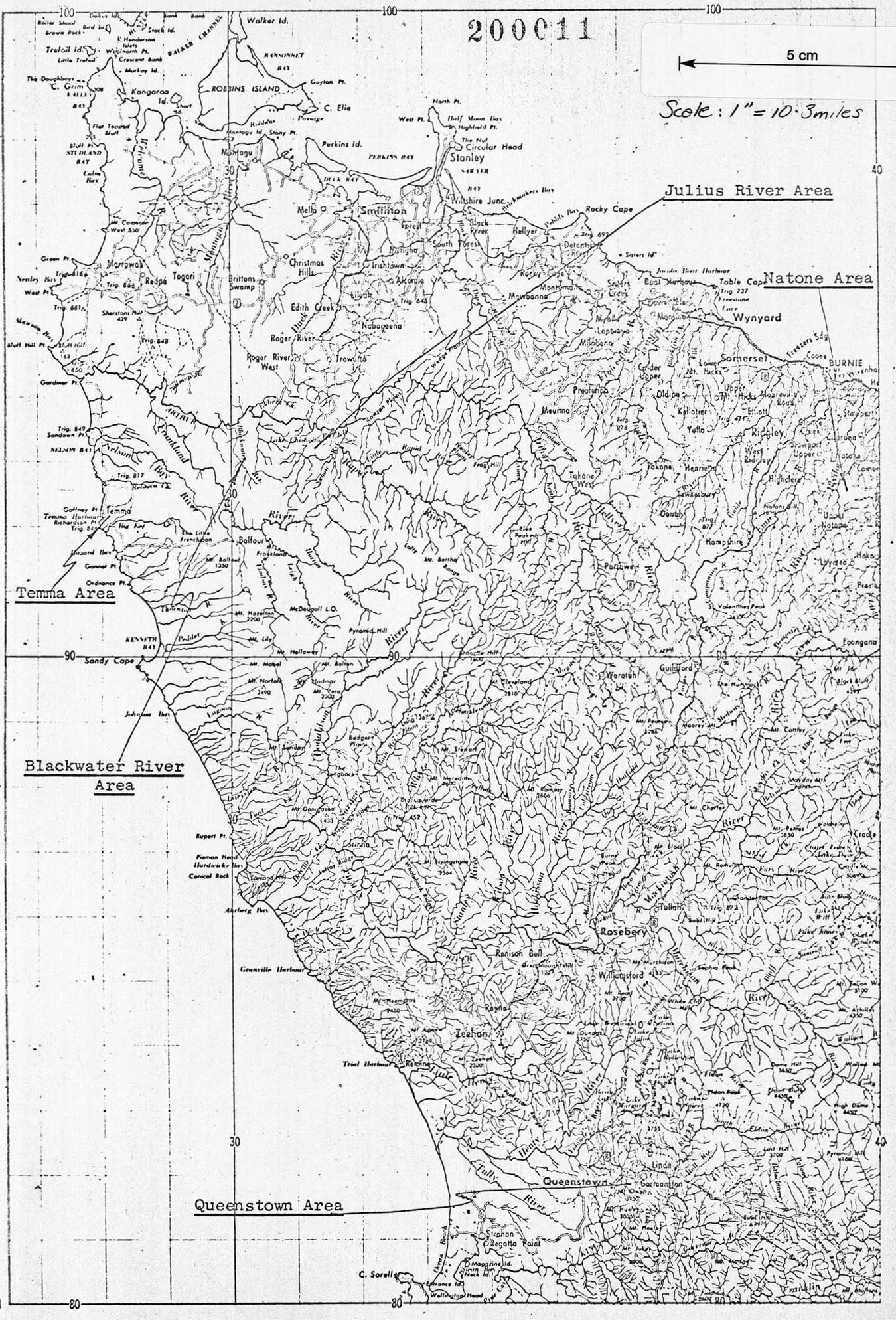
Scale: 1" = 10·3miles



ground magnetics were completed over the showings. The presence of a magnetic anomaly was confirmed and results of the soil surveys are expected shortly. Unfortunately lack of outcrops and the presence of basalt sheets make geological observations difficult. It is possible that further work may be required in this area.

3. Streams draining an area east of Queenstown and south of the highway to Hobart, contain anomalous amounts of copper and at times lead. Total copper in stream sediments is of a low order from 150 ppm - 200 ppm withreadily extractable copper ranging from 20 ppm to 30 ppm. Follow-up work has been completed, confirming the low order copper anomaly overlying favorable volcanics and sediments which to the north form the host rocks to the Lyell deposits. It is noteworthy that the anomalous area lies on the extension line of the Lyell deposits. Geochemical information defining the limits of the area of interest is being plotted and evaluated. In this respect it would be important to check existing records with the Mines Department in Hobart, to establish particularly what the extent of previous investigations by Mt. Lyell Mines has been in this area of interest.

4. Sampling of the Blackwater River area has shown a 2' stream to contain 1.6% Pb in the stream sediment. Near the NE corner of the Balfour S.P.L. 410 area, sediments of the Blackwater River contain as much as 8000 ppm Pb. The anomalous streams drain areas of magnetic "highs" and areas underlain by Cambrian tuffs and sediments which are in turn transversed by major faults.

This geochemical anomaly is considered most interesting. Follow-up stream sediment surveys are presently under way to pin-point the source of the Pb anomaly. Zinc and copper occur in small amounts.

5. Sampling of the Julius River area has revealed the presence of abnormal amounts of lead and zinc in sediments of streams draining the general area. Highest values recorded are 1500 ppm Pb with 5940 ppm of Zn. Two other samples contained 1740 ppm Pb and 1500 ppm Pb respectively. The anomalous area appears to be associated with a contact of Cambrian rocks with Precambrian shales and slates, alternatively the source is wholly in an area underlain by Cambrian rocks in the catchment area of the Blackwater, Stephens and Julius Rivers. It is too early to determine the importance of this anomaly, but follow-up stream sediment sampling and noting the more important geological features of the area would seem essential to assessing the significance of the geochemical anomaly.

6. A stream sediment sample taken where the road crosses the Savage River in the area of the iron ore deposit contained high concentrations of lead. The cause of this geochemical anomaly should be established at some convenient time and with the approval of Savage River Mines.

7. The entire length of the Arthur River becomes an area of interest by virtue of high concentrations of Zn and Pb in stream sediments of this wide river. This anomalous condition with as much as 0.5% Zn persisting to the mouth of the river, is a result of contamination from the Mount Bischoff and Magnet Mine areas. The anomaly is

purely of academic interest, in that it shows that conditions in the Arthur River stream system are ideal for the formation of extensive metal dispersion trains in stream sediments and waters.

7. BRIEF NOTES ON THE GEOLOGY OF THE CONCESSION AREA

On the sketch map on the following page the major geological units are outlined and the locations of most of the known metalliferous mineral occurrences in the area shown.

Precambrian sediments are the oldest rocks in the area and these are overlain by Younger Precambrian (late Proterozoic) or Cambrian rocks which include as the lowest member the Success Creek Phase of dolomites and sandstones. This latter horizon is important because most of the significant mineral occurrences of Northwestern Tasmania appear to be associated with strata younger and above the Success Creek Phase. This upper succession includes spilites, pyroclastics, greywackes, sandstones, mudstones and dolomites. Evidence of igneous activity during Cambrian times is provided by the presence of gabbro-peridotite-serpentinite bodies (Cu-Ni, Cr, Os-Ir mineralization) and the Mt. Read volcanics. The latter include rhyolites, agglomerates, and tuffs. The last stages of Cambrian igneous activity are represented by granites intrusive into the volcanic rocks. Associated with the Mt. Read volcanics are Mt. Lyell (bornite, chalcopyrite, pyrite, minor sphalerite and galena), Rosebery area (sphalerite, galena, chalcopyrite), Mt. Farrell (galena, minor sphalerite and chalcopyrite).

The Ordovinian succession includes the Owen Conglomerate, sandstones, shales and limestones.

The Silurian rocks are represented by sandstones, mudstones, and limestones (Eldon Group).

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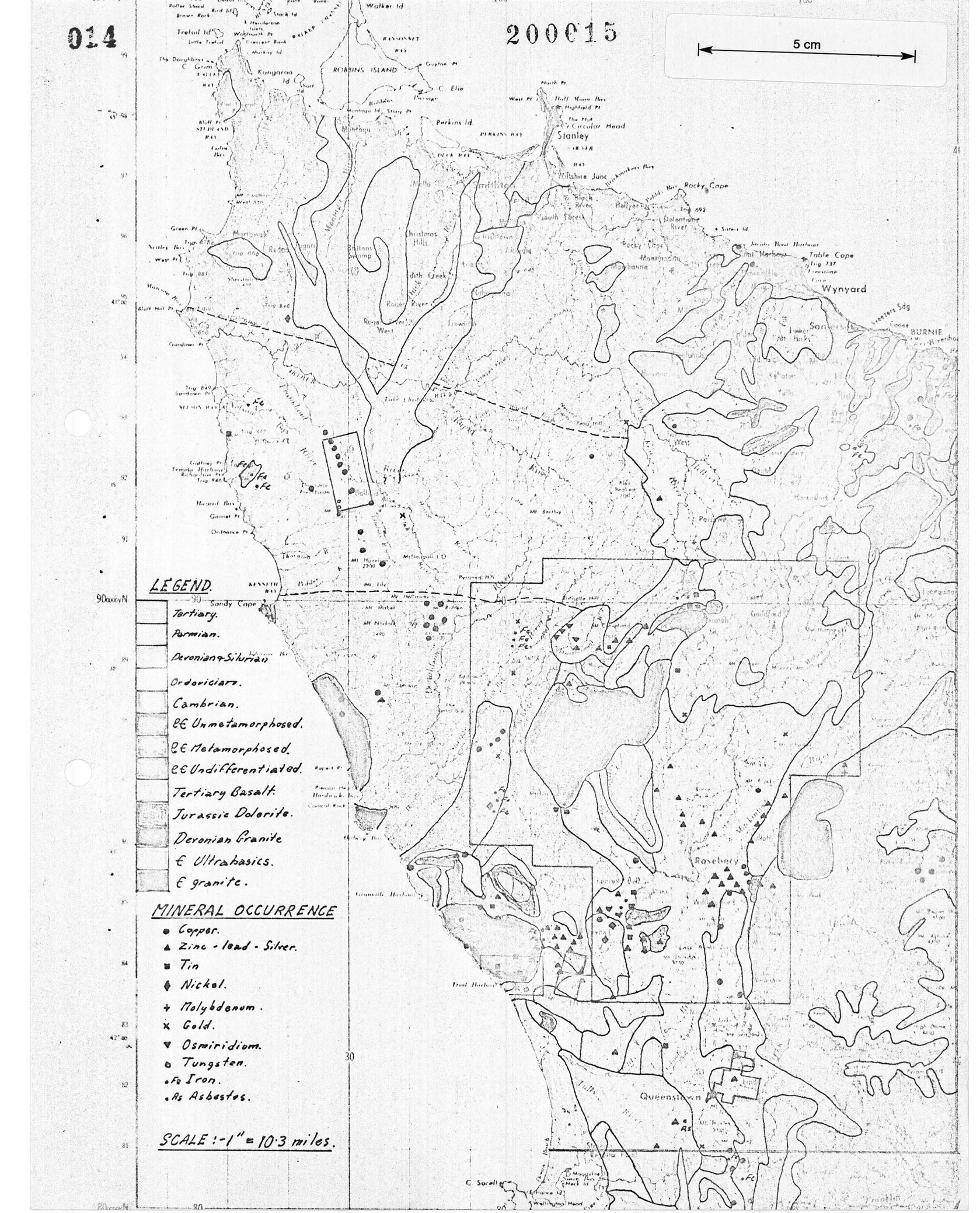

The Devonian marked the close of sedimentation and during this period occurred the significant Tabberabberan orogeny which gave rise to major fold and fault structures. Towards the close of earth movements, granite intrusions (plus minor quartz-porphyry) occurred, resulting in late stage mineralization near the margins of the granite stocks (cassiterite, wolframite, minor molybdenite and bismuthinite, lead-zinc). Other types of mineralization closely linked with the Tabberabberan epoch are:-

1. Pb-Zn-Ag with sulphide-cassiterite ores - Mt. Bischoff, Renison Bell.

2. Pb-Zn-Ag - Dundas, Zeehan, Renison Bell, Rosebery, Hercules, Tullah.

The Jurassic-Permian succession is represented by tillites, sandstones, limestones, mudstones and coal seams.

The Tertiary rocks include sediments and basaltic lavas which in northwestern Tasmania may cover extensive areas.

In assessing the mineral potential of the northwest Tasmanian regions it is noteworthy that to date replacement deposits (e.g. Mt. Lyell, Hercules, Rosebery, Mt. Bischoff, Renison Bell) have proven to be the most important economically, by virtue of their larger tonnages. Generally this type of deposit is associated with Cambrian tuffs, dolomites, etc.

Many of Tasmania's smaller and mostly exhausted deposits are of the fissure lode type (e.g. Zeehan, Mt. Farrell). They may occur in rocks of Cambrian to Lower Devonian ages, are frequently of rich grade but generally their distribution is erratic and small in size.

At the outset of the Tasmanian project it was envisaged that prospecting of the concession area would be by broad-scale reconnaissance techniques with a view towards minimum expenditures yet maintaining an

optimum chance of locating exploitable materials. The methods being employed include geochemical stream sediment sampling and noting the more important geological features which come to the attention of the geologist whilst on a traverse, viz. rock types, structural features such as folds, faults, strikes and dips, lineations, shearing; also, evidence of wall rock alteration, mineralization, gossans, etc. Initially, and whilst crews were getting familiar with field methods, this aspect of recording pertinent geology might have been neglected. However, its importance is now realized by all, particularly as geologists find themselves getting acquainted more fully with the Tasmanian geology and find also that they have to relate geochemical anomalies as they appear, to a specific geological setting. Every effort is, therefore, being made to record geology, particularly where such information is lacking in inaccessible and heretofore unmapped regions.

It has been suggested by Mr. W.E. Conway that Mr. T.D. Hughes, one-time chief geologist for the Tasmanian Department of Mines and now in the employ of Mr. R. Hudson, might be available to the project on a consulting basis for a limited time. The operation would unquestionably benefit by Mr. Hughes' experience and in subscribing to this plan it is proposed that perhaps Mr. Hughes could be persuaded to visit Tasmania some time in June for, say, an initial 2 week period to discuss:-

1. Results of investigations to date.
2. Geology of Tasmania and specifically the northwestern areas.
3. Mines within the concession area and past prospecting and mining activities.
4. Mineral occurrences and favorable targets.
5. General

Further with respect to geology, it has been suggested by Mr. Stan Keith, Chief Geologist for Cerro Corporation, that in some cases petrological studies may be necessary to understand cases of complex geology. It is agreed that, such studies may prove very essential in the future and the suggestion is being borne in mind.

8. STATUS OF EXPLORATION LICENCES WITHIN THE AREA HELD BY E.L. 12/65

Exploration Licences held by other mining companies are shown on the geological sketch map accompanying this report. This situation appears to be a fairly fluid one by virtue of the fact that companies are obliged to release ground periodically and in accordance with agreements with the Tasmanian Government. On the whole, the entire northwestern part of Tasmania must be considered to be an area of considerable mineral potential and interest and because of this, the Tasmanian project should be on the alert so as to be able to pick up additional areas if considered warranted. It is recommended that the legal firm representing Pickands Mather and Co. International and located in Hobart, should check once a month mine records to note any changes in the status of exploration licences in areas in Northwestern Tasmania.

9. EXPENDITURES

Since prospecting operations commenced in Tasmania during December, 1965, the plan to carry out such work has been adhered to with minor modifications. This means also that expenditures to date are in line with cost estimates for 1965-66. It is realized that staying within the budget limits in future is essential.

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7 plans missing

+ possibly (at least) 3 reports missing