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Prepared for:

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SYDNEY, N.S.W., 2000.

April, 1971.
CONTENTS

1. INTRODUCTION 1

2. VICTORIA RIVER BASIN 2
   2.1 General Considerations 2
   2.2 Base Metal Mineralisation with Possible Sedimentary Controls 2
   2.3 Base Metal Mineralisation Associated with Basic Volcanic Extrusions 2
   2.4 Mineralisation Associated with Structures 3
   2.5 Mineralisation Associated with Pre-Upper Proterozoic Strata 3
   2.6 Mineralisation Associated with Cretaceous Sediments 3
   2.7 Discussion 4
   2.8 Outline of an Exploration Programme 5
   2.9 Determination of the Details of the Exploration Programme and its Likely Costs 6

3. HELEN SPRINGS 8
   3.1 General Considerations 8
   3.2 Manganese Mineralisation 8
   3.3 Mineralisation Associated with Basic Volcanic Rocks 8
   3.4 Mineralisation Associated with Structure 9
   3.5 Proposed Method of Exploration 9

ENCLOSURE 1 8
Sketch Map of Victoria River Basin showing Proposed Survey Areas.
1. \textbf{INTRODUCTION}

Following thorough literature surveys on an area in the Victoria River Basin and an area near Helen Springs, Northern Territory, Robertson Research (Australia) Pty. Limited concluded that there were a number of possibilities for locating mineral occurrences in both areas. These possibilities were outlined in Report Nos. 60 and 61. As a preliminary phase in further exploration, it was decided to carry out a detailed photogeological interpretation. This was compiled by Robertson Research Company Limited in the United Kingdom and the results of this study have been presented by that company in their Report No. 553.

This present report contains a brief resume of what are now considered to be the significant features of the areas and outlines what are the most suitable methods with which to continue the exploration.
2. VICTORIA RIVER BASIN

2.1 GENERAL CONSIDERATIONS

Very little is known about the detailed geology of the specific area under consideration. Any "targets", therefore, have been chosen either by analogy with other areas occurring within the same general geological province - in this respect, information available on the area immediately to the north has proved invaluable - or as a result of the photogeological studies.

2.2 BASE METAL MINERALISATION WITH POSSIBLE SEDIMENTARY CONTROLS

The Precambrian Angalarri Siltstone is considered to be the most prospective horizon, exposed within the area, for this type of mineralisation. This unit crops out over extensive areas as shown in Enclosure 1 and is thought to contain the source rock for anomalous copper values obtained in an adjacent area to the north. Barite pods and lenses and pyrite have also been reported from shaley horizons within this unit.

Pyritic sandstone horizons of the Auvergne Group are also prospective for this type of mineralisation, but such horizons may only be sporadically-developed.

2.3 BASE METAL MINERALISATION ASSOCIATED WITH BASIC VOLCANIC EXTRUSIONS

Rocks of the Antrim Plateau Volcanic Sequence, of Cambrian age, are present in the north-east of the area, within Area 3 as depicted in Enclosure 1.
Elsewhere in the Northern Territory, these rocks are known to contain disseminated copper minerals.

2.4 MINERALISATION ASSOCIATED WITH STRUCTURES

Much of the metalliferous mineralisation in the general region is closely-associated with major structural features. The photogeological study of the area under consideration has indicated four such areas of major tectonic dislocation. These are diagramatically indicated as areas Nos. 1, 2, 3 and 4 in Enclosure 1.

2.5 MINERALISATION ASSOCIATED WITH PRE-UPPER PROTEROZOIC STRATA

Throughout the Northern Territory as a whole, much of the metalliferous mineralisation is present in Pre-Upper Proterozoic, igneous and metasedimentary rocks. No such rocks are recorded within North Coast Mining Limited's area, but Durack Mines Ltd. have reported uranium mineralisation from Middle Proterozoic granite in the region to the north. The photogeological study has indicated a number of areas where Pre-Upper Proterozoic rocks may be exposed in "windows" in the Upper Proterozoic cover. The largest of these possible "windows" is contained within the boundaries of Area 6, Enclosure 1, while other, smaller ones are present within Areas 1 and 3.

2.6 MINERALISATION ASSOCIATED WITH CRETACEOUS SEDIMENTS

In the Darwin region, Tertiary laterites formed from Cretaceous Mullaman Beds contain enhanced uranium values.

In the area under review, there are extensive
occurrences of lateritised Mallaman Beds which may contain similar enhanced values. In addition, Durack Mines Ltd. have reported radiometric anomalies over laterites - of unspecified source, however - from the region to the north.

**DISCUSSION**

As can be seen from the above, numerous possibilities for finding mineralisation exist within the area under review. It must be re-emphasised, however, that no known mineralisation is present within the area and that the possibilities outlined above have been arrived at by analogy with known regional mineralisation. Exploration, therefore, will be of a "grass roots" nature.

It is considered neither necessary nor desirable to endeavour to explore the entire area for all of the possibilities outlined above.

It is possible to define certain areas which are regarded as more promising than others. Six such areas are presented in Enclosure 1 and have been selected for the following reasons:

(a) Areas 1, 2, 3 and 4 contain major structural dislocations.

(b) Areas 1, 3 and 6 contain possible exposures of Pre-Upper Proterozoic strata.

(c) Areas 1, 2, 3, 4 and 5 contain the Angalarri Siltstone.

(d) Area 3 contains exposures of Antrim Plateau Volcanic rocks.
(e) All of the areas contain strata of the Auvergne Group.

(f) Areas 1, 2, 3, 4 and 5 contain some exposures of the lateritised Mullaman Beds.

2.8 OUTLINE OF AN EXPLORATION PROGRAMME

It is not possible at the present time to present a detailed exploration programme, nor is it possible to give even a rough estimate of the cost or timing of such a programme. However, it is possible to broadly indicate the types of programme considered to be most applicable to the various areas.

Areas 1, 2, 3, 4 and 6 should be aeromagnetically surveyed at low level. This will provide further structural information and aid in the location of any buried, igneous, intrusive bodies which may be present. It may also directly locate any magnetic ore-body which may be present. At comparatively little extra cost, a gamma ray spectrometer survey can be incorporated with the aeromagnetic survey. This should yield invaluable information for mapping purposes and will detect any radiometric anomalies within the areas surveyed.

Areas 1, 3 and 5 should be geochemically and geologically surveyed on a regional reconnaissance basis. This programme would be designed to detect surface metalliferous mineralisation within such areas and to broadly determine the source of such
mineralisation.

Although it would be preferable to await the results of the aerial survey prior to commencing the geochemical and geological programmes, time factors may not allow this. If this is so, then Area 6 should also be geologically surveyed on a reconnaissance basis in order to establish the presence or absence of Pre-Upper Proterozoic strata.

Upon completion of these programmes, enough information should then be available to allow a direct assessment of the mineral potential of the area and to further plan any continuation or expansion of the exploration programme which may be necessary.

2.9 DETERMINATION OF THE DETAILS OF THE EXPLORATION PROGRAMME AND ITS LIKELY COSTS

Before any detailed exploration programme and its costs can be finally decided upon, it is essential that a suitably-qualified geologist visit the area and obtain a first-hand general appreciation of the area. It is vital to know such things as stream gradients, availability of roads, possibility of cross-country driving, availability of landing sites for helicopters should these be considered necessary and many other factors. It is envisaged that such a visit would require approximately ten days made up as follows:

(a) Two days travelling to and from the area.
(b) Two days flying over the area in a light aircraft.

(c) Six days on the ground using a four-wheel-drive vehicle.

It is recommended that this visit be made as soon as possible, following which, a detailed programme and its likely costs can be presented.
3. HELEN SPRINGS

3.1 GENERAL CONSIDERATIONS

Considerably more published information is available regarding Helen Springs than is available on the Victoria River Basin. Most of this information is general in nature and it must be emphasised again that there is no recorded metalliferous mineralisation within the area held by North Coast Mining Limited. By analogy with areas in the surrounding metallogenic province, a number of possibilities for mineralisation were outlined in our Report No. 60. These possibilities were broadly confirmed by the photogeological study which also delineated a number of specific localities which warrant field-checking.

3.2 MANGANESE MINERALISATION

A number of manganese occurrences which have produced ore are known in adjacent areas. The photogeological study has indicated a number of localities within North Coast Mining Limited's area with photographic characteristics similar to those of the known manganese deposits and occurring within the same rock types.

3.3 MINERALISATION ASSOCIATED WITH BASIC VOLCANIC ROCKS

A considerable portion of the area is covered by basic volcanic rocks of the Helen Springs Volcanic Series. These rocks are of the same age as the Antrim Plateau Volcanics which are widespread in the Northern Territory and which are known to contain disseminated copper mineralisation in certain areas. It is possible that the Helen Springs Volcanics
and the adjacent sediments may contain similar mineralisation.

3.4 MINERALISATION ASSOCIATED WITH STRUCTURE

Although much of the mineralisation in the Northern Territory is genetically associated with igneous, particularly granitic, intrusives, depositional controls are frequently structural. No granites have been recorded from the Helen Springs area, but the photogeological interpretation reinforces the opinion given in Report No. 60 that the entire area lies within a mobile zone and that major structural dislocations exist within the area. If intrusives exist at depth, it is possible that these dislocations acted as channel-ways for mineralising solutions.

3.5 PROPOSED METHOD OF EXPLORATION

Although the geological problems at Helen Springs are basically the same as those of the Victoria River Basin, the smaller size of the former area, its easier accessibility and the generally less favourable prospect for finding significant ore-bodies, indicate that aerial surveys, although geologically desirable, cannot be justified because of the high costs involved. It is recommended that those areas specifically indicated by Lucarelli in Report No. 553 be geologically examined in the field and that the outcrop of the Helen Springs Volcanics, the sediments adjacent to this group and those areas traversed by major structural deformations be geochemically surveyed by stream sediment, reconnaissance techniques.

- 9 -
Details of this programme and its likely costs will be submitted in a later report together with the relevant proposals for the Victoria River Basin project.