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**MINES BRANCH**

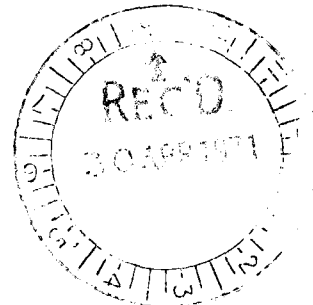
Tin Creek Mining Corporation Limited

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Proposal for Stage II of Exploration  
at

Hidden Valley, Northern Territory.

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Sydney

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Watts, Griffis & McQuat (Australia) Pty. Limited.

1.0.

## SCOPE

Watts, Griffis and McOuat (Australia) Limited have been commissioned by the Tin Creek Mining Corporation Limited to establish the potential of the vanadium enriched laterites in Application for Authority to Prospect 3502. Progress in the exploration to date has been summarised in the report entitled:-

"Progress Report on Investigation of Iron-Vanadium Prospect at Hidden Valley, Northern Territory."

submitted on April 23, 1971.

The results of the preliminary programme were not very encouraging, however, since only a small part of the 1,400 square miles of the Authority to Prospect was surveyed it was felt that further exploration should be implemented to try to locate any enriched zones which could support a viable mining operation.

At a meeting with the Directors of the Tin Creek Mining Corporation Limited, and the writer, it was resolved the next stage of the exploration would be commenced in May, 1971. Watts, Griffis and McOuat (Australia) Limited were requested to submit to the Company the details for the proposed exploration.

The object of this report is to recommend to the Tin Creek Mining Corporation Limited a suitable exploration programme and also to submit a cost estimate to undertake the work.

## 2.0. RECOMMENDED EXPLORATION PROGRAMME

### 2.1. General Outline

The thorough exploration of a 1,400 square mile property is a lengthy and costly exercise. In order to effect economies certain assumptions as to the concurrence of economic minerals in the area have been made. The preliminary investigation established fairly conclusively that the vanadium was enriched in the laterites, which occur as a thin surface veneer throughout the region. It is therefore assumed that the vanadium will not be concentrated economically in other rock types which constitute the parent material for the laterites and the basement to the area. The exploration will therefore be directed to examining the areas of laterite outcrop, which will

usually occur as cappings on isolated hills, chains of hills and ridges. Not all of the laterite masses may be enriched in vanadium, so the preliminary regional survey outlined below will be aimed at identifying those areas of laterite considered to have the greatest potential for economic vanadium concentrations.

In order to effect maximum economies and keep the exploration costs per square mile to a minimum, it is recommended that the investigations be conducted systematically according to the following procedure:-

- (i) Establishment of ground reference points.
- (ii) Areal survey and definition of targets for further investigation.
- (iii) Ground reconnaissance survey to inspect areas distinguished during the areal survey.
- (iv) Detailed ground investigation of areas finally selected as most promising.
- (v) If justified by the results of (iv), a bulk sample should be taken and tested metallurgically.

The detailed procedure for each stage of the proposed exploration is as follows:-

## 2.2. Establishment of Ground Control

In order to facilitate the location of areas of interest, it was agreed at the meeting between the writer and the Directors of Tin Creek Mining Corporation, that a network of ground reference markers would be laid out on the area. The Company is to undertake to complete this task prior to Watts, Griffis and McOuat's entry into the field. The proposed layout of markers each large enough to be visible from the air, is indicated on the accompanying Figure 1680-3/6.

A route is shown on the figure for a bulldozer track to form a baseline for all the ensuing exploration. The route suggested follows the easiest ground for road construction. The position of the various markers should be numbered consecutively so that the number can be read from a low flying aeroplane. If a marker occurs in a more heavily wooded area, it will be desirable to burn the surrounding scrub to enable the marker to be more readily visible.

Once the most promising areas have been selected by air search and ground appraisal, a track will need to be cut through to them using a small bulldozer. Since the track-cutting is a slow and tedious task, this work should not be commenced until the most interesting laterite occurrences have been delineated.

## 2.3. Airborne Reconnaissance

The work completed to date has indicated a strong correlation between the

laterite and the type of vegetation that it supports. Where laterite occurs, it appears that a thick growth of lancewood is usually present, in other areas, gum trees grow sparsely.

Enquiries have revealed that air photo coverage of the area is available through the Department of National Development in Canberra. It is therefore recommended that Watts, Griffis and McOuat purchase air photographs on behalf of Tin Creek Mining Corporation Limited, and that a preliminary examination of the photos be made to delineate areas of lancewood growth and also to eliminate obviously unfavourable areas before the geologists enter the field.

In order to establish a priority rating of the various laterite areas, additional information from that available from airphotos is required. It is therefore proposed that a light aircraft be hired for a Senior Geologist to survey the area by low level flying.

The air survey should provide the following information:-

- (i) Colour of laterites - this may be used to define more iron and vanadium rich lateritic areas (previous work has indicated that a purple red iron stone is often the mostly highly mineralized material).
- (ii) Vegetation type and boundaries as related to colour and extent of underlying soil.
- (iii) Accessibility of lateritic areas.
- (iv) Any areas of outcropping rocks which the geologists feel are worthy of inspecting later on the ground.
- (v) The location of lateritic areas which warrant ground follow up work. The grid reference system will be used to define the location of the various occurrences and to enable those areas within the 1,400 square miles appearing to be of most promise to be located on the ground.

#### 2.4. Ground Reconnaissance

The areas selected as most interesting by the Senior Geologist in the aerial survey will be inspected by a ground reconnaissance survey, using a 4 wheel drive vehicle where possible. The purpose of the inspection will be to reduce the number of interesting areas to about 5, which will then be subjected to a more detailed exploration programme. It is probable that grab samples will be taken for assay at each of the areas inspected, however, the preliminary decision to reject an area will need to be based upon a visual appraisal. Should the assays for samples from

a rejected area prove to be of interest the detailed exploration programme can be expanded to include the area.

#### 2.5. Scintillometer Survey

Included as part of the field examination, it is recommended that a vehicle mounted scintillometer survey should be conducted on the various tracks, and over the laterites thought to be most interesting. The purpose of this survey is threefold:-

- (i) To test for phosphorites which can be associated with overlying zones enriched in vanadium.
- (ii) To test for uranium-vanadium deposits. Although the geology of the area may not be favourable for such occurrences, all possibilities for economic minerals should be tested for, especially if such testing can be incorporated into the search for vanadium enriched laterites.
- (iii) To test for vanadium, which, the results of previous sampling indicate occurs with trace amounts of potassium which can be radioactive.

#### 2.6. Mapping

In order that the exploration can be conducted systematically, it is recommended that a geological plan of the area should be prepared from the air photographs to show the location of the various deposits selected for preliminary and detailed study.

In general, it is felt that a detailed geological map of the area will not be required since major attention will be given to the laterite crust rather than the underlying bedrocks.

#### 2.7. Detailed Exploration of Selected Areas

A grid will be laid out over each of the areas selected using a chain and compass. Various chip and grab samples will be taken from the surface outcrops, but most of the emphasis will be directed towards containing more representative samples of the underlying material.

The previous work has shown that due to the varying hardness of the laterites, the samples recovered from percussion drilling are of dubious reliability. Consequently, it was agreed that a number of sampling locations would be selected within each area, and a test pit excavated using

percussion drill holes loaded with explosives. It is anticipated that the laterite will be fairly uniform in thickness from about 8 - 12 feet and hence it should be possible to sample accurately from the sides of a pit or from the cleaned-down edge of the laterite layer on an escarpment.

It is emphasised that the sampling of the deposits will be of considerable importance and the Senior Geologist will spend time to ensure that the procedures adopted will be adequate and that the samples produced are truly representative of the deposits.

The various samples will be reduced in size under the direction of the Geologist, packaged according to Watts, Griffis and McOuat's standard procedure, and returned to Sydney for assaying.

It is also proposed that various representative samples be taken for mineralogical examination at the discretion of the Senior Geologist.

#### 2.8. Metallurgical Testing Programme

Unfortunately, there will be a time lag between the completion of the sampling of the most promising areas and the receipt of the results of the assays. Since a metallurgical testing programme will not be warranted unless the assay values are of adequate interest, it is considered that a final decision as to the need for this work should only be made when the  $V_2O_5$  grades have been calculated. However, it is recommended that a bulk sample, suitable for metallurgical testing, should be taken while the Party is in the field. The sample of about two tons in weight, would need to be transported and stored at a railhead from where it could be despatched to a testing laboratory if required. Literature research to date has revealed little information on the recovery of vanadium from laterites, hence any conclusions based upon results of  $V_2O_5$  extraction from other rock types may be quite misleading. It is therefore considered, that metallurgical testing may be required before the potential of these deposits can be finally assessed.

#### 3.0. COST ESTIMATE FOR EXPLORATION

It will be appreciated that, at present it is not known how long the proposed programme will take to implement, and hence, the following budget should be used only as a general guide:-

Personnel - Field and Office

Supervising Geologist	14 days @ \$170/day	\$2,380.00
Senior Geologist	20 days @ \$150/day	3,000.00
Geologist	45 days @ \$100/day	4,500.00
Drafting	7 days @ \$44/day	308.00
Typing	5 days @ \$44/day	<u>220.00</u>
		\$10,408.00

Accommodation

Allow 10 days @ \$15.00 per day 150.00

Travel

Allow 4 return air trips @ \$553 per trip 2,212.00

Aircraft Rental

Allow 15 hours @ \$25.00 per hour 375.00

Communications

Allow 100.00

Freight and Postage

Allow 200.00

Maps, Prints, Airphotos, etc.

Allow 100.00

Rental of Scintillometer (TV-4)

25 days @ \$9.00 per day 225.00

Miscellaneous

Allow 50.00

\$ 13,820.00

+ Contingencies 10%, say, \$ 15,000.00

4.0. DETAILS OF COST ESTIMATE

4.1. Watts, Griffis and McQuat (Australia) Pty. Limited Personnel

It is planned for a Senior Geologist to visit the area, plan the details of

the exploration programme and instruct the Project Geologist as to how the investigations are to be implemented. The Senior Geologist will visit the area for 10 days on at least two occasions while the work is in progress. Allowance has also been made for the writer to visit the area for several days late in the programme.

Since the result of the preliminary investigations suggested that the potential of the area was very marginal, it was felt that the next stage of the investigation should be given every chance for success. Consequently, it has been allowed for the Senior Staff to spend ample time supervising the work and assessing the results.

#### 4.2. Accommodation and Travel

This item will be charged at cost to the Company.

An allowance has been made for accommodation en route to the area. It is not anticipated that the amount indicated will be required.

#### 4.3. Communications

Telegrams and telephone charges will be charged at cost.

#### 4.4. Freight

An amount has been allowed for freighting of rock samples and equipment. The actual amounts will be charged at cost.

#### 4.5. Aircraft Rental

The Company can arrange for the hire of an aircraft or, alternatively, Watts, Griffis and McOuat (Australia) Limited will undertake to do this. The charges will be charged at cost.

#### 4.6. Assaying

No allowance has been made for assaying of samples or mineralogical studies. These will all be charged at cost.



5.0.

## PROJECT ORGANIZATION

### 5.1. Timing

The Geologists will enter the field early in May. It will be appreciated if the Company can give Watts, Griffis and McOuat (Australia) Pty. Limited one week's notice of a starting date.

When the Geologists arrive on site it is expected that the reference grid will have been laid out so that the aerial survey can start immediately.

### 5.2. Administration

The project will be administered by the Sydney Office of the Firm and all communications and correspondence should be sent to that office.

### 5.3. Work Standards

In order to fulfil their professional obligation to clients, it is Watts, Griffis and McOuat (Australia) Pty. Limited's policy that all geological work must be conducted in accordance with the highest professional standards. To implement this aim, all geological, technical and assisting staff are supervised in the field by an experienced Senior Geologist. The project as a whole will be administered by an Executive Geologist of the firm who will visit the field party to advise on problems as well as to ensure that Tin Creek Mining Corporation Limited is kept acquainted with the progress of the work.

### 5.4. Reports

The final report for the project will be submitted at the completion of the work after the result of assays are known. In addition to the final report mentioned above, summaries outlining the progress of the work will be submitted at shorter intervals.

152° 45'

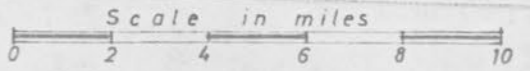


LEGEND:

- Alluvium
- TERTIARY**
- Laterite; ferruginous rubble; some soil and sand cover.
- LOWER CRETACEOUS**
- Mullaman Beds  
Claystone and siltstone; glauconitic sandstone; ferruginous conglomerate, quartz sandstone with plant fossils.
- Geological boundary, position approximate.
- Fault.
- Road.
- Vehicle track.
- Water hole
- ⊗ Proposed location of reference points (to be numbered on ground).

NOTE:

Economic vanadium deposits will occur with laterites.



WATTS, GRIFFIS AND McQUAT (AUSTRALIA) PTY. LIMITED  
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 TIN CREEK MINING CORP. LTD.

Geology and Ground Control for Exploration Programme.

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