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Environmental impact statement for the mining and processing of alluvial tin at Gibsonvale, N.S.W.

METALS EXPLORATION LIMITED

ENVIRONMENTAL IMPACT STATEMENT FOR THE MINING AND PROCESSING OF ALLUVIAL TIN AT GIBSONVALE, N.S.W.

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R.W. CORKERY & CO. PTY. LIMITED

FORM 4

ENVIRONMENTAL PLANNING AND ASSESSMENT ACT, 1979 9 SECTION 77 (3)(d)
ENVIRONMENTAL IMPACT STATEMENT

This statement has been prepared on behalf of Metals Exploration Limited being the applicant making the development application referred to below.

The statement accompanies the development application made in respect of the development described as follows:-

The open cut mining and processing of alluvial tin.

The development application relates to the land described as follows:-

Portions 29, 34, 136, 137, 139, 140 and 142
Parish: Kikoira
County: Dowling

The contents of this statement, as required by Clause 34 of the Environmental Planning and Assessment Regulation, 1980, are set forth in the accommpanying pages.

Name, Qualifications and Address of person who prepared Environmental Impact Statement	R.W. Corkery, B.Sc.,M.Appl.Sc., P.O. Box 444, Willoughby. NSW. 2068

Certificate

I, Robert William Corkery of 9B Chaleyer Street, Willoughby, hereby certify that I have prepared the contents of this Statement in accordance with clauses 34 and 35 of the Environmental Planning and Assessment Regulation, 1980.

.....

Signature

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Summary

THE PROPOSAL

Metals Exploration Limited (hereafter referred to as "the Company") proposes to mine and concentrate alluvial tin from the Kikoira/Gibsonvale deep lead system over a five year period. The Company has applied for four Mining Leases to cover the proposed mine areas which are not within the Mining Leases already held by the Company. The Company undertook open cut mining at Gibonsvale between 1969 and 1974 to recover alluvial tin. The Company proposes to undertake the mining operation in two phases.

Phase 1: Retreatment of some coarse tailings from previous operations and mining of remnants of "shallow ground" (2-20 m) on the western side. (Duration 15 months.)

Phase 2: Mining of deep ground (25-40 m) on the eastern side. (Duration 45 months.)

Phase 1 and Phase 2 are independent of each other in that all areas mined in Phase 1 can be mined and rehabilitated without dependence on any areas to be mined in Phase 2.

The Company proposes to proceed with Phase 1 as soon as the Mining Leases are granted. Phase 2 will immediately follow Phase 1 provided international tin quotas are removed at that time.

MINING

The Company has outlined seven areas where they propose to mine. Within these areas a total of 480,000 m^3 of alluvial tin wash occurs beneath an estimated 9,000,000 m^3 of overburden. In addition to the seven "proposed" areas, the Company has defined some "possible" extensions adjacent to the recently defined ore bodies. A decision to mine the "possible" extensions will depend on future drilling and economics.

Mining will be at a low rate of 80,000 m^3/ month during Phase 1 rising to 200,000 m^3/ month during Phase 2.

The mining operation will involve the removal of between 2 and 40 m of overburden (clay, gravel and sandy clay) overlying 1 to 2 m of tin bearing gravel wash. The mining will be done by open-cut methods using scrapers, bulldozers, front-end loaders and trucks.

Mining will be undertaken in a sequential manner with the area disturbed by operative mining at any one time being limited. Extraction in each area will commence by either stockpiling overburden or placing it in a nearby opencut. Once exposed, the wash will be transported to the treatment plant for processing.

Topsoil previously removed and stockpiled separately or removed from the next mining phase, will be placed and levelled on to back-filled areas. The Company proposes to engage a contractor to undertake all mining. Mining will be undertaken six days per week between the hours of 7.00 am and 6.00 pm in areas of Phase 1 close to residences and between 4.00 am and midnight at other sites in Phase 1. Overburden removal in Phase 2 will be undertaken between 6.00 am and 10.00 pm or 4.00 am and midnight depending on the location and depth of mining. Mining and transportation of tin wash to the treatment plant will only be undertaken during the period 7.00 am and 6.00 pm.

Of the agricultural land to be mined 50 per cent will be rehabilitated back to agricultural land, 30 per cent to water-storage dams and 20 per cent to overburden dumps. All roads mined will be replaced after mining. Small remnants near existing workings will be rehabilitated in a manner which will improve the stability and appearance of the present site.

TREATMENT PLANT

The tin-bearing wash will be delivered to the treatment plant by either scrapers (short haul) or trucks (long haul). The treatment plant will be situated on the site of the previous treatment plant which is central to the proposed mining operations. The wash will be fed in to a hopper, washed and sized. The tin is easily separated because of its high specific gravity. Once concentrated, the tin is further cleaned, dried and placed in drums awaiting the monthly despatch to the tin smelter at Alexandria, N.S.W.

During the initial two month's operation of the treatment plant when the coarse tailings are treated, it is proposed to operate the plant two shifts per day (6.00 am to 10.00 pm). However, once the tailings are treated, the mined tin wash will be treated between 7.00 am and 5.00 pm week days only.

Tailings from the treatment plant will be pumped into the old open cuts where they will be retained and the excess water decanted for re-use. Make-up water for the plant will be drawn from the Company's existing pipeline from Lake Cargellico.

EMPLOYMENT AND HOUSING

Fifteen men will be employed during the construction phase. The workforce during the mining and treatment operation will fluctuate between 28 in Phase 1 and 33 during Phase 2. The Company's previous experience indicates that the majority of employees will be local persons.

The Company will provide on-site transportable homes for some employees. However, it is anticipated that other employees will have no problems in obtaining local rental housing.

ENVIRONMENTAL CONSTRAINTS

The principal environmental constraints that will control the Company's project will be:

Topography and Drainage: The Gibsonvale area is relatively flat (slopes varying from 0^{o} to 2^{o}). Drainage from all new mining areas will flow into the existing open cuts.

Soils: Thick, well developed, fertile, red earth soils occur on areas to be mined.

Meteorology: The Gibsonvale area has an irregular rainfall pattern reflecting the changes in wind direction. Annual rainfall is approximately 490 mm. Temperatures are high in summer (33.4^{o} - Av Maximum - January) and low in winter (2.7^{o} Av. Minimum - July).

Ambient Noise Levels: Ambient noise levels are low and reflect the rural nature of the area. They are especially low when wind speeds are low or absent, however the occurrence of these conditions is rare.

Flora and Fauna: The proposed mine areas are primarily agricultural land with scattered shade trees. Local fauna include birds, wallabies, hares, rabbits, foxes, possums, echidnas and mice.

Nearby Residents: The closest residences to the proposed mining operation and treatment plant are those of E. Schirmer and R. Contessa near the corner of Thulloo Road and Schirmers Lane. The closest homestead to the mining areas and treatment plant is "Lavente" south of the site.

Socio-Economic Factors: Gibsonvale lies within a sparsely settled rural area where agriculture is the dominant industry. Small rural townships are in close proximity. There is a considerable number of local persons

unemployed. 1981 Census figures and the Company's investigations show that a considerable number of private dwellings are available for rent.

Transportation: The site is served by local unsealed roads. The Company has defined economic grades of tin beneath two sections of Thulloo Road.

ENVIRONMENTAL IMPACTS

The principal environmental impacts of the Company's project will be:

Topography and Drainage: All drainage will be contained within the catchment of the existing open pits. Most existing drainage lines and topography will be restored in areas not proposed for rehabilitation as water storage dams or overburden dumps. Some local changes in drainage will occur in the vicinity of the new water storage dams principally to assist in water catchment.

Soils: All soil will be cared for and used in rehabilitation of the site. Erosion by wind and water will be avoided through use of revegetation and stock control.

Air Quality: The Company's proposed site management and housekeeping will ensure the impact of wind blown dust is minimized.

Flora and Fauna: Occasional mature shade trees will be removed during mining. The existing tree population in the area will be restored (and increased) after mining when the Company plants numerous trees around rehabilitated areas, specifically the water storage dams.

Noise Climate: The mining operation will be audible at a number of local residences. Although audible, the noise levels will not exceed noise design goals during the day with the exception of two residences (E. Schirmer and R. Contessa). These excessive noise levels would only be

experienced for a three month period. The planned hours of operation at night will ensure that design goals are met at all residences.

Noise from the treatment plant may also be audible at some residences but will not exceed the design goals during its operation.

Land Use: Approximately half of the agricultural land mined will be returned to agricultural use whilst the remainder will be left as water storage dams and revegetated overburden dumps.

Socio-Economic Factors: The Company's project will provide a considerable boost to the local community through the provision of jobs, injection of rental payments and purchase of provisions.

Visual Aspects: Most of the mine sites and the treatment plant will be visible from Thulloo Road and/or some nearby residences. No practical screens are possible.

Services: Existing services are adequate to meet both community and Company demands. Any service facility moved during the course of mining will be replaced at the conclusion of mining in the area affected.

Transportation: Properly constructed road diversions will ensure there are no impacts upon motorists using Thulloo Road.

CONCLUSION

The Company's project has been well planned to ensure that it has minimal environmental impact throughout its operations. Furthermore, the planned final use of the landform will be generate benefits including the provision of water storage dams.

The mining will enable unstable conditions beneath and close to Thulloo Road to be eliminated. Numerous parts of the mining area at Gibsonvale will be improved aesthetically as a result of the Company's operation. The project will have considerable economic and social benefit to the local area, principally through the provision of jobs, the need for housing and local spending. The project will also provide benefits for New South Wales and Australia.

Section 1

Introduction

1.1 SCOPE

This Environmental Impact Statement has been prepared by R.W. Corkery & Co. Pty. Limited to support a Development Application by Metals Exploration Limited to the Bland Shire Council. The proponent, hereafter referred to as "the Company", proposes to mine and process alluvial tin at Gibsonvale. The Company holds Mining Leases remaining from its previous Gibsonvale alluvial tin mining operation which ceased in 1974. In order to undertake the mining proposed in this project, the Company is seeking additional Mining Leases through the Department of Mineral Resources. Obtaining Development Consent is a pre-requisite before these Leases can be granted. Mining within a Mining Lease is a designated development within Schedule 3 (Part m) of the Environmental Planning and Assessment Regulation, 1980.

This Statement also serves as a basis of applications to the State Pollution Control Commission for licences and approvals required to operate the mine and processing plant.

Figure 1.1 shows the location of Gibsonvale which is approximately 50 km west-northwest of West Wyalong and 30 km north of Weethalle.

The Mining Leases sought are located on Crown and private land within the Parish of Kikoira and County of Dowling.

1. 2 BACKGROUND OF THE PROPOSAL

In 1979, Metals Exploration Limited applied for a 64 square km Exploration Licence covering the Gibsonvale-Kikoira Tinfield. Exploratory drilling within the Exploration Licence (E.L.1383) adjacent to the old workings and in Portions 29, 136, and 137 (see Figure 2.2) has delineated sufficient reserves for the Company to

recommence mining in the area. The new reserves are in tailings, remnants, and extensions to previously mined deep leads. A brief history of the Company's mining activities in the Gibsonvale area is presented in Section 1.4.

The Company has planned a new mining venture based on the delineated reserves. Four Mining Lease Applications were lodged with the Department of Mineral Resources on the 8th March, 1984. Details of the Mining Lease Applications are presented in Section 2.2.

1.3 THE PROPONENT

Metals Exploration Limited is an Australian-owned mining and exploration Company. Since incorporation in 1954, it has made several substantial metal discoveries and sponsored a number of companies. Metals Exploration Limited has continuously produced tin since 1964 working deposits in New South Wales and Queensland and has been an important producer of nickel and cobalt since 1970. Metals Exploration Limited directly employs 80 people and through partly-owned ventures employs another 1100. The main areas of interest, apart from Gibsonvale, are:-

1. Producing Mines

   North Kalgurli Mines Ltd. (W.A.) (30% owned)
   1982/83 produced 39,574 fine ounces of gold from 308,900 tonnes of open pit and underground ore.

   Greenvale Nickel/Cobalt Mine. (Qld). (50% owned)
   1982/83 produced 20,029 tonnes of contained nickel and 1,088 tonnes of contained cobalt from 1,957,000 tonnes of laterite mined by open pit.

Plate 1 — The Company's alluvial tin processing plant at Dinner Creek - Sandy Flat in Queensland

Plate 2 — Samples of cassiterite separated from alluvial wash obtained during exploratory drilling at Gibsonvale.

2. Non-Producing Properties

Dinner Creek/Sandy Flat Tin Mine (Qld). (100% owned)
1982/83 produced 134 tonnes of 70% tin concentrate from 99,600 cubic metres of alluvial wash (see Plate 1).

Nepean Nickel Mine. (W.A.) (100% owned)
1982/83 produced 2,079 tonnes of contained nickel from 80,085 tonnes of sulphide ore mined from underground narrow veins. Now on care and maintenance.

Mt. Bischoff. (Tas.) (85% owned)
Open cut tin prospect.

Forrestania. (W.A.) (51% owned)
Nickel prospect.

1.4 HISTORY OF MINING AT GIBSONVALE

E. Conolly is reported to have discovered tin in a quartz reef on Portion 29, Parish of Kikoira in 1906 (see Figure 2.2). The reef is reported to have varied from 15 cm to 90 cm in width. Work in 1906 raised 300 tonnes of stone, of which 13 hand-picked tonnes were treated to produce 1.1 tonnes of 57.9 per cent tin concentrate. Other tin lodes were worked but production was minimal.

Prospecting for alluvial tin re-commenced in 1935 but was hampered by lack of water for treatment. In 1938, J. Gibson discovered rich alluvial tin under the road between Portions 23 and 29, in the Parish of Kikoira. Production expanded rapidly, peaking at 650 tonnes of concentrate in 1941. By 1945, nearly three kilometres of deep lead had been defined and over 3,000 tonnes of concentrate produced. Production declined rapidly after 1946, and by 1957 had virtually ceased.

Attempts were made to develop the deposit on a large scale. In 1949, Beechworth Alluvials Ltd. of Sydney and Broken Hill South Ltd., investigated a dredging scheme but rejected it, presumably because of uncertain water supply and low tin prices.

In 1961, the Aberfoyle Tin Development Partnership of which 25 per cent was held by Metals Exploration Limited and its subsidiaries commenced an active study of the field and initiated a drilling programme in March, 1962. The drilling and sampling was completed in March, 1963 and the reserves estimated at 820,000 cubic metres of wash grading 4.4 kg/m3, overlain by 8,390,000 cubic metres of overburden.

In 1966, the partners decided against developing the tinfield after which Metals Exploration Limited acquired the remaining 75 per cent. Metals Exploration Limited commenced a drilling and sampling programme in October 1966, to confirm the Partnership's work and carried out a study on exploitation procedures.

The key to large-scale mining was water supply , and this was solved by construction of a pipeline from Lake Cargelligo, a distance of 54 kms. In 1969, mining by open pit methods commenced and in the period from 1969 to 1974, Metals Exploration Limited produced 3,771 tonnes of 70 per cent tin concentrate from 960,000 cubic metres of wash overlain by 12,300,000 cubic metres of overburden. The overall grade of wash mined by the Company was 3.9 kg/m^3, which was much lower than the grades of 12 to 18 kg/m^3 required for the underground miners.

Metals Exploration Limited ceased mining in 1974 due to exhaustion of reserves that were economic under the prevailing conditions. The open pits covered much of the area intensively worked by the underground miners.

During the late 1960's and 1970's, production other than from the Metals Exploration Limited operation was limited. G.B. Tin Mining

Company Pty. Limited operated an open-cut mine on Mining Leases 28 and 48 and Contessa Bros. treated tailing dumps. By the mid-1970's production from the field had essentially ceased.

1.5 TIN - ITS PROPERTIES, USES AND MARKETING

1.5.1 Properties

Tin can be found in range of minerals such as stannite, cylindrite, teallite, complex sulphides, and cassiterite. Cassiterite (Tin Oxide - SnO2) is the main economic ore of tin. The cassiterite at Gibsonvale occurs as small grains 0.3 mm to 6 mm corresponding to medium gravel sand to fine gravel. Most are, however, in the range of 0.3 mm to 2 mm. (see Plate 2).

The cassiterite at Gibsonvale is primarily dark brown to black. It has a high specific gravity of 7.0 which is approximately three times the specific gravity of the other sands and gravels in the tin-bearing wash.

1.5.2 Uses

The most important use of tin is in tin plating of other metals, mainly copper and steel. Tin plate is thin steel sheet coated with tin by hot dip or electrolitic processes. It combines the strength of steel with the non-corrosive properties of tin.

Black (1982) described that the properties of tin which determine its usefulness. These are:-

1. Its low fusibility;

2. Its malleability;

3. Its resistance to corrosion and fatigue, and

4. Its ability to alloy with other metals.

Tin - lead alloys, often with other metals such as antimony, bismuth or cadmium, have a wide variety of uses as various forms of solder, bearing metals and other soft, low melting point alloys. Another major use of tin is in copper - tin alloys such as bronze and gun metal.

Tin is also used to produce inorganic and organic compounds which are used for a variety of purposes such as fungicides, colorants, toothpaste, veterinary medicines, and opacifiers.

1.5.3 Tin Marketing

Australian mine production of tin concentrate is sold essentially to the Associated Tin Smelters at Alexandria, N.S.W., and two smelters in Malaysia. The price for concentrate is based on the Penang or London Metal Exchange Price, with deductions for smelting and impurities.

The tin market is subject to the International Tin Agreement which is governed by the International Tin Council, of which Australia is a member. The Agreement's objective is to achieve a balanced market and alleviate problems due to surplus or shortage and large price variations. When the market price moves outside certain limits a buffer stock manager buys or sells tin to stabilize the price. If a serious over-production problem occurs, tin production quotas are placed on mining operations.

In the period from 1958 to 1982 there have been four periods of quotas. In mid 1982, a quota was introduced which limits present production to 60 per cent of the 1981 annual production. During the past five years the tin price has been subject to quite large

fluctuations, rising from a low point of Malaysian $25.00 per kilogram to a high of M$40.10 per kilogram. The price during March, 1984 was M$29.15 per kilogram.

The Company currently has a quota for its operations throughout Australia. Production rates at Gibsonvale will be controlled to a major extent by the Company's quota.

1.6 FORMAT OF THE IMPACT STATEMENT

This Environmental Impact Statement has been written in six sections with a set of appendices. The requirements of Clause 34 of the Environmental Planning and Assessment Regulation, 1980, have been incorporated into the most appropriate sections of the Statement. The format is as follows:-

Section 1 - Introduces the proposal, examines the history of mining at Gibsonvale and outlines the scope of the Statement.

Section 2 - Outlines the Company's objectives, the Mining Leases sought and the proposed plans for mining, rehabilitation and processing of the alluvial tin.

Section 3 - Describes the existing environment around Gibsonvale in the areas proposed for mining. Potential constraints imposed by the existing environment are identified.

Section 4 - Presents the safeguards which have been incorporated in the mine plan and design of the processing plant to protect the environment in the vicinity of the mine.

Section 5 - Analyses the impact the safeguarded project will have on the environment around Gibsonvale.

Section 6 - Justifies the project in terms of environmental, economic and social considerations and examines the consequences of not proceeding with the mine and processing plant.

Appendices - Present the Energy Statement, a report which examines the acoustical aspects of the project, a list of birds, and correspondence from the National Parks and Wildlife Service regarding Aboriginal aspects.

1.7 MANAGEMENT OF THE INVESTIGATIONS

The bulk of the investigations and report writing has been undertaken by Robert W. Corkery, B.Sc.,M.Appl.Sc., principal of R.W. Corkery and Co. Pty. Limited. Fieldwork together with relevant background data and discussions regarding the project with the Bland Shire Council were undertaken on 19th and 20th July, 1983. Discussions were held regularly with Company representatives throughout the preparation of the Statement. Assistance with the Statement's preparation was obtained from:-

The National Herbarium (Sydney) - for the identification of specimens of trees and shrubs collected in areas to be affected by the mining activities.

Geocom Pty. Limited - for calculation of noise readings and preparation of wind roses.

Eden Dynamics Pty. Limited - for assessment of acoustical impact of the project.

Graham Wade of Pilgrim International Ltd - for the preparation of perspective sketches.

The following authorities were consulted during the preparation of the Environmental Impact Statement. Those marked (*) provided comments on a draft copy of the Statement.

Department of Environment and Planning (Sydney)
Bland Shire Council (West Wyalong)*
Soil Conservation Service (West Wyalong)*
Department of Mineral Resources (Sydney and Orange)*
Department of Industrial Relations (Orange)
Department of Agriculture (West Wyalong)
National Parks and Wildlife Service (Griffith)
State Pollution Control Commission (Bathurst)*

Section 2

Description of the Project

2. 1 OUTLINE OF PROPOSAL

The Company proposes to mine and concentrate alluvial tin from the Kikoira/Gibsonvale deep lead system. The Company has delineated reserves in extensions to the previously mined deep lead systems, some non-mined remnants, and some of the tailings from their 1969-1974 mining campaign. The Company proposes to undertake the mining in two phases.

Phase 1: Retreatment of tailings and mining of the relatively shallow deposits (2-20 m) close to previous mining.

Phase 2: Mining of relatively deep deposits (25-40 m).

Phase 1 and Phase 2 are independent of each other in that all areas mined in Phase 1 can be mined and rehabilitated without dependence on any areas to be mined in Phase 2.

The Company proposes to proceed with Phase 1 as soon as the Mining Leases are granted. Phase 2 will immediately follow Phase 1 provided international tin quotas are removed at that time.

The operation will involve mining alluvial tin at depths from 2 to 40 m using open-cut methods with conventional bulldozers and scrapers, with some truck haulage on longer haul distances to the treatment plant. The open-cuts will be progressively rehabilitated with the majority of the area being back-filled and returned to agricultural land.

Figure 2.1 presents the overall site layout and shows the seven areas to be mined. Table 2.1 shows the area proposed in each phase in mining. Each area is described separately in the Statement. It should be noted that the areas to be mined are shown as either proposed or possible. Those shown as "proposed" will definitely be mined once all approvals are obtained, whereas those shown as

Plate 3 Northeasterly view from the existing coarse tailings dump across Thulloo Road (middle distance) towards the areas to be mined ie. -Schirmer's, Harrington's and Contessa

Plate 4 Easterly view from the existing coarse tailings dump across the old (and proposed) site for the treatment plant. The proposed area for mining ie. -Airstrip and N.S.E. Tribs is on the left, middle distance. Overburden from the previous mining operations is seen on the right

Plate 5 Northwesterly view from the coarse tailings dump across the Gibcripp Extension Remnant and Thulloo Road - Post Office B (middle distance)

"possible" are marginally economic and their mining will depend upon prevailing economic factors, principally the price of tin and earthmoving costs.

If only the "proposed" areas are mined, a total of 51 ha of previously undisturbed land (agricultural/road) will be disturbed. A further 13 ha will be disturbed if all "possible" areas are mined. In addition, a further 28 hectares of the land previously disturbed will be mined and rehabilitated or used for dams and the plant site.

The tin will be concentrated in a conventional wet process alluvial treatment plant. The concentrate will be dried, placed in drums and sent to the smelters by road transport. Tailings from the treatment plant will be back-filled into open-cuts left from the earlier mining operations.

Water will be drawn from dams within the old open-cut areas which will be topped up with water drawn from the Company's existing Lake Cargelligo to Gibsonvale pipeline. Electricity supply for the plant and accommodation will be drawn from the State grid.

TABLE 2.1

PHASES OF DEVELOPMENT AND THE AREAS TO BE MINED

	(Tailings Retreatment
	(1. Post Office A and B, and Gibcripp Extension Remnant
Phase 1	(2. Reserve Extension
	(3. O'Kane's Block
	(4. Gibcripp
	(5. Airstrip/Contessa/N.S.E. Tribs
Phase 2	(6. S.S.E. Tribs
	(7. Schirmer's/Harrington's

TABLE 2.2
EXISTING MINING LEASES HELD BY THE COMPANY IN THE GIBSONVALE TIN FIELD IN FORCE AT 10TH APRIL, 1984

P.L.L. No.	Portion No.	Area (acres)	Surface (acres)	Depth (ft.)	Expiry Date
3274	PML 25	78.1.24	1.0. 0		7.05.85
3718	PML 23	70.0. 8	70.0. 8		14.05.89
3719	PML 28	18.2. 1	18.2. 1		14.05.89
3721	ML 58	1.2.14	Nil		14.05.89
3727	PML 46	74.3.22	74.3.22		14.05.89
3735	PML 35	9.3.24	9.3.24		19.08.89
3738	PML 8	58.3.31	58.3.31		18.09.89
3782	PML 15	66.1.18	66.1.18	(50)	8.12.91
3790	PML 13	2.0. 5	2.0. 5		4.07.92
3801	PML 27	80.0. 0	80.0. 0	(50)	15.10.92
3745	PML 34	0.2.16	0.2.16		7.04.90
3813	PML 10	17.3.25	17.3.25	(250)	18.01.93

2. 2 MINING LEASES

The Company has applied for four Mining Leases to cover the areas with defined economic grades of alluvial tin. These Lease Applications surround a number of other leases held by the Company. Figure 2.2 shows the location of the Company's Mining Lease Applications and other Leases currently held in the area.

M.L.A's cover a total of 520.9 hectares and traverse the Company's land, private land, Crown land and public roads vested in the Bland Shire Council. Table 2.2 lists the existing Mining Leases in the

Gibsonvale Tin Field in force at 1st April, 1981 and Table 2.3 lists the proposed mining areas and the appropriate Mining Lease Application.

TABLE 2.3
MINING LEASE APPLICATIONS AND PROPOSED MINING AREAS

MLA 236 (Orange)	O'Kane's
MLA 237 (Orange)	Contessa/Harrington's
MLA 239 (Orange)	Post Office B, Gibcripp Extension Remnant, Gibcripp Island, S.S.E. Tribs, N.S.E. Tribs, Airstrip
MLA 241 (Orange)	Reserve Extension/Post Office A Schirmer's

2. 3 THE ORE BODIES

The ore bodies are part of the Kikoira-Gibsonvale deep lead which is a buried ancient river system. The ore is termed wash and is tin bearing ancient river gravel which is overlain by varying depths of sand, clay and soil overburden.

The Company proposes to mine some 480,000 m^3 of wash overlain by 9,000,000 m3 of overburden. Figure 2.3 shows typical pit cross-sections. Further details on the nature and distribution of the tin is contained in Section 3.3.

Table 2.4 presents a breakdown of the quantities of overburden and tin wash within each of the areas to be mined.

TABLE 2.4
VOLUMES OF SOIL, OVERBURDEN AND TIN WASH TO BE MOVED DURING MINING

	Soil	Overburden	Tin Wash
Phase 1			
Reserve Extension	15,000	120,000	31,000
O'Kane's	12,000	70,000	13,000
Post Office B	13,000	230,000	27,000
Gibcripp Extension Remnant	nil	270,000	18,000
Post Office A	2,000	110,000	8,000
Phase 2			
Gibcripp Island	4,000	200,000	27,000
Airstrip/Contessa	70,000	3,700,000	181,000
S.S.E. Tribs	60,000	1,400,000	53,000
Schirmer's/Harrington's	63,000	2,700,000	121,000

2. 4 MINING ACTIVITIES

2. 4.1 Mining Method

The alluvial wash will be won by open-cut methods using conventional earth-moving equipment. The operation is planned to minimise areas of overburden dumps and final pits, and maximise the area restored to agricultural land. Backfilling and restoration will be carried out as the mining progresses. A perspective sketch of the proposed mining operation is presented in Figure 2.4.

The mining operation will involve similar procedures for both Phase 1 and Phase 2 with the exception of Post Office A and B, Gibcripp extension remnant and Gibcripp Island which are remnants of previous mining.

A Mining Method - New Areas (See also Section 2.4.3)

1. Site Preparation

Site preparation will involve removal of trees and shrubs where present. Any timber that could be used around the mine site or by local landholders will be retained. All other timber will be stockpiled to one side for firewood and any unusable wood burnt on site.

Fences will be removed and replaced around the proposed working areas. Gates will be installed at appropriate locations indicated by landholders.

Soil will be separated and stockpiled ahead of overburden removal. All 10-15 cm of the A horizon and at least 30 cm of the B horizon will be removed. The soil will be placed in longitudinal mounds up to 1 m high, parallel to the sides of the open-cut. In later stages of mining, the soil will be placed directly onto rehabilitated areas.

Diversion banks will be installed to direct any run-off around the open pits.

2. Overburden Removal

Sufficient overburden will be removed initially to expose a 100 m length of alluvial wash. The overburden will be won by scrapers and placed either in worked out areas of old open cuts or placed

in a prepared stockpile adjacent to the pits. Once the alluvial wash in the exposed area is removed, the overburden in the subsequent 100 m will be placed in the worked out section of the pit. After the overburden is placed in position, it will be allowed to settle to assume a profile similar to the surrounding surface. The backfilled pit will then be topsoiled and re-vegetated. Further details of the rehabilitation of the overburden is outlined in Section 2.14.

3. Mining of Wash

In most cases, the wash will be mined and carted to the treatment plant in scrapers. On the longer hauls some use will be made of trucks which will be loaded by rubber tyred front-end loaders.

4. Rehabilitation

All sites in Phase 2 and O'Kane's Block and the Reserve Extension in Phase 1 will be rehabilitated to retain as much agricultural land as possible. Where necessary, water storage dams and revegetated overburden dumps will be left (see Figure 2.4). Where possible overburden will be placed in nearby open cuts. Further details of rehabilitation is presented in Section 2.14.

B Mining Method - Remnants (See also Section 2.4.3)

1. Site Preparation

Site preparation will involve pumping the water from the adjacent open-cuts and the removal of the few trees and shrubs on the sites. Any soil will be separated and placed to one side.

Fences will be removed where necessary and placed around the proposed work areas. In the case of Post Office B, Thulloo Road will be diverted as shown on Figures 2.1 and 2.9.

Diversion banks will be installed to direct any run off away from the working area.

2. Overburden Removal

The overburden will be removed and backfilled into the adjacent open cuts and previously worked out sections of the pit.

3. Mining of the Wash

In most cases tin wash will be won by scrapers and hauled directly to the treatment plant.

4. Rehabilitation

The Thulloo Road will be backfilled with compacted overburden and restored to its original position. The road reserve will be topsoiled and revegetated. Other overburden will be used to stabilise old workings adjacent to the roads and the final pits will be contoured down to 1:3 (vert:hor). All areas will be topsoiled and revegetated.

2.4.2 Mining Equipment

The Company proposes to use conventional earthmoving equipment to extract the overburden and wash. The choice of equipment will depend on the length of haul and the nature and properties of the material which is being mined. Table 2.3 lists the earthmoving equipment proposed to be used at Gibsonvale. Some back-up equipment will be

retained on site to be utilised during periods of mechanical breakdown.

The equipment will be supplied by the Company's contractor and it is expected to be the most up to date earthmoving equipment. There will be a considerable contrast with the efficiency and noise characteristics of the newer equipment. The newer equipment will be more efficient and considerably quieter than that previously used on-site.

TABLE 2.5

EARTHMOVING EQUIPMENT TO BE USED AT GIBSONVALE

Type	Size	Number
Bulldozers	CAT D10	1
	CAT D9L	1
Scrapers	CAT 651B	4
Grader		1
Trucks	Tipping $7m^3$	4*
Front-end Loaders	$4m^3$	2*
Water Cart	20,000 l	1

* To be used intermittently

2.4.3 Details of Mining Areas

S.S.E. Tribs. (Figure 2.5)

Topsoil from the initial pit will be stockpiled and the overburden placed into the S.E. Tribs pit, which was left open after mining in 1973. The remaining overburden will be backfilled into the S.S.E. Tribs pit as mining progresses in a southerly direction. A final pit,

covering approximately 4.8 ha, on the southern end will have its walls battered down, topsoiled and be formed into a water storage area.

N.S.E. Tribs. (Figure 2.6)

The mining of this pit will depend on prevailing economics. If it is mined, the topsoil from the initial pit will be stockpiled and the overburden placed into the northern side of the S.E. Tribs pit. As mining progresses westwards, the overburden will be backfilled into the worked out pit area and topsoiled. If N.S.E. Tribs is worked prior to the Airstrip and Contessa blocks, the mining cycle will continue to advance into the Airstrip and Contessa blocks, but if mining occurs after Airstrip and Contessa are worked out, a final pit battered down to a dam will remain between the Airstrip and N.S.E. Tribs block.

Airstrip and Contessa (Figure 2.6)

Mining of this area will commence at the eastern end of the Airstrip block (Option 1) unless a prior decision to mine N.S.E. Tribs is made (Option 2). The initial pit topsoil will be stockpiled and the overburden placed in a dump with battered sides at the southern side of the pit. Mining will progress in an easterly and then northerly direction across Thulloo Road and into the paddock on the northern side of the road, with continuous backfilling of the worked out pit. Based upon existing drilling information, mining is planned to cease approximately 450 m north of Thulloo Road where a dam covering 4 ha will be formed. There is a possibility that further drilling may prove a connection between Contessa and the Harrington block, in this case mining would continue to the Harrington block (Option 2) and the final dam would be formed 750 m north of the road. The agricultural land other than the initial overburden dump and final dam will be restored to agricultural land.

Thulloo Road will be diverted to the north while mining is carried out under its existing location. As soon as the road area is backfilled, the road will be returned to its present position.

Schirmer's and Harrington's (Figure 2.7)

Mining will start at either the eastern or western end of this block depending on final exploration and prevailing economics.

Option 1 presents the layout for mining starting on the western end and Option 2 presents the layout for mining commencing at the eastern end in conjunction with areas of possible mining. The topsoil from the initial pit will be stockpiled and overburden placed in battered dumps the areas shown in Figure 2.7. Mining will proceed along the lead in the normal cycle leaving the central mining path backfilled and restored to agricultural land. A dam covering 4 ha will be formed where mining ceases at the final pit.

There are two possible mining blocks extending some 500 m east and west of the main Harrington block. Should these be mined, the final dam will occur at the eastern end of the block to the east of the main mine area.

Gibcripp Island (Figure 2.8)

This remnant occurs in the centre of pits left from mining during the period 1969-74. A small section of the Island will be mined and the overburden used to form dam walls in preparation for backfilling of this section of Gibcripp workings with tailings from the proposed treatment plant.

Post Office Area (Figure 2.9)

The small remnant of wash previously worked by underground methods remains between old open pits in the vicinity of the old Gibsonvale Post Office. Mining of this area will result in backfilling of pits adjacent to the existing road and stabilisation of areas slumping as old underground workings collapse.

Area A

Overburden from this small area which has been extensively disturbed by previous mining will be used to fill the open cut area abutting Schirmers Lane, thus stabilising this area. The southwestern pit wall will be battered to a safe angle at the completion of the work. Topsoil for the final rehabilitation will be brought in from other areas.

Area B

A 450 m section of Thulloo Road adjacent to the old Post Office overlies economic wash. Forty thousand cubic metres of overburden from the Gibcripp Extension Remnant will be placed in the existing open pits which abut the northern side of Thulloo Road. Electricity and telephone lines along Thulloo Road will be diverted north of the existing road onto the backfilled area. Overburden from the initial roadway pit will be placed in the existing open pit south of the road with further overburden being placed in the worked out pit sections. The final pit will be backfilled with further overburden from the Gibcripp Extension Remnant.

The backfill will be compacted as it is replaced and the road properly restored to its existing status. Due to the intensity of previous mining in this area, little topsoil remains and topsoil for roadside rehabilitation will be carted in from other areas.

Gibcripp Extension Remnant

Overburden from this block will be used as backfill for the Post Office B mining programme and to stabilise the southern side of Thulloo Road. The final pit will have its walls battered , topsoiled and rehabilitated.

Reserve Extension (Figure 2.10)

Topsoil from this pit will be stripped and placed in temporary storage areas on the northern side of the pit. Overburden from the initial pit will be placed on the northern side of the pit while wash is removed. Once the wash is removed, the pit will be completely backfilled with overburden from this pit and nearby dumps. The topsoil will be replaced and the area returned to its original configuration.

O'Kane's Block (Figure 2.11)

Topsoil from this pit will be stripped and placed in temporary storage areas. Overburden from the initial pit will be backfilled into nearby pits. The remaining overburden will be backfilled into the pit leaving part of the area restored to original contours and the remainder as a dam. The topsoil will be replaced and vegetation re-established.

TABLE 2.6

AREAS OF LAND TO BE MINED AND RESTORED*

Agricultural Land mined	Phase 1	Phase 2	Total
S.S.E. Tribs		13.1	13.1
Airstrip and Contessa		12.0	12.0
Schirmer's and Harrington's		12.6	12.6
Reserve Extension	3.0		3.0
O'Kane's Block	2.3		2.3
Sub-Total	5.3	37.7	43.0
Pasture area used for Thulloo Road diversions 1300 m x 15 m		2.0	2.0
Pasture area used for pit haul roads			
S.S.E. Tribs - 2300 m x 10 m		2.3	2.3
Airstrip and Contessa - 2300 m x 10 m		2.3	2.3
Schirmer's and Harrington's -1400 m x 10 m		1.4	1.4
	0.0	8.0	8.0
Total Agricultural Land disturbed	5.3	45.7	51.0
Agricultural Land not returned after mining			
S.S.E. Tribs - dam		4.8	4.8
Airstrip and Contessa - overburden dump		4.0	4.0
" " - dam		4.0	4.0
Schirmer's and Harrington's - overburden dumps		8.0	8.0
" " - dam		4.2	4.2
O'Kane's Block - dam	1.2		1.2
	1.2	25.0	26.2
Note: Percentage of Agricultural Land rehabilitated	77%	45%	49%
Disturbed Areas to be Mined			
Post Office A	1.1		1.1
Post Office B (including Thulloo Road)	3.3		3.3
Gibcripp Extension Remnant	1.0		1.0
Contessa (Thulloo Road)		1.1	1.1
	5.4	1.1	6.5
Possible Extensions			
N.S.E. Tribs		2.9	2.9
Contessa to Harrington		2.6	2.6
Harrington	0.0	12.5	12.5

* Hectares

2. 5 CONSTRUCTION AND WORKING HOURS

Construction and commissioning of the treatment plant and installation of on-site accommodation will occur over a three month period. Work on the treatment plant will be between the hours of 7 a.m. and 5 p.m., six days per week.

The Company proposes to remove overburden during the hours shown on Table 2.7. The proposed hours are those based primarily on the limitations of compliance with the requirements of the Noise Control Act, 1961. The Company does, however, plan to increase its working hours for overburden removal to those shown as "possible" on Table 2.7. The Company expects to achieve the "possible" hours of operation when

1. background noise levels are raised by wind - a common feature of the Gibsonvale area, and

2. when extraction is lower than 10 m in all pits in Phase 2.

Mining of wash will only take place between 7.00 am to 6.00 pm, Monday to Saturday.

TABLE 2.7

PROPOSED WORKING HOURS FOR OVERBURDEN REMOVAL

	Proposed Working* Hours	Possible Working** Hours
PHASE 1		
Reserve Extension	4am - Midnight	4am - Midnight
O'Kane's Block	4am - Midnight	4am - Midnight
Post Office B	7am - 6pm	7am - 6pm
Gibcripp Extension Remnant	7am - 6pm	7am - 6pm
Post Office A	7am - 6pm	7am - 6pm
PHASE 2		
Gibcripp Island	6am - 10pm	6am - 10pm
Airstrip/Contessa	6am - 10pm	4am - Midnight@
S.S.E. Tribs	6am - 10pm	4am - Midnight@
Schirmer's	6am - 10pm	4am - Midnight@
Harringtons	4am - Midnight	4am - Midnight

* The proposed working hours are limited by requirement for visibility and/or the limitations imposed by satisfying the requirements of the Noise Control Act, 1961.

** The possible working hours are set out to indicate the period the Company would like to work provided noise generated is within the limits set by the State Pollution Control Commission when enforcing the Noise Act, 1961.

@ Subject to mining at depths greater than 10 m.

TABLE 2.8

PROPOSED PROGRAMME FOR MINING AT GIBSONVALE

Mine Areas	Duration of Mining in each area (months)
Tailings Retreatment (Month 0 - Month 2)	
Coarse Tailings	2
Shallow Ground* (Month 2 - Month 14)	
(Reserve Extension	4
(O'Kane's	2
(Post Office A	2
(Gibcripp Extension Remnant	3
(Post Office B	4
Deep Ground ** (Month 15 - 60)	
(Gibcripp Island	2
(Airstrip/Contessa	45
(S.S.E. Tribs	45
(Schirmer's/Harrington's	45

* These areas will be mined in the order listed, however, there will often be overlap between these mining operations, that is, two pits will be operative on many occasions.

** To be mined concurrently

2. 6 LIFE OF MINE

The mine life will be dependent upon -

1. the effects of the International Tin Council production quotas,

2. the economics at the time of mining, and

3. the results of further exploration along the deep lead.

It is envisaged that the mine will produce for one year at relatively low levels due to quotas, followed by four years at full production.

On completion of operations, the treatment plant which is in modular form, will be dismantled and moved to another mine site.

Table 2.8 presents the Company's tentative programme for mining. It should be noted that there will often be overlaps between the sites to ensure a regular supply of wash to the treatment plant.

2.7 TREATMENT PLANT

2.7.1 Location

The treatment plant will be erected on the site of the earlier plant, adjacent to the coarse tailings stockpile (see Figure 2.8). This site is central to the deep lead system being mined and close to the old pits which are to be used for water supply dams and tailings disposal.

2.7.2 Construction

The treatment plant will be similar to the previous plant and will use the existing trommel, sluice boxes and foundations. A new jigging section and feeding hopper will be erected. The jigs will be covered by a steel clad roof and a steel clad shed erected for the final treatment of the tin concentrate (see Figure 2.13).

2.7.3 Principles of Treatment

Figure 2.12 displays the proposed flowsheet for the treatment plant. The treatment process makes use of the high specific gravity of tin to enable separation from the alluvial wash. The tin-bearing wash is fed into a hopper, washed with high pressure water and run into a trommel. In the trommel, the wash is scrubbed, oversize material is separated, and the -12 mm material delivered to the jigging plant by a 250 mm gravel pump. The excess water is removed with 600 mm cyclones and the cyclone underflow delivered to three banks of primary jigs. The jig hutch concentrate goes to the secondary jigs and the overflow to the sluice box and then to the tailings dam. Tin concentrate from the secondary jigs is sent to a tin shed, where it will be cleaned over a shaking table and willougby, dried and placed in drums. Test work is being carried out to see if the sluice can be replaced with spirals.

The plant will be run by a combination of electricity and diesel. The diesel engines proposed are already owned by the Company and previously used at the original plant. The engines are CAT3306. A CAT950 or 966 front-end loader will be used to load the wash into the hopper.

2.7.4 HOURS OF OPERATION

During the initial two month's operation of the treatment plant when the coarse tailings are treated, it is proposed to operate the plant two shifts per day (6.00 am to 10.00 pm). However, once the tailings are treated, the mined tin wash will be treated between 7.00 am and 5.00 pm weekdays only. The two shift operation for the treatment of tailings is necessary to produce the required quantity of tin necessary to maintain the Company's tin quota.

Some maintenance and production work will be carried out on Saturdays on an eight hour shift.

2.8 WASTE DISPOSAL

2. 8.1 Nature of Wastes

The wastes or tailings from the treatment plant consist of a slurry of sand and gravel, with small quantitites of silt and clay. No chemicals are added to the water during the treatment process.

2.8.2 Disposal

The tailings will be pumped to a series of tailings dams to allow the sand, gravel, silt and clay to settle out. The clear water in the final dam will be decanted for re-use in the treatment plant.

The Company will construct a new dam adjacent to the treatment plant (see Figure 2.8) into which tailings will be placed. The finer grained material (fine sand, silt and clay) will gradually flow beyond this dam onto a series of old open cuts. A series of slots will be cut between the open cuts to allow movement of the tailings from one site to the next. Clear water will continue to flow beyond the tailings into the water storage dams.

There will need to be some construction within the old open cuts to form the walls of the water storage dams. The location of new walls is shown on Figure 2.8.

Due to the small local market for sand and gravel, there would appear to be no advantage in producing an above-ground stockpile similar to that on the site. The sand and gravel will, however, remain accessible should a local market develop for these products. Previous experience on the site has shown that the clay and silt fraction in the tailings eventually dry and consolidate and is useful as a backfilling material. The decanted water in the final dam will be of a similar quality to that already present in the existing dams. Tests by the Department of Agriculture have shown the water to be suitable for laundry, personal ablutions, hot water systems, septic tanks and limited irrigation use. Past experience has shown that floculents are not required.

2. 9 SERVICES

2.9.1 Water Supply

The water supply for the treatment plant will be drawn from surface water in the existing open cuts and from the Company's pipeline to Lake Cargelligo (see Figure 2.14). The pipeline is presently

operating from the lake to the 25 km pump station, where the supply to Tullibigeal is tapped off. The section from the 25 km pump station to the mine site will be re-opened and the pumps at the lake and 25 km pumping station refurbished.

The total water usage in the treatment plant will be 260 litres per second comprising approximately 230 litres per second of re-circulated water and 30 litres per second of make-up water. The make-up water is added at a rate of 2000 litres per cubic metre of wash treated. The need for make-up water arises due to losses by evaporation and water being retained in tailings.

Prior to commencement of production, 180 megalitres will be required in storage. The Company expects to use the water stored in the open cuts during the early stages of the operation. Recent rain has ensured that in excess of 180 megalitres is within the open cuts.

Domestic water will be collected from building run-off and stored in appropriate sized tanks. Domestic water will be supplemented by water obtained fromLake Cargelligo.

2.9.2 Power

State grid electricity is required for lighting and domestic use, as well as small motors in the treatment plant. The large pumps will be powered by diesel motors already owned by the Company.

The total plant and workshop power requirement is predicted to be 35,000 kw hrs/month. The domestic use for the Gibsonvale mining settlement will be approximately 6000 kw hrs/month.

During mining of the Post Office B and Contessa blocks, it will be necessary to re-route power lines presently located along Thulloo Road.

2.9.3 Sewerage

The housing units will each have a septic tank system. Toilet blocks at the treatment plant and earthmovers' quarters will also have their own separate septic systems.

2.9.4 Telephone

The Company expects that five telephones will be required on site. These will be in the mine offices and residences.

The existing telephone line along the Thulloo Road will be re-routed during the mining of the Contessa and Post Office B blocks.

2.10 SAFETY ASPECTS

The following safety aspects will be carefully planned and implemented by the Company.

1. Trucks and scrapers crossing the Thulloo Road will only be operated during daylight hours. Road signs will be placed in the appropriate positions to give adequate warning to motorists using Thulloo Road of the regular cross-traffic on the road.

2. The road diversions around the proposed mining areas will be properly constructed with reflectors and will provide good visibility. (See Section 2.11.3).

3. Routes for the earthmoving equipment will be properly defined and vehicles working at night provided with flashing lights to enable easy recognition.

2.11 TRANSPORTATION

2.11.1 Access to the Site

The main road access to the site is from the Mid-western Highway at either Yalgogrin or Weethalle. (see Figure 1.1 and Section 3.1.6).

2.11.2 Proposed Transport Route

The transportation of the tin concentrate to the smelters will be along the Gibsonvale to Yalgogrin road, unless poor road conditions or local flooding prevent its use. The road from Gibsonvale to Weethalle could be used during wet periods as there is only 6.5 km of dirt road compared to 20 km of the Gibsonvale/Yalgogrin road.

2.11.3 Road Diversions

The Company proposes to divert the Thulloo Road while mining is carried on in the Post Office B and Contessa Blocks.

At the Post Office, a 450 m length of road will be diverted 30 m north of its present route onto filled pits. This diversion parralleling the existing road will be used for six months while mining takes place.

At the Contessa block, a 600 m length of road will be diverted 400 m north of its present route. This diversion will be used for a period of twelve months.

The road diversions will be built to the standard of Thulloo Road and equipped with warning signs and white guide posts with reflectors. The Thulloo Road areas mined will be backfilled with compacted overburden and restored to the existing road standard. The roadside

reserve area and adjoining Company land will be topsoiled and rehabilitated by planting trees and shrubs.

2.11.4 On Site Road Network

Figure 2.1 shows the existing and proposed road network on site. The roads will, where possible, follow roads left from previous operations. Where this is not possible, the road will follow the pit outline and fence lines. The roads will be formed using compacted sandy clay.

Scrapers and trucks hauling wash from pits north of the Thulloo Road will cross the road at Contessa and the Post Office blocks.

2.12 EMPLOYMENT

During the construction phase, 15 men will be employed. Employment will increase to 28 when mining and treatment commence. The workforce is expected to fluctuate, peaking at 33 when deep ground is mined. Approximately one third of the employees will be involved in the treatment of the wash with the remainder on earthmoving. Table 2.9 presents the expected breakdown of the workforce to be employed in the development stages and operating phases of the Company's mining project. It should be noted that already ten persons are employed on the site, consequently an additional five persons will be employed to develop the mine site as the existing staff will form part of the development workforce. Where possible, the Company will recruit its workforce locally. The Company's previous experience in the area suggests that the contractor will also engage a large proportion of his operators from the local workforce.

2.13 HOUSING

The Company expects there to be sufficient housing available both on site and throughout the Gibsonvale district to satisfy the requirements of the employees and the contractors. Statistics collected during the 1981 census and compiled by the Australian Bureau of Statistics indicate sufficient unoccupied private dwellings are present within 40 km of Gibsonvale. The Company has also recently investigated availability of housing in the Gibsonvale Area. Data relating to housing availability is presented im Section 3.13.

The Company's current workforce at Gibsonvale reside either on-site (four single) or on nearby farms (four single and one married) and one married employee lives in West Wyalong.

TABLE 2.9

PROPOSED WORKFORCE - GIBSONVALE

Work Force		Development	Operating
Staff	Manager	1	1
	Accountant	1	1
	Plant Foreman	1	1
	Technicians	1	2
	Geologists	1	-
Award	Treatment Plant	-	7
	Construction	7	-
	Rehabilitation	-	1
	Drilling	3	-
	Sub-total	15	13
	Earthmoving	-	20
	Total	15	33

2.14 REHABILITATION

2.14.1 Outline

All areas disturbed in the mining programme will be rehabilitated. Where possible, the pits will be backfilled, topsoiled and sown to pasture. The remaining mining areas will be either contoured,

revegetated overburden dumps or water storage dams. Tree planting to form windbreaks will be carried out along the Thulloo Road, in paddock areas, adjacent to dumps and water storage dams. An outline of the areas to be rehabilitated and the form of rehabilitation is presented on Figures 2.16 and 2.17. Option 1 relates to rehabilitation of only the "proposed" mine areas and Option 2 relates to rehabilitation of all "proposed" and "possible" areas mined. Figure 2.15 shows a perspective sketch of the proposed form of rehabilitation.

It is stressed that the rehabilitation of all areas in Phase 1 can be completed without any dependence on the timing or occurrence of Phase 2. The Company recognises the need and value of immediate rehabilitation once all wash is mined.

During mining, the topsoil (A horizon) and at least 30 cm of the subsoil (B horizon) will be preserved for use in rehabilitation. Tailings from the treatment plant will be backfilled into the Gibcripp pit, which was only partly backfilled during previous mining programmes.

Of the agricultural area to be disturbed by mining, approximately 50 per cent will be returned to agricultural land. The pits will be backfilled as mining progresses, and topsoiled. While the pasture is being re-established, the area will be fenced to prevent stock damage.

The three dumps from initial pits will be contoured to give final batters of 1 in 3 (Vert:Hor). Following construction of each dump, they will to be fenced, topsoiled and planted to allow revegetation. Trees will be planted around each dump.

Final pits that will remain open at the completion of mining will have their walls battered down and the wash zone and other permeable areas sealed with clay to form water storage dams. The section of dam wall

above water level will be fenced, topsoiled and revegetated.

All restoration work will be carried out in consultation with the landowners and under the guidance and the Soil Conservation Service. Vegetation and grass types as well as fertilizer will be applied according to their requirements.

2.14.2 Rehabilitation of Mine Areas

Figures 2.18 to 2.26 show the details of the proposed rehabilitation in each of the mine areas.

Where mining has disturbed areas adjacent to Thulloo Road and Schirmers Lane, an intensive tree-planting programme will be carried out. The area with open pits remaining from early operations near the Post Office will, when re-mined in the new proposed programme, be backfilled, topsoiled and restored.

The details of rehabilitation of each mine area is set out in the same order as the details of mining areas set out in Section 2.4.3.

S.S.E. Tribs (Figure 2.18)

The southern end of the area will be rehabilitated to a water storage dam covering approximately 4.8 ha. The northern end will be backfilled and returned to agricultural land. This area will blend in with the partly backfilled S.E. Tribs pit. Those fences disturbed will be replaced and shade tress planted around the dam.

N.S.E. Tribs (Figure 2.20)

The entire N.S.E. Tribs pit will be rehabilitated back to agricultural land. The rehabilitated area will blend with the partly backfilled northern end of the S.E. Tribs pit.

Airstrip/Contessa (Figures 2.19 and 2.20)

Option 1 (Figure 2.19)

The entire Airstrip area would be blackfilled and rehabilitated to agricultural land. The mined section of Thulloo road would be replaced and the road re-established. The trees removed during mining will be replaced with tube stock and the vegetation re-established at a similar intensity on either side of the mine area. The northern end of the Contessa Block will be rehabilitated as a water storage dam covering approximately 4 ha. Fences removed during mining will be replaced and/or re-located around the dam.

Option 2 (Figure 2.20)

The entire Airstrip/Contessa area would be backfilled and returned to its original contours and use as agricultural land. The mined section of Thulloo road would be replaced and the road re-established. The trees removed during mining will be replaced with tube stock and the vegetation re-established at a similar intensity on either side of the mine area. The northern and southern ends of the blocks will coalesce with similar rehabilitation on Harrington's and N.S.E. Tribs.

Schirmer's/Harrington's (Figures 2.21 and 2.22)

Option 1 (Figure 2.21)

The rehabilitation of these blocks will result in the retention of two overburden dumps and a water storage dam. All other areas will be backfilled and returned to the original contours. Fences moved during mining will be either replaced or re-located around dams and the overburden dumps.

Option 2 (Figure 2.22)

The rehabilitation will leave two water storage dams and one overburden dump. All other areas will be backfilled and returned to the original contours. Fences moved during mining will be either replaced or re-located around dams and the overburden dumps.

Gibcripp Island (Figure 2.23)

The Gibcripp Island will be rehabilitated by its incorporation on the edge of the fresh water dam. An even smaller island will remain in the middle of the fresh water dam.

Post Office A and B (Figure 2.24)

Rehabilitation of Post Office A will result in the enlargement of the adjacent dam. The mined area will have a final slope of 1:3 (Vert:Hor). The western end of the dam adjacent to Schirmers Lane will be backfilled and the area made safer.

Rehabilitation of Post Office B will result in Thulloo Road being replaced and the adjacent areas backfilled to improve safety. The areas adjacent to the road will be planted with trees to provide a long term visual screen for the area.

Gibcripp Extension Remnant (Figure 2.24)

This block will be left as a dam which is incorporated with a dam already present west of the block.

Reserve Extension (Figure 2.25)

The entire block will be rehabilitated to its original contours for subsequent re-cropping. The small length of fence removed will be

replaced at the conclusion of mining.

O'Kane's Block (Figure 2.26)

Rehabilitation of this block will result in a small water storage dam at the northern end of the block. The southern end will be returned to its original contours and grassed.

2.14.3 Tailings Dams

The open cuts or tailings dams will only be partly filled at the completion of mining and treatment. There will be a gradual slope on the top of the tailings reflecting the direction of tailings disposal. The dams will be left as water storage dams. The Company's experience with the previous tailings suggests that the tailings will quickly consolidate to form a relatively solid base in the subsequent water storage dams.

2.14.4 Treatment Plant and Accommodation

On completion of mining, the treatment plant and the accommodation on the Gibsonvale Mining Settlement will be removed from site. The plant and accommodation being of transportable, modular construction, will be suited to use at other sites after Gibsonvale. Haul roads and the plant site will be ripped and cleaned up and then topsoiled and revegetated.

The Company's water supply dams will be retained for the use of local residents.

Section 3

Description of the Existing Environment

3. 1 TOPOGRAPHY

Gibsonvale is located on the plains of Central Western New South Wales where the topography is essentially flat with many local variations. The topography around Gibsonvale is relatively flat with natural slopes varying from 0^{o} to 2^{o}. Previous mining activities have dramatically changed the topography immediately around Gibsonvale and Kikoira with the creation of large overburden dumps and large excavations now used for water storage. Many of the slopes within the excavations are near-vertical. However, there is invariably a ramp providing access to each pit. Slopes on the overburden banks vary from 5^{o} to 45^{o}. The excavations are up to 28 m deep, whereas the overburden dumps are up to 15 m high.

Elevations in the Gibsonvale area where mining is proposed vary from 845 feet (256 m) to 795 feet (240 m) A.H.D.

The slopes and direction of slope in the proposed mining areas are presented in Table 3.1. Slopes vary from 0.2^{o} to 1.0^{o}.

3.2 DRAINAGE

With the exception of O'Kane's Block, all the proposed and possible mining will be located within one catchment, that is within the upper reaches of Narriah Creek (see Figure 3.1) . This creek lies within the Murrumbidgee River catchment close to its watershed with the Lachlan River catchment. Drainage from O'Kane's Block flows westward in an adjacent local catchment which in turn flows in Narriah Creek southwest of Gibsonvale.

The existing open pits from the previous mining operation are located in the lowest part of the catchment shown on Figure 3.1. Consequently, most of the proposed and possible mining will drain into

these pits. Flow beyond these areas is not expected as the pits have considerable volume to hold all runoff flowing into them. Furthermore, the overburden dumps from the previous mining operations lie across the main drainage line and block the flow of water from the site.

TABLE 3.1

SLOPES IN THE PROPOSED MINING AREAS

Area	Maximum Slope (°)	Minimum Slope (°)	Average Slope (°)	Direction of Slope
S.S.E.Tribs	0.6	0.2	0.3	N.N.W.
N.S.E.Tribs	0.5	0.3	0.4	W.N.W.
Airstrip/Contessa	0.7	0.3	0.4	S.S.W.
Schirmer's/ Harrington's	0.4	0.25	0.3	S.to S.W.
Gibcripp	0.2	0.2	0.2	N.W.
Post Office A	0.5	0.25	0.3	S.E.
Post Office B	0.4	0.2	0.3	S.
O'Kane's Block	1.0	0.5	0.7	W.

3.3 GEOLOGY AND ORE RESERVES

The Gibsonvale Tin Field is part of a tin province covering some 480 kms. This province with tin-bearing granites extends south-south east from Mt. Tallebung through Ardlethan and Walwa to Mt. Wills.

The Gibsonvale region is blanketted by an extensive cover of Recent and Tertiary aeolian (wind blown) and alluvial sands and clay. Outcrop is rare and is usually highly weathered. Basement in the area is Upper Ordovician sediments comprising interbeds of siltstone, sandstone, shale and quartzites, which has been intruded by the Kikoira Granite. Several phases of this granite have been recognised in the field. Tin occurs with the granite either in zones of obvious greisenization or as a major mineral in quartz tourmaline veins.

The tin resource Metals Exploration Limited propose to mine is located within the Kikoira - Gibsonvale deep lead system. This deep lead system is considered to have developed during the late Oligocene (25 million yeaers ago) when a juvenile stream system was active in the region. In the deep leads, cassiterite is widespread throughout the basal sand gravel and boulder wash in sections of the lead draining from the granite.

Overlying the basal wash is a sand bed which is almost exclusively quartz. This bed usually has a minor clay content but in the deeper areas can be free-running. Other planes have some sand and gravel layers cemeted by silica forming billy. The sand is in turn overlain by layers of clay, gravel and sandy clay, the upper-most portions of which exhibit poor sorting and distinctly different clays to the lower portions. This upper sedimentation could possibly be aeolin in origin.

The cassiterite distribution with the deep lead is controlled by the source and local fluviatile environment. There is a distinct grade difference between economic and uneconomic areas of wash. These richer portions are generally in the deepest section of the stream, while local features such as tributaries, granite bars and curves influence distribution.

Drilling by the Company has outlined a resource of some 480,000 cubic metres of alluvial wash overlain by 9,000,000 cubic metres of overburden.

3.4 SOILS

3.4.1 Nature and Distribution

The soils throughout the Gibsonvale area are well developed red-earths. The principal features of a typical soil profile are:-

A Horizon	0 - 0.15 m	Sandy loam, brown-red, often hard setting, apedal uniform in colour.
B Horizon	0.15 - 1.2 m	Clay (medium to heavy), dark red, high pedality, well structured, variable concentrations of ironstone gravel throughout.
C Horizon	1.2 - 1.5 m	Weathered Bedrock, often red-brown coarse sandy gravel.

In some areas, the B horizon contains remnant clay pans. One locality adjacent to the southern boundary of the S.E. Tribs open cut displays the pans as more resistant to erosion than the surrounding B horizon.

The A horizon is considerably fertile as demonstrated by the successful cropping of the soil in many of the areas to be mined. However, the B horizon is poor in fertility but provides an excellent seal to prevent the moisture present in the A horizon from rapidly infiltrating the underlying coarse sandy gravel.

3.4.2 Erosion Potential

The soils in the area to be mined have a low erosion potential primarily because of the low natural slopes. The A horizon would be particularly erodible on steeper slopes if not properly vegetated.

3. 5 METEOROLOGY

3.5.1 Source of Data

All meteorological data has been drawn from Naradhan Post Office, 30 km west of Gibsonvale where meteorological records have been kept for approximately 12 years.

3.5.2 Rainfall

The average annual rainfall of 493.5 mm occurs as shown in Table 3.2. The highest average rainfalls occur during the months of January, May and October, with least during the months of March and November. The irregular rainfall pattern reflects the changes in wind directions between seasons.

Many of the low registrations shown on Table 3.3 occurred during the recent drought when rainfall was well below average for almost three years.

TABLE 3.2

MEAN MONTHLY RAINFALL - NARADHAN POST OFFICE* - mm

Month	J	F	M	A	M	J	J	A	S	O	N	D
Average	60.5	36.2	23.5	36.2	51.7	34.7	35.8	40.3	46.1	60.6	30.3	37.6
Highest	148.6	88.6	46.6	153.9	120.8	83.8	88.0	73.4	129.4	127.6	104.9	86.0
Lowest	4.6	1.7	13.0	2.2	1.4	5.5	4.4	4.0	6.8	5.2	3.8	2.2

* 12 years of records

3.5.3 Evaporation

Table 3.3 presents the mean monthly evaporation. This data has been prepared from published mean daily pan evaporation data. Evaporation exceeds rainfall throughout all months of the year.

TABLE 3.3

MEAN MONTHLY EVAPORATION - NARADHAN POST OFFICE* - mm

Month	J	F	M	A	M	J	J	A	S	O	N	D
Average	269	218	189	117	65	45	50	65	96	149	207	269
Highest	319	263	217	141	81	60	59	83	138	210	267	332
Lowest	205	156	158	45	53	33	37	49	69	96	162	207

* 12 years of records

3.5.4 Temperatures

Table 3.4 presents the monthly variations in temperature. January is the warmest month (33.4^{o} Maximum and 18.2^{o} Minimum). Frosts are common throughout the winter months.

TABLE 3.4

MEAN DAILY TEMPERATURES - NARADHAN POST OFFICE* - ^{o}C

Month	J	F	M	A	M	J	J	A	S	O	N	D
Maximum	33.4	32.4	29.4	24.3	19.4	15.5	14.8	16.6	19.7	23.9	27.8	31.9
Minimum	18.2	18.0	14.7	10.3	7.3	4.0	2.7	3.6	6.1	9.6	12.4	15.5

* 12 years of records

3.5.5 Temperature Inversions

Radiation inversions are the main type of temperature inversions likely to cause any noise to be enhanced. An indication of the frequency of radiation inversions is obtained by examining fog frequencies as fogs are radiation inversions when water vapour is present. Table 3.5 and 3.6 present the recorded fog frequencies for Naradhan and West Wyalong. These inversions occur early of a morning and usually disappear by 9.00 am.

TABLE 3.5

FOG FREQUENCIES - NARADHAN

Month	J	F	M	A	M	J	J	A	S	O	N	D
Av. No/Month	-	-	-	-	<1	1	<1	1	<1	-	-	-
Max. No. Recorded/Month	-	-	-	-	2	3	3	3	1	-	-	-

TABLE 3.6

FOG FREQUENCIES - WEST WYALONG

Month	J	F	M	A	M	J	J	A	S	O	N	D
Av. No/Month	-	-	-	-	1	2	2	1	-	-	-	-
Max. No. Recorded/Month	-	-	-	-	5	7	7	3	-	-	-	-

3.5.6 Wind

Figure 3.2 presents the wind roses prepared from data collected at Naradhan. The roses show during summer that winds are strongest and more frequent from the east-northeast sector and the southwest. Similar patterns are evident in autumn, however, wind strength are generally slower. During winter and spring, the winds are predominantly from the northwest to southwest sector.

3.6 WATER RESOURCES

3.6.1 Surface Water

The principal natural water resources in the Gibsonvale area are within farm dams and open pits left by previous mining operations. Figure 3.1 shows the location of these pits and dams. There are no perennial streams in the area.

Local residents utilize the abandoned pits to supplement their water supply. Since the dams have been left, they have provided local residents with a much more reliable source of water. The dams are often used in summer for recreational purposes.

The quality of water within the pits is satisfactory for stock use and domestic use (laundry, ablutions etc.). The use of the water for irrigation is doubtful because of the relatively high sodium levels. Table 3.7 presents the results of water analyses undertaken on samples submitted to the Department of Agriculture in May, 1983.

TABLE 3.7

WATER ANALYSES - KIKOIRA AND GIBSONVALE *

Location	pH	Electrical Conductivity+	Total Alkalinity@	Chloride (Cl)@	Hardness (Ca + Mg)@	CaCO3 Saturation Index
Gibsonvale Mine Water Supply Dam	8.63	1160	150	185	140	+0.95
Kikoira Dam ** adjacent to Railway Line	7.71	910	210	185	118	+0.19

* Analyses undertaken by the N.S.W. Department of Agriculture

** See Figure 3.3 for location

\+ Units microsemens/cm at $25^{o}C$

@ Units mg/l

3.6.2 Underground Water

The water table in the Gibsonvale area is extremely deep. The Company never encountered the water table either during its previous mining operations (open cuts to depths of 32 m) or drilling operations (to depths of 46 m).

3.7 BACKGROUND NOISE LEVELS

3.7.1 Monitoring Procedures

Background noise levels were monitored at two sites shown on Figure 3.1. Measurements at these sites was considered sufficient to adequately describe the existing environment, especially as it relates to existing noise sources. Noise levels were monitored in accordance with Australian Standard AS1055-1978 on the 19th and 20th July, 1983. The noise levels were monitored using a Bruel and Kjaer integrating peak sound level meter type 2225. The meter was calibrated regularly using a Bruel and Kjaer sound level calibrater type 4230. A series of readings were taken at approximately two second intervals for a period of ten minutes using the meter's fast response mode. All readings are "A" scale readings.

3.7.2 Statistical Analysis

The data was statistically analysed by Geocom Pty Ltd into L90, Leq, and L10 classes. L90 is the sound level exceeded 90 per cent of the sampling time, Leq is the sound level of continuous noise which emits the same energy as the fluctuating sound over a fixed period and L10 is the sound level exceeded 10 per cent of the sampling time. L90 is considered to be representative of background noise levels.

3.7.3 Results

The results of the background noise monitoring presented in Table 3.8 shows that the background noise levels (L90) reflects the rural nature of the Gibsonvale area. During the day background noise levels are in the order of 23-30 dB(A) when wind speeds are relatively low. These values naturally increase as wind speeds increase which is a common occurrence around Gibsonvale, especially of an afternoon. Noise levels during the late evening and early morning could be expected to be similar to those recorded on the evening of 19th July, 1983, when the recorded noise levels were usually less than the 20 dB(A) limit of detection.

The only other sound audible throughout the district which would raise the above background noise levels are motor vehicles travelling on local roads, and farm machinery being used.

3.8 FLORA

The proposed mining areas are located primarily within crop land, however, stands of trees do occur along Thulloo Road and on Harrington's block and in scattered locations as shade trees elsewhere throughout the properties to be mined. Tables 3.9 and 3.10 present the range of trees, shrubs and ground cover identified by the National Herbarium in Sydney from samples collected on each mine site. All these species are common throughout the Gibsonvale area.

3.9 FAUNA

The main fauna observed in the areas to be mined are stock, namely sheep and minor cattle. Other native and introduced species include the grey kangaroo and rabbits, hares, foxes, possums and echidnas.

TABLE 3.8

BACKGROUND SOUND LEVEL MEASUREMENTS IN THE VICINITY OF GIBSONVALE.

Site No.	Location*	Early Morning L_{90}	Early Morning L_{eq}	Early Morning L_{10}	Mid Afternoon L_{90}	Mid Afternoon L_{eq}	Mid Afternoon L_{10}	Early Evening L_{90} L_{eq} L_{10}
1.	Thulloo Road (Opposite Schirmer's residence)	25	28	30	23	28	31	Below detection limit (20dB(A)) for bulk of sampling period
2.	Airstrip	30	35	40	24	28	31	

	Date:	20th July, 1983	19th July, 1983	19th July, 1983
FIELD	Time:	7.00 - 7.30 am	3.00-3.30 pm	8.00-8.30 pm
	Temp:	6°C	11 °C	7°C
MEASUREMENT	Cloud Cover:	100%	Clear	Clear
	Mean Wind Speed:	1.7 - 4.2 m/s	0-1.5 m/s	
CONDITIONS	Wind Direction:	S.W.	W.N.W.	

NOTE: L_{90} = sound level exceeded 90% of the sampling time.

L_{eq} = Level of continuous noise which emits the same energy as a fluctuating sound over a fixed period

L_{10} = Sound level exceeded 10% of the sampling time

* See Figure 3.1 for site locations

TABLE 3.9

EXISTING VEGETATION - PROPOSED MINING AREAS - PHASE 1

Scientific Name	Common Name	Post Office A	Post Office B	Gibcripp Ext.Rem	Reserve Extension	O'Kane's Block
Under cultivation					X	
Trees/Shrubs						
Acacia trineura	Green Wattle	X	X			
Eucalyptus microcarpa	Grey Box	X	X			
Acacia alicina	Sally Wattle	X	X			
Schinus areira	Pepper Tree	X				
Eucalyptus gracilis	Yoorel	X				X
Ground Cover						
Xanthium spinsuna	Bathurst Burr	X	X	X	X	X
Schlerolaena muricata	Black Roly Poly				X	X
Atriples suberecta	Lagoon Saltbush				X	X
Eriochloa pseudocrotricha	Early Spring Grass	X			X	X
Helichrysum viscosum	Sticky Everlasting					X
Salsola kali	Soft Roly Poly				X	X
Atriplex leptocarpa	Slender-fruited Saltbush		X	X		X
Sisymbruim orientale	Hedge Mustard	X	X	X		X
Atriplex spinibractea	Spiny-fruit Saltbush		X	X		X
Chloris truncata	Windmill Grass	X	X	X		X
Asphodelus fistulosus	Onion Weed		X	X		X
Stipa sp		X	X	X		X
Echium plantagineum		X	X	X	X	X
Creepers						
Cassytha sp						X

TABLE 3.10

EXISTING VEGETATION - PROPOSED MINING AREAS - PHASE 2

Scientific Name	Common Name	S.S.E. Tribs.	N.S.E. Tribs	Airstrip/ Contessa	Schirmer's/ Harrington's	Gibcripp Island
Under Cultivation		X	X	X	X	X
Trees/Shrubs						
Eucalyptus microcarpa	Grey Box	X		X		
Schinus areira	Pepper Tree			X		
Myoporum playtcarpum	Sugarwood			X		
Cassia erernophila	Cassia			X		
Casuarina cristata	Belah			X		
Callitris columellaris	White Cyprus Pine			X		
Eucalyptus populnea	Bimble Box				X	
Ground Cover						
Xanthium spinosuna	Bathurst Burr			X	X	
Schlerolaena muricata	Black Roly Poly	X		X	X	
Atriplex suberecta	Lagoon Saltbush					
Eriochloa pseudocrotricha	Early Spring Grass	X	X	X	X	
Helichrysum viscosum	Sticky Everlasting					
Salsola kali	Soft Roly Poly	X	X	X	X	
Atriplex leptocarpa	Slender-fruit Saltbush					
Sisymbruim orientale	Hedge Mustard					
Atriplex spinibractea	Spiny-fruit Saltbush					
Chloris truncata	Windmill Grass	X	X			
Asphodelus fistulosus	Onion Weed					
Stipa sp						
Echium plantagineum	Patersons Curse	X	X	X	X	X

Appendix 3 presents the range of birds observed and known to occur on the site.

3.10 ECOLOGICAL ASPECTS

The site has a relatively low ecological value due to its primarily cleared nature and regular use for agriculture.

3.11 LAND USE

3.11.1 Existing Land Uses

With the exception of the previously mined areas, the major land use in the areas to be mined is farming. The principle crop sown is wheat.

3.11.2 Surrounding Land Uses

The principal land uses adjacent to the areas to be mined are cropping and grazing.

3.11.3 Nearby Landowners

Table 3.11 presents the nearby and adjacent landowners and their respective distances to the treatment plant site and the closest mine area.

TABLE 3.11

ADJACENT AND NEARBY LANDOWNERS

Landowner	Distance to Treatment Plant (km)	Distance to Closest Mine Area (km)
E. Schirmer	1.2	0.1 (Post Office B)
R Contessa	1.5	0.3 (Post Office A)
G. Schirmer	2.7	1.7 (Post Office A)
Cripps	2.5	2.2 (Gibcripp Ext. Remn)
Parkinson ("Lavente")	2.1	1.0 (S.S.E. Tribs)
Payne ("Myrtledale")	4.7	3.0 (S.S.E. Tribs)
Mulyan	6	4.0 (Harrington's)
Ellis	4.4	1.5 (O'Kane's Block)
Kikoira	4.9	2.2 (O'Kane's Block)

3.12 PRE-EUROPEAN HISTORY

The site of the Company's proposed mining operations has been visited by naturalist Brickhill of the Griffith office of the National Parks and Wildlife Service. As a result of his visit, naturalist Brickhill advises that it is very unlikely that there are any aboriginal relics in the areas to be mined or disturbed by any of the Company's operations. A copy of correspondence from the Service is enclosed as Appendix 4.

3.13 SOCIO-ECONOMIC FACTORS

3.13.1 Population

Gibsonvale lies within a sparsely settled rural area. Table 3.12 lists the recorded population (1981 Census) in the Gibsonvale and surrounding areas including the towns of West Wyalong Weethalle, Ungarie, and Tullibigeal.

Table 3.13 presents the age structure of persons in a typically rural area (Gibsonvale), small towns (Weethalle and Ungarie) and the larger town of West Wyalong.

3.13.2 Workforce

Table 3.12 presents the existing workforce (1981 Census) in each of the statistical sub-divisions in the Gibsonvale - West Wyalong area. The unemployment levels at that time are also indicated.

The 1981 census figures provide a breakdown of employment types in the area. A summary of the data is presented in Table 3.14. This table shows that approximately 80 per cent of the population around Gibsonvale are directly involved with agriculture whereas in the small towns and West Wyalong, a significantly greater proportion are employed as sales workers, tradesmen, and in administration and the service industries.

3.13.3 Housing

The 1981 census recorded a total of 154 unoccupied private dwellings in the Gibsonvale - West Wyalong area. Many of these were on properties as well as within townships (See Table 3.12). The Company

TABLE 3.12

POPULATION, EMPLOYMENT AND HOUSING

GIBSONVALE - WEST WYALONG DISTRICT - JUNE, 1981.

Locality (Collector's District)	Average Distance from mine (km)		POPULATION * Male	Female	Total	HOUSING Private Dwellings Occupied	Unoccupied
Naradhan (110101)	40	T	82	68	150	48	14
		E	57	32	89		
		U	3	-	3		
Gubbata (110102)	20	T	119	92	211	64	2
		E	67	37	104		
		U	4	-	4		
Gibsonvale (110103)	5	T	99	87	186	51	5
		E	66	42	108		
		U	-	-	-		
South of Weethalle (110109)	40	T	72	55	127	33	0
		E	49	26	75		
		U	-	2	2		
Youngareen (110105)	25	T	175	134	309	92	0
		E	102	69	171		
		U	3	-	3		
South of Yalgogrin (110106)	25	T	141	123	264	75	14
		E	72	55	137		
		U	-	2	2		
South of Tullibigeal (031312)	25	T	69	60	129	40	8
		E	55	31	86		
		U	-	2	2		
Tullibigeal (031311)	40	T	74	76	150	43	7
		E	41	25	66		
		U	-	2	2		
Ungarie (110104)	35	T	207	221	428	147	11
		E	114	68	182		
		U	-	-	-		
Weethalle (110110)	30	T	87	84	171	57	4
		E	43	25	68		
		U	5	3	8		
Northwest of West Wyalong (110202)	70	T	175	145	320	98	6
		E	92	51	143		
		U	5	2	7		
West Wyalong (110304 - 110309)	80	T	1882	1896	3778	1150	83
		E	1044	809	1853		
		U	41	25	66		

Source: 1981 Census
T = Total number
E = Number employed
U = Number Unemployed

TABLE 3.13

AGE - BY POPULATION - JUNE, 1981

Age (Yrs)	Ungarie		Weethalle		Gibsonvale		West Wyalong	
	M	F	M	F	M	F	M	F
0-4	21	6	4	12	19	8	177	153
5-9	17	20	12	3	17	17	136	120
10-14	13	20	3	12	14	20	139	140
15-19	18	16	4	4	16	16	153	158
20-24	18	14	9	6	18	14	153	177
25-29	18	12	8	6	18	12	150	153
30-34	13	15	5	5	13	15	174	112
35-39	15	12	3	0	15	12	103	84
40-44	8	14	2	5	8	14	94	86
45-49	9	4	11	9	9	4	102	74
50-54	10	20	7	4	10	20	78	107
55-59	17	17	5	5	17	17	87	89
60-64	15	11	2	3	15	11	81	115
65-69	8	7	0	5	8	7	77	87
70-74	3	8	2	2	3	8	63	82
75+	5	24	7	4	5	24	77	98
Totals	208	220	74	75	205	219	1882	1896

Source: 1981 Census

TABLE 3.14

EMPLOYMENT - BY INDUSTRY

GIBSONVALE - WEST WYALONG DISTRICT - JUNE, 1981

Employment Category	Gibsonvale (110103)	Weethalle (110110)	Ungarie (110104)	West Wyalong (110304-110309)
Professionals (Dr,teachers etc)	1.8	4.3	8.2	8.4
Administration	0	0	0	4.9
Clerkical Workers	2.7	7.2	8.8	12.4
Sales Workers	0	4.3	6.6	12.0
Agriculture	80.4	27.5	25.8	8.1
Mining, Quarrying	1.8	0	0	0.4
Transport	1.8	5.8	6.0	7.6
Tradesmen, labourers and process workers	0	23.2	17.0	23.6
Service	1.8	14.5	13.7	13.1
Not known	9.8	13.0	13.7	9.2

Source: 1981 Census

has recently undertaken an initial assessment of housing availability in the immediate vicinity of Gibsonvale the results of which are presented in Table 3.15. The Company's assessment has been confined to townships, and as such is considered conservative as further rural accommodation could be expected, once it is sought.

TABLE 3.15

AVAILABILITY OF HOUSING - GIBSONVALE DISTRICT *

Company owned or rented	Camp area	up to 4 single
	Wowic homes	6 off
	Transportable	1 off
	Farmhouse	1 off
Available	Ungarie district	2 houses
	Weethalle	1 house
	Kikoira	2 houses
	Tullibigeal	2 houses

* Undertaken by Company in March, 1984

3.14 VISUAL ASPECTS

The proposed areas to be mined are visible from Thulloo Road and Schirmers Lane. The generally flat nature of the country around Gibsonvale enables the mining areas to be seen for long distances in all directions. Small stands of trees provide local screens.

3.15 TRANSPORTATION NETWORK

Figure 1.1 shows the major road network in the Gibsonvale - West Wyalong district.

The roads in the vicinity of the mining operation (Thulloo Road and Schirmers Lane) are both unsealed roads approximately 15 m wide within a 60 m wide easement.

The State Government maintains a rail link between Naradhan and Temora which passes through Kikoira 3 km north of Gibsonvale. This rail link is only used at the completion of wheat stripping to transport locally grown wheat to Temora storages.

3.16 SERVICES

3.16.1 Power

The Northern Riverina County Council maintains a domestic supply (3 phase) to the Gibsonvale settlement. This supply is carried in an above ground single pole line.

3.16.2 Telephone

Telecom maintain a line along Thulloo Road which supplies the current requirements at the Company's dwellings.

Section 4

Design and Operational Safeguards

4.1 AIR POLLUTION CONTROLS

The principal air contaminant will be dust generated by movement of vehicles along the haul roads and during overburden removal.

The air pollution controls to be adopted on site will be

1. Exposed areas limited: the areas required for mining will be limited. As mining advances in each block, the worked out areas will be backfilled with overburden from the following stage of operation.

2. Rehabilitation: As areas are mined and the wash removed, they will be backfilled, levelled and rehabilitated as described in Section 2.14. The soil placed on top of the final surface will be seeded with pasture grasses and fertilizers to establish good ground cover and hence eliminate dust generation. Any areas not established during the initial planting will be resown to achieve total grass cover.

3. Watering: A water cart will be used constantly by the contractor to water the unsealed roads on site to ensure that dust generation along the roads is eliminated. Other often used areas on the site will also be watered as required. Water will be applied at a rate of up to 1.5 litres per sq. metre. This water will be drawn from the main water storage dam near the treatment plant or the closest source on the Company's property.

4. Internal Roads: These will be minimised and well defined to ensure vehicles do not travel on grassed areas.

5. On-Site Machinery/Trucks: On-site equipment will be fitted with exhausts directed upwards. All machinery and trucks on site will be confined to specified access roads to minimise the areas utilised for roads.

6. The overburden dumps will be contoured and top soiled and grass established to ensure no windblown material leaves the site.

4.2 WATER POLLUTION CONTROLS

The main features of the Company's water management control will involve

1. The use of existing pits to collect all water flowing across the Company's land.

2. Diversion banks will be constructed to direct uncontaminated runoff away from the proposed open cuts. This procedure essentially assists in minimising the quantity of water necessary to be pumped from the open cuts after rainfall. All pit and runoff water will be stored together in the old open cuts.

Additional information on the Company's water pollution controls will be supplied if required to the State Pollution Control Commission in support of an application for approvals under Section 19 of the Clean Waters Act, 1970.

4.3 NOISE LEVEL CONTROLS

4.3.1 Mining Operation

The principle noise sources during the mining operation will be the earth moving equipment outlined in Section 2.3. The main noise controls to be adopted on site will be

1. Machine Silencers: All equipment will be fitted with standard exhaust silencers.

2. The existing overburden dumps will provide good shielding in a number of the areas to be mined.

3. Open Cut Design: Whilst the earth moving equipment is operating in the open cuts, the open cut itself will provide significant noise attenuation when they exceed 5 metres in depth. Any additional information required by the State Pollution Control Commission to support these controls will be supplied when approval under Section 27 of the Noise Control Act is sought.

4.3.2 Treatment Plant

The main noise controls to be adopted at the treatment plant will be

1. Machine Silencers: All motors and the diesel generators will be fitted with appropriate mufflers and noise control devices. All electric motors and diesel engines will be shielded from the weather with appropriate covers. Accordingly these covers will also act to reduce noise.

2. The overburden dumps and stockpile of coarse tailings to the west of the plant will provide considerable shielding of the noise generated at the treatment plant. Further details to support these controls will be supplied to the State Pollution Control Commission when approval under Section 27 of the Noise Control Act is sought.

3. The front-end loader feeding the hopper will be fitted with a high quality exhaust muffler.

4.4 VISUAL CONTROLS

The mining operation itself will be visible from Thulloo Road and Schirmers Lane when open cuts are operated close to these roads and close to the surface. At other times (Eg. S.S.E. Tribs and Schirmer's/Harrington's) the mining operation will either be screened behind existing or proposed overburden dumps or be considerably distant from vantage points.

Visual controls will virtually be negligible on the site due principally to the existing flat open nature of the countryside and the proposed sequential mining operation and relatively short duration of mining.

The Company's proposed programme will assist in long term screening of the site.

4.5 SOIL EROSION CONTROLS

The Company recognises the value of the soil resources they have on their property and accordingly propose to adopt the following safeguards to ensure that these resources are properly conserved.

1. Top soil from the initial extraction area in each block will be stock piled in low longitudinal mounds. Both the 'A' horizon and at least 0.3 metres of the 'B' horizon will be stock piled separately for subsequent re-use.

2. The water diversion banks outlined in Section 4.2 will minimise the extent of scouring on the site of open pits and hence should retain soil resources close to the pits.

3. The progressive rehabilitation using soil from the following extraction operation will ensure that the soil resources are used

as soon as possible whilst high soil fertility remains.

4. The application of fertilizers when seeding will assist in early grass generation to avoid erosion by both wind and water.

Section 5

The Project's Impact on the Environment

5.1 TOPOGRAPHY

The Company's proposed mining programme will have the following impacts on the local topography .

1. Three overburden dumps will be created adjacent to the Airstrip and Schirmer's and Harrington's open cuts. These dumps will each cover an area of approximately 4 ha and have a height of approximately 10 m. These dumps are of similar height to the existing dumps in the Gibsonvale area but will cover a considerably smaller area.

2. The final stages of a number of the mining proposals involve the creation of a void which will subsequently be rehabilitated to a water storage dam. The voids will cover an area of approximately 4 hectares and vary in depth from 5-25 m. The slopes of the dams will be in the order of 1:3 (Vert:Hor). Experiments will be undertaken with the Soil Conservation Service to ensure that the chosen angle of the slope will, in fact, be stable.

3. A number of the existing open cuts close to Thulloo Road and Schirmers Lane will be partly back-filled close to the road to ensure greater safety close to the road.

4. All other areas not referred to in (1), (2) and (3) above will be contoured to blend in with the existing landscape.

5.2 DRAINAGE

The main changes to local drainage during the mining operation will be

1. Provision of water storage dams at the completion of mining in

most areas.

2. The construction of diversion banks to direct water away from operating open cut areas. There will be no impact from the storage of this water on site as it has it has previously been stored in the numerous open cuts on the Company's property. No land owners will be adversely affected by the creation of the water storage dams on the Company's property. On the contrary, the water supply dams will provide considerable water storage for use by local landholders in dry periods.

5.3 SOILS

The soils present on the proposed mining sites will be retained for use in rehabilitation. The safeguards outlined in Section 4.5 will ensure that the soil resources are conserved as much as possible to provide maximum benefits for the rehabilitation. The proposed mining program, with its safeguards, should not have any significant impact on the soil resources on the site.

5.4 TIN RESERVES

The mining of 480,000 m^3 of wash over the five year period will have considerable beneficial impact in terms of economic and social considerations.

5.5 AIR QUALITY

The safeguards outlined in Section 4.1 should ensure that dust levels on and around the site are relatively low. The greatest impact of dust (if generated) being blown from the site would occur during winter and spring from the north-west to south-west sector and during summer from the north-east to east sector. It is during these periods when wind speeds are more frequent and of maximum speed.

5.6 FLORA

The Company's proposed mining activities will be confined mainly to existing agricultural land but will involve removal of some trees in the vicinity of Thulloo Road and Harrington's block. Small numbers of shade trees will be removed from the other blocks. The trees to be removed are those listed on Tables 3.9 and 3.10.

5.7 FAUNA

The impact of the Company's proposed mining operation on the local fauna will be minimal. The birds listed in Appendix 3 will have fewer habitats when the trees are removed. However, the plans to replace these trees and provide additional trees in the long term will again provide nesting for birds and shade for stock. The provision of water storage dams in the rehabilitated areas will provide additional water habitats for local birds and additional drinking water for stock.

5.8 NOISE LEVELS

The impact of the mining operation on the local accoustical environment has been evaluated in detail by Acoustical Consultants, Eden Dynamics Pty Limited (see Appendix 2).

5.8.1 Noise Criteria

The criteria used to establish the impact of noise from the Company's project are drawn from Australian Standard 1055 "Noise Assessment in Residential Areas". The Gibsonvale area would be classified as Noise category R1 (Rural). Using the Standard, design goals are set to provide a basis to establish whether noise levels are excessive, and if so, by how much. The State Pollution Control Commission has adopted the design goals as enforceable limits plus a margin of + 5 dB(A). The design goals for the Gibsonvale area are set out in Table 5.1

TABLE 5.1

NOISE DESIGN GOALS - GIBSONVALE

TIME	DESIGN GOAL	MAXIMUM ACCEPTABLE LEVEL
Daytime		
0700-1800	45dB(A)	50dB(A)
Morning and Evening		
0600-0700 to 1800-2200	35dB(A)	40dB(A)
Night		
2200-0600	30dB(A)	35dB(A)

5.8.2 Mining Operation

The principal sources of noise in the mining operation will be the scrapers and bulldozers. The factors controlling the level of impact of noise from this equipment include;

(a) Background noise levels: The higher the background noise level, the lower the impact.

(b) Proximity of mine areas to residences.

(c) Depth of Mining: The deeper the mining the lower the impact.

(d) Shielding due to previous overdurden dumps and vegetation.

Appendix 2 presents a detailed assessment of expected noise levels at residences in the vicinity of the mining areas.

There will be considerable short term impact at the residences of E. Schirmer and R. Contessa caused by mining in Post Office A and B and Gibcripp Extension Remnant. Excesses above the 50dB(A) design goal during the day would vary between 1 and 14dB(A) depending on the number of machines used and their depth and location within the pit. The maximum noise levels at E. Schirmer's residence would occur for less than one month when mining is on the surface at the western end of the Post Office B block. The short nature of the project in this area suggests that the problem of noise will have an unavoidable impact over a short term.

Mining within the areas close to E. Schirmer and R. Contessa will be restricted to between 7.00am - 6.00pm. This should ensure maximum noise levels are avoided when background noise levels are generally low.

The other nearby resident that could be affected by noise from the mining operations is Parkinson who resides approximately 1km south of the proposed S.S.E. Tribs open cut. Noise levels (up to 12 dB(A) above design goal) would occur if overburden removal took place between 10pm and 6am at depths less than 20m. Accordingly to avoid this impact the Company will not operate within this period. All other design goals should be met at Parkinson residence.

The maximum noise levels generated by the earth moving equipment which are presented in Appendix 2 assume natural atmospheric conditions. Noise levels would be increased during a temperature inversion, however, the impact of these excesses would be low principally because temperture inversions only occurs for an average of six days per year (May to August).

Appendix 2 shows that in order to satisfy the State Pollution Control Commission, the Company will need to restrict hours of operations in some other areas until the levels of the pits are reduced to 10 m below the surface. Some sites are acceptable for mining 24 hours per day. The Company's proposed hours of operation listed in Table 2.7 have been designed to ensure that the mining operation has an acceptable impact on the local noise climate.

For comparitive purposes Eden Dynamics Pty Ltd have compared noise levels emitted from earth moving equipment and tractors. As an example, a 188 horsepower Fiat-Ellis tractor generates a sound pressure level of 89dB(A) at 7 m (which corresponds to a sound power level of 114dB(A) from the cabin and 83dB(A) inside the cabin. The scapers and bulldozers used in the report are approximately 6dB(A) louder, a difference in noise levels that would be difficult for an untrained observer to distinguish between when listening to each of the two sources a day or two apart. Thus the noise from the earth moving equipment would be similar both in character (frequency content) and level to local tractors used for ploughing.

It is also worth noting that the 50dB(A) design goal during the day would be exceeded by the above tractor ploughing closer than 600 m to any residence.

5.8.3 Treatment Plant

Predicted noise levels from the treatment plant do not exceed the design goals under normal conditions at any of the closest residences. (See Table A2.3 - Appendix 2). Hence, there should be no detrimental impact on the local noise climate caused by the Treatment plant.

5.8.4 Combined Treatment Plant and Mining Operation

Predicted noise levels from the treatment plant and earthmoving equipment do not significantly alter the levels from the earthmoving equipment at any of the closest residences; see (Table A2.4)

5.9 LAND USE

The Company's proposed mining operation will result in a reduction of 26 ha of existing agricultural land. These areas would, after mining, be either water storage dams or overburden dumps. The amount of land returned to farming represents 50 per cent of the total area mined.

Although there will be reduction in available farm land, the provision of additional water storage dams should be of considerable value to the local land holders in a similar way to the existing pits.

5.10 PRE-EUROPEAN SETTLEMENT

As discussed in Section 3.12, there appears to be little likelihood of finding evidence of Aboriginal habitation in the Gibsonvale area in the areas to be mined. Therefore the impact on the pre-European history of the area is considered negligible. In the event that the Company locates any Aboriginal relics on the areas to be mined, work will cease (as requested by the National Parks and Wildlife Service) until the relics are properly assessed. See Appendix 4.

5.11 SOCIO-ECONOMIC FACTORS

The Company's proposed mining operation would have favourable impact on the local and State economic environment and social setting. Local unemployment will be reduced by the employment of up to 20 local persons.

The local townships and West Wyalong will benefit from wages spent on rent, food and provisions.

The established high level of unoccupied private dwellings in the district will ensure that there is adequate accommodation for the Company's and contractors' employees.

5.12 VISUAL

The Company's proposed mining operation will be visible from the Thulloo Road and Schirmers Lane especially when mining is undertaken close to these roads. The visual impact of the proposed activities on passing motorists is considered to be minor.

5.13 TRANSPORTATION

The major impact of the Company commencing its operation will be the increased traffic on roads leading to the site principally Thulloo Road and Schirmers Lane. The additional traffic will comprise mainly cars with a few trucks delivering the pre-fabricated treatment plant components. During the operation, employees not living on the site will travel to and from the Gibsonvale. The impact of these vehicles and a single truck transporting tin from the site on one day per month will be negligible.

The proposed mining of Thulloo Road in two areas will result in current instability problems being eliminated. The use of properly constructed diversions around these areas will ensure motorists travelling along these roads are not disadvantaged.

5.14 SERVICES

The Company will utilize the existing power services to the site and extend these to the additional housing units proposed. In addition, the telephone will also be extended in the vicinity of the mine site and treatment plant. The mining of sections of Thulloo Road will involve the relocation of the existing telephone lines running within the easement of Thulloo Road. The relocation of these lines, at the Company's expense will not have any major impact on the services involved. Discussions with Telecom Australia suggest that the relocated line near the Post Office block will remain in the position adjacent to the road diversion, however the line moved into the Contessa block will be relocated within the easement of Thulloo Road.

Section 6

Evaluation of the Project

6.1 JUSTIFICATION OF THE PROJECT

Clause 34 (f) of the Environmental Planning and Assessment Regulation, 1980 requires this Statement to justify the proposed development in terms of environmental, economic and social considerations.

6.1.1 Environmental Considerations

The project will be adequately safeguarded during its operation to ensure that residents of Gibsonvale and Kikoira will be protected from any significant adverse impacts. The principle adverse impacts will be:-

1. Local increases in noise levels caused by earthmoving plant especially when operating at the surface early in the morning and late in the evening. Greatest impacts will occur when Post Office B is mined.

2. Increased levels in road use (especially Thulloo Road and Schirmers Lane) principally by employees of the Company, its contractors and suppliers.

3. The construction of road diversions around the proposed open cuts between the Airstrip and Contessa blocks and adjacent to the Gibsonvale Post Office B site. Local road users will need to utilise the road diversions during these mining periods.

4. " Temporary " removal of vegetation within the proposed mining areas. Trees will be re-established in these areas and planted in new areas adjacent to dams created during rehabilitation.

6.1.2 Economic Considerations

The employment of 30 persons for the projected 5 year life of the mining operation in conjunction with the expected income multiplier effects will be of considerable economic value to the West Wyalong district, NSW and Australia. The local district will benefit through purchase of local goods and services whilst NSW will benefit from the Company's purchases in NSW and its use of services and payment of State royalties. The Company's production will be an important component to the feed stock for Associated Tin Smelter at Alexandria. Maintenance of feedstock will ensure continued employment for workers at the smelter. The export of the smelted tin will provide export income to Australia and in turn assist in supporting Australia's balance of payments.

6.1.3 Social Considerations

The principle social advantages of the project relate to employment. The provision of 30 jobs including 20 jobs for local persons will be of considerable value in reducing the local unemployment rate.

6.2 CONSEQUENCES OF NOT PROCEEDING WITH THE PROJECT

In accordance with the requirements of clause 34 (i) of the Environmental Planning and Assessment Regulation, 1980 the consequences or impacts of not mining the tin in the areas of the Mining Lease Applications area are as follows:-

1. An economic deposit of tin will not be mined.

2. The economic and social advantages outlined above would not be obtained.

3. Instability problems with Thulloo road caused by subsidence of old mine workings would continue. Note: The Company's proposed mining will result in all unstable areas in Thulloo road being removed and recompacted.

Appendices

APPENDIX 1

ENERGY STATEMENT

The format of this Energy Statement follows the guidelines set out by the Energy Authority of New South Wales.

1. Background Information

The Company proposes to mine and concentrate alluvial tin from the Kikoira/Gibsonvale deep lead system over a five year period. The operation will mine alluvial tin at depths from 2 to 40 m using open cut methods with conventional bulldozers and rubber tyred scrapers, with some truck haulage on longer haul distances. The open cuts will be progressively rehabilitated with the majority of the area being back filled. Approximately 9,000,000 m^3 of overburden will be removed to obtain approximately 480,000 m^3 of tin wash.

The tin will be concentrated in a conventional wet process alluvial jigging plant. The concentrate will be dried, placed in drums and sent to the smelter by road transport. Tailings from the treatment plant will be back filled into open cuts left from earlier mining operations.

The water supply for the treatment plant will be drawn from dams within the old open cut areas which will be topped up with water drawn from the Company's existing Lake Cargelligo - Gibsonvale pipeline.

2. Operational Energy Requirements

2.1 Construction Phase

During the construction of the treatment plant, the following fuel driven vehicles will be used on site:

Crane
Toyota Land Cruiser
Isuzu Truck
Front-End Loader
Falcon Utility
International Truck

It is expected that the above vehicles will use approximately 2000 litres of fuel per month for the three month construction period.

2.2 Mining

The following equipment will be operating full time (10 to 20 hours per day) at any one time during the mining phase of the operation:

1 x D10 bulldozer
2 x D9 bulldozer
4 x 651 scraper

Intermittent use will be made of the following:

1 x grader
1 x water cart
2 x supervisors' vehicles.

When long hauls occur between the mining site and the treatment plant, trucks and loaders will be occasionally used to replace the scrapers to transport the wash.

The Company expects to use approximatly 130,000 litres of diesel per month to operate all the above equipment during the mining operation.

2.3 Treatment Plant

The treatment plant will be operated by a combination of electricity and diesel operated motors.

The small motors in the plant and lighting will be taken from the State Electricity Grid whereas the large pumps used to pump the alluvial wash through the treatment plant will be operated by diesel engines.

The Company expects to utilize approximately 35,000 kw hrs/per month and 25,000 litres of diesel per month.

2.4 Transportation of tin concentrate

The Company proposes to despatch one fully laden semi trailer per month during the first year of operation and two semi trailers per month until the completion of the project. These trucks will utilize approximately 1,000 litres per return journey.

2.5 Accommodation and Office

All electrical applicances including air conditioners fitted in the accommodation units and offices on site will be drawn from the State Electricity Grid. The Company expects the usage of electricty for domestic and office use to be approximately 6000 kw/hrs per month.

2.6 Summary of Fuel Usage

Table A1 presents a summary of the proposed fuel usage throughout the entire project. The fuel to be used in the mining of the overburden and tin bearing wash amounts to approximately 83 per cent of the total fuel usage for the project. The treatment plant will utilize approximately 16 per cent of the total fuel usage of the project.

TABLE A1

SUMMARY OF FUEL USAGE - DURING THE MINING AND TREATMENT OF ALLUVIAL TIN AT GIBSONVALE

	Monthly Usage	Total Usage (litres)
Construction		
Vehicles	2,000	6,000
Mining		
Earth-moving equipment	130,000	7,800,000
Treatment Plant		
Power Generation (for Pumps)	25,000	1,500,000
Transportation of Tin Concentrate		
Truck Transport	1,000	60,000
	Total	9,366,000

3. Justification of Liquid Fuel Usage for the Project

The estimated 9,400,000 litres of fuel to be used during the project is justified for the following reasons:

(1) The size of the equipment used is sufficiently large to provide economy of scale and provide the Company with vehicles with sufficient manoeuvreability in the confined open pits. The alternative form for the equipment (eg. drag line for over burden removal) would be more costly to operate and utilize more fuel.

(2) There are insufficient cost advantages to convert the treatment plant pumps from diesel to electric motors.

This is accentuated by the short term duration of the project.

(3) The transportation of the tin concentrates will be most economically transported by semi-trailer.

(4) Although the Temora to Naradhan railway line passes close to the site at Kikoira, no goods services are provided on that line. The line is provided only to service wheat farms throughout the district during harvesting time.

4. Summary and Conclusions

The annual fuel usage of approximately 1,900,000 litres, although relatively high, must be considered acceptable as the product being won and transported is of extremely high value on the world market.

It is worth noting in comparison, that if the alluvial tin wash was won by underground methods, the fuel usage would be considerably less although the mining costs would be comparable and quantities of tin won would be considerably lower because of higher cut off grate and the need to leave pillar supports in underground mines.

APPENDIX 2

ACOUSTIC ASPECTS OF THE PROPOSED
MINING AND PROCESSING OF ALLUVIAL TIN
AT GIBSONVALE, N. S. W.

Prepared for:
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Project 509
2nd April, 1984.

EDEN DYNAMICS PTY. LTD.
ACOUSTICS - SOUND, VIBRATION AND DYNAMIC BALANCING
MEMBER - ASSOCIATION OF AUSTRALIAN ACOUSTICAL CONSULTANTS
INCORPORATED IN N.S.W. AUSTRALIA. 28 OATLEY AVENUE, OATLEY, N.S.W. 2223. TELE: (02) 5795566

Project 509
2nd April, 1984.

1 INTRODUCTION

The following analysis is based on the E.I.S. prepared by R. W. Corkery & Co. Pty. Ltd. The acoustical aspects of the excavation of overburden and alluvial tin and the noise generated by the processing plant are discussed.

Assessments are made using the relevant Australian Standard, AS1055-1978 "Noise Assessment in Residential Areas" which is used to set acoustic criteria for the noise generated by the proposal.

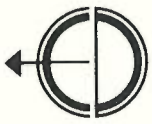
2. SUMMARY

A calculated background sound level or design goal of 45 dB(A) is established for noise from the treatment plant and daytime extraction operations. At night time, the design goal is reduced to 30 dB(A). For both these design goals, a 5 dB(A) excess is assessed as being acceptable.

The processing or treatment plant is always acceptable. Even when there are atmospheric temperature inversions, sound from the treatment plant front-end loader adds an insignificant amount to the noise from the earthmoving equipment.

The extraction equipment is louder and will at times work closer to the nearest residences than is the treatment plant. Even when high performance residential exhaust mufflers are fitted to the scrapers and bulldozers, there will still be excesses over the acceptable sound levels at some locations in the daytime. Restricted hours of operation will apply at many locations at night time. On the infrequent occaisons when there are atmospheric temperature inversions, the equipment on the surface will be clearly audible over large areas and will therefore not be operated.

The Report includes data from which the predicted sound levels have been calculated. The equipment sound power levels are shown in Table A2.2 which also includes the effect of acoustic screening due to various excavation depths in the open-cut pits. The predicted noise levels are shown for the



treatment plant by itself and also for the earth-moving and extraction plant. The data for the earth-moving plant is shown for daytime and night time operation so that the excesses over the acceptable levels can be seen for the two times. This information is provided so that decisions may be made on which areas may be excavated at night with minimum disturbance to neighbours and perhaps which items of equipment might be used at the pits closest to neighbours.

Noise levels from the earthmoving equipment will be similar to noise levels from tractors used in the area. For example, a 188 horsepower Fiat-Ellis tractor generates a sound pressure level of 89 dB(A) at 7 m (which corresponds to a sound power level of 114 dB(A)) from the cabin and 83 dB(A) inside the cabin. The scrapers and bull-dozers used in the report are about 6 dB(A) louder, a difference in noise levels that would be hard for an untrained observer to distinguish between when listening to each of the two sources a day or so apart. Thus the noise from the earthmoving equipment would be similar both in character (frequency content) and level to local tractors used for ploughing.

3. ACOUSTIC CRITERIA

The document by which community noise is currently assessed in Australia is Australian Standard 1055-1978 "Noise Assessment in Residential Areas". The interpretation placed on AS1055-1978 by the Noise Branch of the State Pollution Control Commission has been used in this assessment.

It is unrealistic to expect the background sound level in a rural area to remain the same after the area has been re-zoned for inherently noisier usage such as mining. AS1055 provides a means of establishing noise criteria called "design goals" for areas where there is a planned change of usage. Two noise criteria are used, one for daytime operation and the other for night time operation and these are based on the calculated background sound level determined in accordance with Table 1 in Secton 3 of the Standard.

The quietest "Noise Area Category R1" has been used in this case. The Standard describes it as an area with negligible transportation and it is basically rural. The calculated background sound level between 0700 and 1800 hours on weekdays is 45 dB(A). During the quietiest part of the night, 2200

ACOUSTIC CRITERIA TABLE A2.1

TIME	DESIGN GOAL	MAXIMUM LEVEL NORMALLY ACCEPTABLE
Daytime 0700 to 1800	45 dB(A)	50 (45 +5 = 50 dB(A))
Morning and evening 0600-0700 & 1800-2200	35	40
Night 2200 to 0600	30	35

Note that the noise source would need whatever acoustic treatment is required in order to avoid a tonal character that would make the noise easily identifiable at the nearest houses.

Noise levels on weekends and holidays should be 5 dB(A) quieter again in the daytime, but during the evening and nightime, acceptable levels remain as above.

Daytime 0700 to 1800	40	45
Evening 1800 to 2200	35	40
Weekend nights 2200-0700	30	35

to 0600, the calculated background sound level is 30 dB(A). At other times, the calculated background sound level is 35 dB(A).

It is noted that these calculated background sound levels exceed the measured background sound level by more than 10 to 20 dB(A). Such differences are common in rural areas that are not intensively cultivated.

AS1055 states that if a noise is louder than the background noise level, it is likely to be annoying. Excesses of 5 dB(A) above the background level may be of marginal significance. Adjustments of plus 5 dB(A) are added to a noise if it is tonal or impulsive in nature. The background noise level is described at the averge minimum noise level or L90. In accordance with the practices of the SPCC Noise Branch, the calculated background sound level is used here.

4 NOISE SOURCE LEVELS

Noise level calculations are based on the sound power levels of the equipment to be used shown in Table A2.2. Shielding by existing overburden dumps have been used in the calculations as has attenuation due to trees between O'Kanes and Kikoira. The attenuation due to wind gradients has been neglected in the calculations but it is noted that winds of from 1 to 5 km/hr will decrease the equipment noise by 3 dB(A) when blowing away or raise it by 5 dB(A) when blowing towards the residents.

4.1 Treatment Plant

In order to calculate sound levels at a particular residential location or house from various items of plant, the total sound power level of the treatment plant has been aggregated. The total sound power from all the treatment plant is 116 dB(A) if no special exhaust mufflers are fitted to the front-end loader. If a residential high performance muffler is fitted to the front-end loader, the total sound power level of that plant reduces to 112 dB(A). Our calculations are based on the equipment being installed with the best mufflers in order to minimise noise levels heard by neighbours.

The extraction plant moves around the various mining leases and is also used to cart the alluvial tin wash back to the treatment plant, so noise from the earth-moving equipment will vary according to its location. Three cases have

been used to illustrate the various possible noise levels from the extraction equipment.

Because there are atmospheric temperature inversions which decrease the attenuation of sound due to distance on approximately six days per year, their infrequent effect has not been shown in our tables of predicted noise levels except in the case of the treatment plant, Table A2.3. Strong temperature inversions can raise noise levels by 8 dB(A), but their relative rarity here indicates a lesser figure for decreased distance attenuation should be used. Although decreases in distance attenuation of 8 dB(A) for inversions plus a further 4 dB(A) for the reduced effect of acoustic shielding of the treatment plant has been used in Table A2.3, a figure of 6 dB(A) could be used in any adjustments to the calculations for earthmoving plant.

4.2 Extraction Plant - Worst Case 1

The worst case includes those periods when there are two scrapers working on the surface and conveying overburden to a surface overburden dump. This would only occur during full production in Phase 2 and during the early years (Phase 1) levels would be 3 dB(A) quieter. It has been assumed that two of the three bulldozers with which they are working are in a shallow pit, only 5 metres deep. In this case, it is assumed that the other two scrapers and the third bulldozer are working in a separate but nearby pit, also at a 5 metre depth, with one scraper on the surface there too.

In this case, the total sound power level, corrected for the slight amount of shielding is 119 dB(A) for Phase 1 and 122 dB(A) for Phase 2 which is progressively shielded as the depth at which extraction occurs gets deeper. The total sound power levels are shown for the worst and typical operating depths. At night, there is no carrying of wash back to the treatment plant, so it is quieter then.

4.3 Extraction Plant - Shallow Extraction, Case 2

This case assumes that the closest pit is in the mining location shown in Table A2.4 and that the second pit is at about the same distance from the residential location.

In Phase 1, the small ore bodies would be mined first with about half the equipment used in Phase 2. Only one pit would be mined at a time (except for minor overlap periods) and one scraper would be used to convey wash to the treatment plant while the other and one or two bulldozers remain in the pit. The haul route to the treatment plant is well shielded from the neighbours by existing overburden dumps so that the sound power level radiated to neighbours allowing for the shielding is 113 dB(A) in the daytime. At night, 112 dB(A) applies because the would be no surface haulage to the treatment plant.

For the larger pits to the north, east and south of Phase 1, one scraper is assumed to be on the surface, conveying the tin wash to the treatment plant from each pit. One scraper is assumed to be in each pit with two bulldozers in the closest pit and one bulldozer in the furthest pit. The excavation depth assumed for the pit is 10 metres down. The total sound power level for daytime operation is thus 118 dB(A) for Phase 2. At night time, the scrapers would not be conveying wash to the treatment plant and could therefore be working below the ground surface within the pits. The extra shielding provided by the pit depth lowers the total sound power level at night time to 114 dB(A).

4.4 Extraction Plant - Typical Extraction Depth, Case 3.

Similar positions of the two extraction pits have been assumed for this case. The main differences between this and Case 2 is that trucks (which are 6 dB(A) quieter than scrapers are used during the daytime to convey the tin wash to the treatment plant and that the excavation depth in the pits is an average of 20 metres with the trucks being loaded at the bottom (assumed to be 30 metres down). The night time total sound power level is calculated to be 109 dB(A). This does not include any sound from trucks as they would not be conveying wash to the treatment plant at night. All four scrapers and three bulldozers would be operating in the pit with the lowest scrapers operating at 25 metres which is above the assumed level of tin alluvium for this case.

The daytime total sound power level is 119 dB(A), mostly influended by trucks on the surface and one scraper working on the surface. Although the trucks are quieter than the scrapers, the conveying of tin wash to the treatment plant is at times without the shielding provided by the pits whereas the operation of the other equipment in the pits is shielded.

EQUIPMENT SOUND POWER LEVELS — TABLE A2.2

PLANT ITEM	SOUND POWER LEVEL [dB(A) re 1 pW]	
TREATMENT PLANT EQUIPMENT:	Untreated	Silenced
Front end loader, Caterpillar 966, one	114	110 with best muffler.
Pumps, diesel driven, Caterpillar 3306, two	110	Not required apart
Pumps, diesel driven, Caterpillar 3304, two	109	from good quality
All other fixed equipment, total	102	exhaust mufflers.
TOTAL SOUND POWER of TREATMENT PLANT, allowing 5 dB(A) for shielding of partial building enclosures and elevation	116	112
EARTHMOVING PLANT, on site:	Untreated	Silenced
Bulldozer, Caterpillar D 10, one	122	116 with best mufflers
Bulldozers, Caterpillar D 9L, two	121	115 and engine enclo-
Open bowl scrapers, Caterpillar 651, four	122	116 sures - used in
Trucks, number depends on route, say four	114	110 all calculations
Front end loaders, when trucks are used, two	114	110 below.

TOTAL SOUND POWER of EARTHMOVING EQUIPMENT depends on the items in use at any time, the shielding due to excavation depth and whether scrapers or trucks are being used to cart the tin wash to the treatment plant. The text explains the assumptions used in the three demonstration cases.

PHASE	Phase 1			Phase 2		
CASE	Case 1	Case 2	Case 3	Case 1	Case 2	Case 3
DAYTIME	119	113	112	122	118	119
EVENING or NIGHT	118	112	108	121	114	109

EFFECT OF ACOUSTIC SHIELDING AT DIFFERENT EXCAVATION DEPTHS

Based on average distances from mining location to houses.

DEPTH	SHIELDING LOSSES [dB(A)]	
[m]	Normal Temperature Gradient	Thermal Inversion Conditions
0	0	0
5	8	4
10	10	6
15	12	8
20	14	10
25	15	11
30	16	12
35	17	13
40	18	14

PREDICTED NOISE LEVELS [dB(A)]

Treatment Plant. TABLE A2.3

Daytime operation: 0700 to 1700 hours generally - no excesses over 50 dB(A)
Early morning and evening operation: 0600 to 0700 and 1800 to 2200
- excesses shown over 40 dB(A)
Based on sound power of 112 dB(A), i.e. acoustically treated front end loader.

LOCATION	SEPARATION [km]	THERMAL INVERSION-EXCESS		NORMAL ATMOSPHERIC CONDITIONS
E. Schirmer	1.1	44	4	32
R. Contessa	1.3	43	3	31
G. Schirmer	3.0	35		23
Cripps	2.3	47	7	35
Parkinson "Lavente"	2.2	49	9	37
Payne "Myrtledale"	4.7	37		25
"Mulyan"	6	34		22
Ellis	4.4	39		27
KIKOIRA	4.9	37		25

Plant under normal conditions adds a negligible amount to sound from the earthmoving equipment.

SUMMARY OF EARTHMOVING PREDICTIONS

Either E. Schirmer or R. Contessa are the most affected by all but one of the mining locations. S. S. E. Tribs affects Parkinson more than any other neighbour. Although Ellis is closest to O'Kane's, the attenuation of trees results in low noise levels to the north with little effect on Ellis or the town of Kikoira. E. Schirmer and R. Contessa experience levels 12 dB(A) higher, at a maximum of 39 dB(A) from O'Kane's and 43 dB(A) from Reserve Extension, daytime

Post Office A and B should only be mined in the daytime.
Gibcripp Extension Remnant may be mined in the evenings when down 20 metres.
Harrington's is always acceptable. Schirmer's and Contessa are acceptable in the evening and once they are down 10 m, for 24 hours per day, as is S. S. E. Tribs. Gibcripp is always acceptable in the evenings.

PREDICTED NOISE LEVELS [dB(A)]

Earthmoving and Extraction Plant. TABLE A2.4 Daytime

Daytime operation 0700 to 1800 hours.
Therefore maximum noise level required by N.S.W. SPCC is 50 dB(A).
Based on maximum acoustic treatment and three cases as described in the text.
Sound levels will be up to 6 dB(A) higher if less acoustic treatment is used.

RESIDENTIAL LOCATION	MINING LOCATION	SEPARATION [km]	CASE 1 dB(A)	EXCESS	CASE 2 dB(A)	EXCESS	CASE 3 dB(A)	EXCESS
E. Schirmer	Post Office B	0.1	64	14	58	8	57	7
	Gibcripp	1.2	40		36		37	
	Contessa	1.8	37		33		34	
R. Contessa	Post Office A	0.3	52	2	46		45	
	Contessa	2	39		35		36	
G. Schirmer	Post Office A	2	38		32		31	
	Gibcripp	2.8	36		32		33	
	Contessa	3.8	33		29		30	
Cripps	Gibcripp Ext.R.	2.2	33		27		26	
	Contessa	3	29		25		26	
Parkinson	S.S.E. Tribs	1	48		44		45	
	Contessa	2.4	37		33		34	
"Myrtledale"	S.S.E. Tribs	3	35		31		32	
	Contessa	4.6	21		17		18	
"Mulyan"	Harrington's	4	30		26		27	
	Contessa	5.2	28		24		25	
Ellis	O'Kane's	1.5	27		21		20	
	Contessa	4.6	21		17		18	
KIKOIRA	O'Kane's	2.1	24		18		17	
	Contessa	5.4	20		16		17	

PREDICTED NOISE LEVELS [dB(A)]

Earthmoving and Extraction Plant. TABLE A2.4 Nighttime

Mostly daytime operation but also for 20 hours per day when required when remote from neighbours, i.e. not at Post Office A or B.
Therefore maximum noise level required by N.S.W. SPCC is 35 dB(A) at night and 40 dB(A) during morning 0600 to 0700 hours and evening 1800 to 2200 hours.
Excess over acceptable sound level is based on 35 dB(A).
Based on maximum acoustic treatment and three cases as described in the text.
Sound levels will be up to 6 dB(A) higher if less acoustic treatment is used.

RESIDENTIAL LOCATION	MINING LOCATION	SEPARATION [km]	CASE 1 dB(A)	CASE 1 EXCESS	CASE 2 dB(A)	CASE 2 EXCESS	CASE 3 dB(A)	CASE 3 EXCESS
E. Schirmer	Gibcripp	1.2	39	4	32		27	
	Contessa	1.8	36	1	29		24	
R. Contessa	O'Kane's	2	38	3	32		28	
	Contessa	2	39	4	35		36	1
G. Schirmer	Reserve Ext.	1.4	42	7	36	1	35	
	Gibcripp	2.8	35		28		23	
	Contessa	3.8	32		25		20	
Cripps	Gibcripp Ext.R.	2.2	not mined at night					
	Contessa	3	28		21		16	
Parkinson	S.S.E. Tribs	1	47	12	40	5	35	
	Contessa	2.4	36	1	29		24	
"Myrtledale"	S.S.E. Tribs	3	34		27		22	
	Contessa	4.6	20		13		8	
"Mulyan"	Harrington's	4	29		22		17	
	Contessa	5.2	27		20		15	
Ellis	O'Kane's	1.5	27		21		20	
	Contessa	4.6	26		20		16	
KIKOIRA	O'Kane's	2.1	23		17		13	
	Contessa	5.4	19		12		7	

APPENDIX 3

BIRDS OBSERVED AND KNOWN TO OCCUR AT GIBSONVALE

COMMON NAME	SCIENTIFIC NAME
Singing Bushlark	Mirafra javanica
Welcome Swallow	Hiundo neoxena
Australian Pipit	Anthus novaesee landiae
Magpie-lark	Grallina cyandeucs
White-winged Wren	Malurus leucopterus
Reed-Warbler	Acrocephalus australis
Brown Songlark	Cinclorhamphus cruralis
Little Thornbill	Acanthiza nana
Yellow-tailed Thornbill	Acanthiza chrysorrhoa
Southern Whiteface	Aphelocephala leucopsis
Red-capped Robin	Petroica goodenovii
Hooded Robin	Petroica cucullata
Willie Wagtail	Rhipidura leucophrys
White-fronted chat	Ephthianura albifrons
Striated Pradalote	Pardalofus substriatus
Black Honeyeater	Certhionyx niger
Brown-headed Honeyeater	Melithreptus brevirostris
Zebra Finch	Taeniopygia guttata
White browed Wood-Swallow	Artamus superciliosus
Black-backed Magpie	Gymnorhina tibicen
Black-tailed Natine Hen	Tribenyx ventralis
Coot	Fulica atra
Wiskered Tern	Chlidonias hybrida
Peaceful Dove	Geopelia striata
Suplhur-crested Cockatoo	Cacutua lead beater
Galah	Eolophus roseicapillus
Cockatiel	Nymphicus hollandicus
Budgerigar	elopsiffacus undulatus
Barn Owl	Tyto alba
Laughing Kookaburra	Dacelo gigas
Red backed Kingfisher	Halcyon pyrrhopygia
Australian Crow	Corvus orru

New South Wales Government

National Parks and Wildlife Service

GRIFFITH DISTRICT
STATE GOVERNMENT OFFICES
104 - 110 Banna Avenue,
Griffith N.S.W. 2680
P.O. Box 1049,
Griffith N.S.W. 2680

Our reference: GD:9

Your reference: PM:DL

Mr. R. W. Corkery,
R. W. Corkery and Co. Pty. Ltd.,
14 Belleve Parade,
HURSTVILLE, NSW, 2220.

21st October, 1983.

Telephone: 62 0255
STD: 069

Dear Sir,

Reference is made to your letter Ref:2:F3 dated 7th September, 1983.

The Metals Exploration Tin Mine at Gibsonvale was inspected by Naturalist J. Brickhill on the 12th October, 1983. Naturalist Brickhill did not see any aboriginal relics and is of the opinion that it is very unlikely that there are any aboriginal relics within the marked area on your map Ref:1.

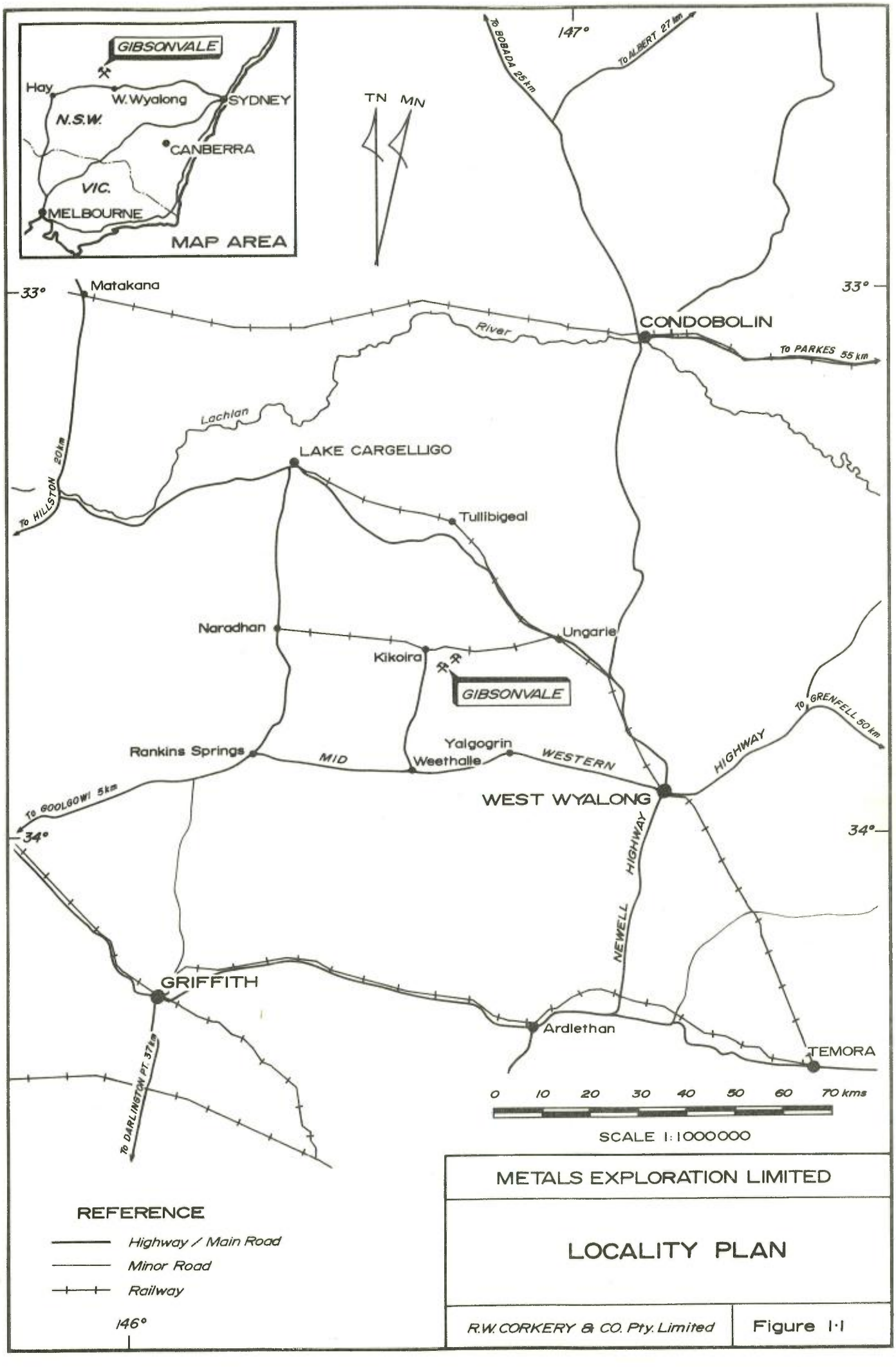
The National Parks and Wildlife Service do not require an archeological survey with the Environmental Impact Statement for the Mine. However Metals Exploration must cease work and notify the National Parks and Wildlife Service if any aboriginal relics are found during mining operations.

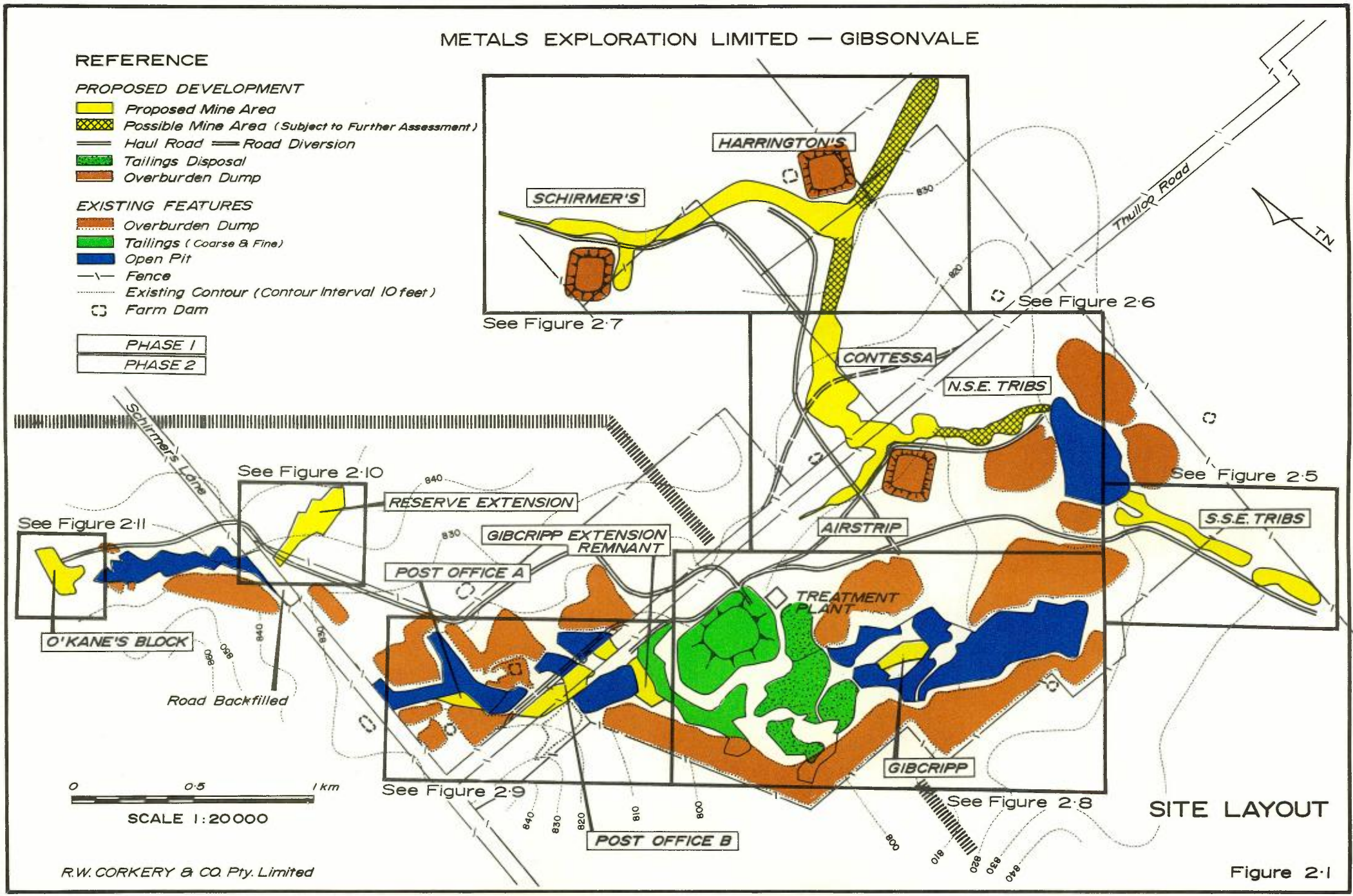
Yours faithfully,

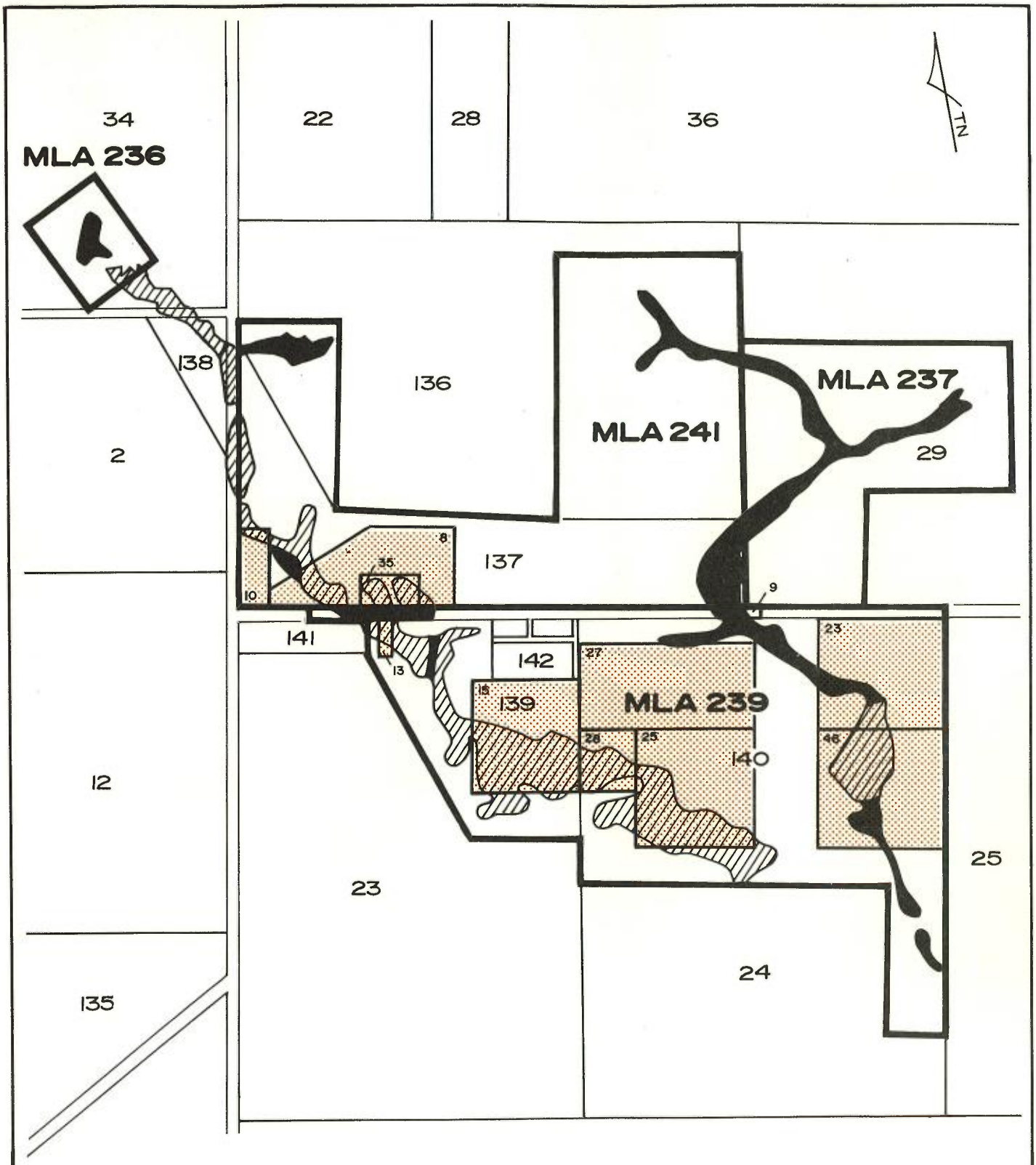
Pet Moore

Peter Moore,
O.I.C.,
Griffith District No.13.

c.c. Regional Archeologist,
Western Region.


GIBSONVALE
Hay
W. Wyalong
SYDNEY
N.S.W.
CANBERRA
VIC.
MELBOURNE
MAP AREA
TN MN
147°
To BOBADA 25 km
To ALBERT 27 km
33°
Matakana
CONDOBOLIN
River
To PARKES 55 km
Lachlan
LAKE CARGELLIGO
To HILLSTON 20km
Tullibigeal
Naradhan
Ungarie
Kikoira
GIBSONVALE
To GRENFELL 50 km
Rankins Springs
MID
Yalgogrin
Weethalle
WESTERN
HIGHWAY
WEST WYALONG
To GOOLGOWI 5km
34°
NEWELL HIGHWAY
GRIFFITH
Ardlethan
TEMORA
To DARLINGTON PT. 37km
0 10 20 30 40 50 60 70 kms
SCALE 1:1000000
REFERENCE
Highway / Main Road
Minor Road
Railway
146°
METALS EXPLORATION LIMITED
LOCALITY PLAN
R.W. CORKERY & CO. Pty. Limited
Figure 1·1


METALS EXPLORATION LIMITED — GIBSONVALE
REFERENCE
PROPOSED DEVELOPMENT
Proposed Mine Area
Possible Mine Area (Subject to Further Assessment)
Haul Road
Road Diversion
Tailings Disposal
Overburden Dump
EXISTING FEATURES
Overburden Dump
Tailings (Coarse & Fine)
Open Pit
Fence
Existing Contour (Contour Interval 10 feet)
Farm Dam
PHASE 1
PHASE 2
HARRINGTON'S
SCHIRMER'S
See Figure 2·7
See Figure 2·6
Thullop Road
TN
CONTESSA
N.S.E. TRIBS
See Figure 2·5
S.S.E. TRIBS
AIRSTRIP
Schirmer's Lane
See Figure 2·10
RESERVE EXTENSION
GIBCRIPP EXTENSION REMNANT
POST OFFICE A
See Figure 2·11
O'KANE'S BLOCK
Road Backfilled
TREATMENT PLANT
GIBCRIPP
See Figure 2·9
See Figure 2·8
POST OFFICE B
0 0·5 1 km
SCALE 1:20000
SITE LAYOUT
R.W. CORKERY & CO. Pty. Limited
Figure 2·1



REFERENCE

- Road
- Proposed Mining Lease
- Existing Mining Lease
- Proposed Mine Area
- Previously Mined Area
- Portion Boundary
- 29 Portion No.
- 10 P.M.L. No.

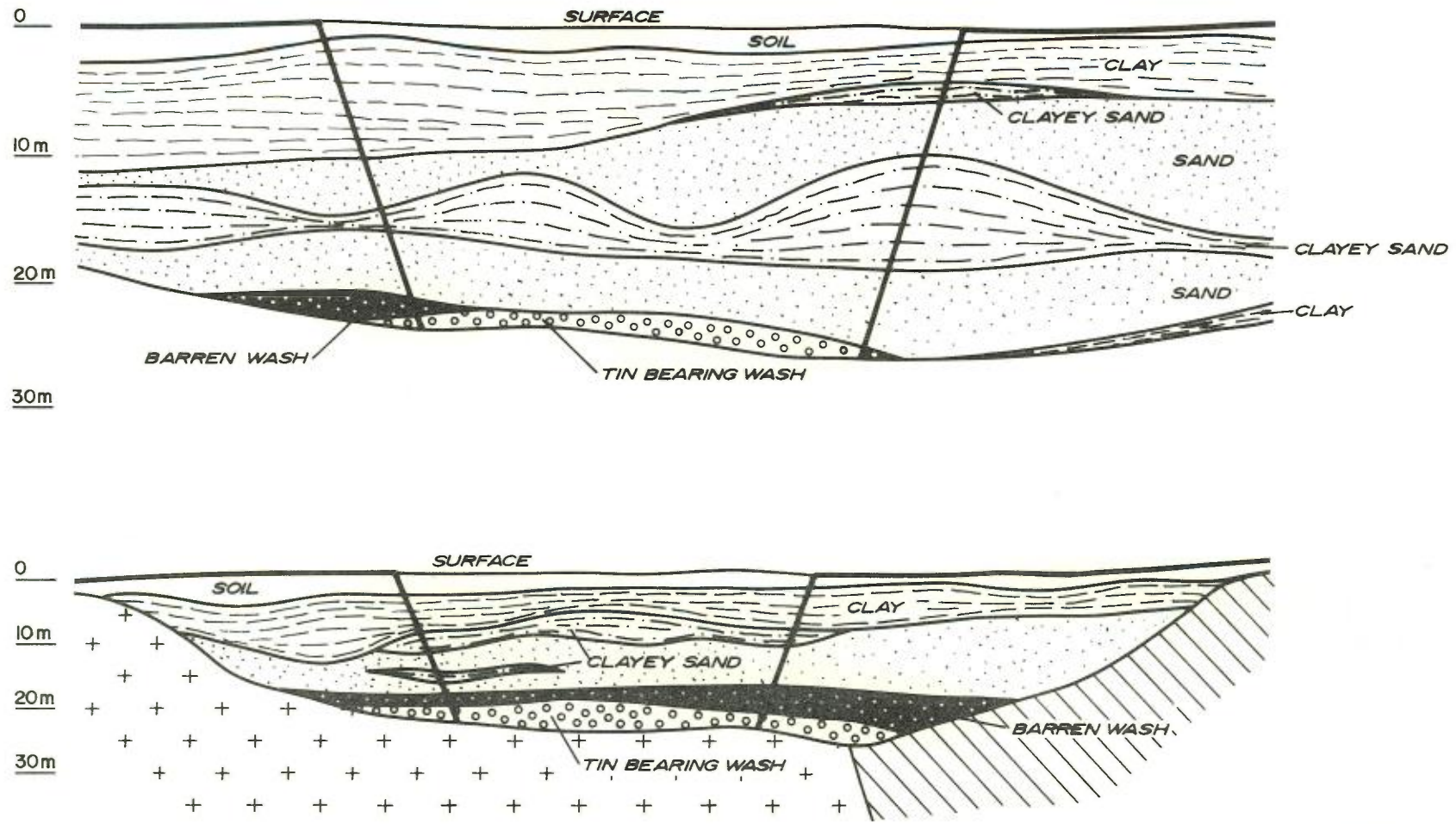
0·5 0 0·5 1 km

SCALE 1:25 000

METALS EXPLORATION LIMITED

MINING LEASE APPLICATION

R.W. CORKERY & CO. Pty. Limited | Figure 2·2



* Source: Metals Exploration Limited

** Source: D. Campi et al (1973)

10 0 10 20 m

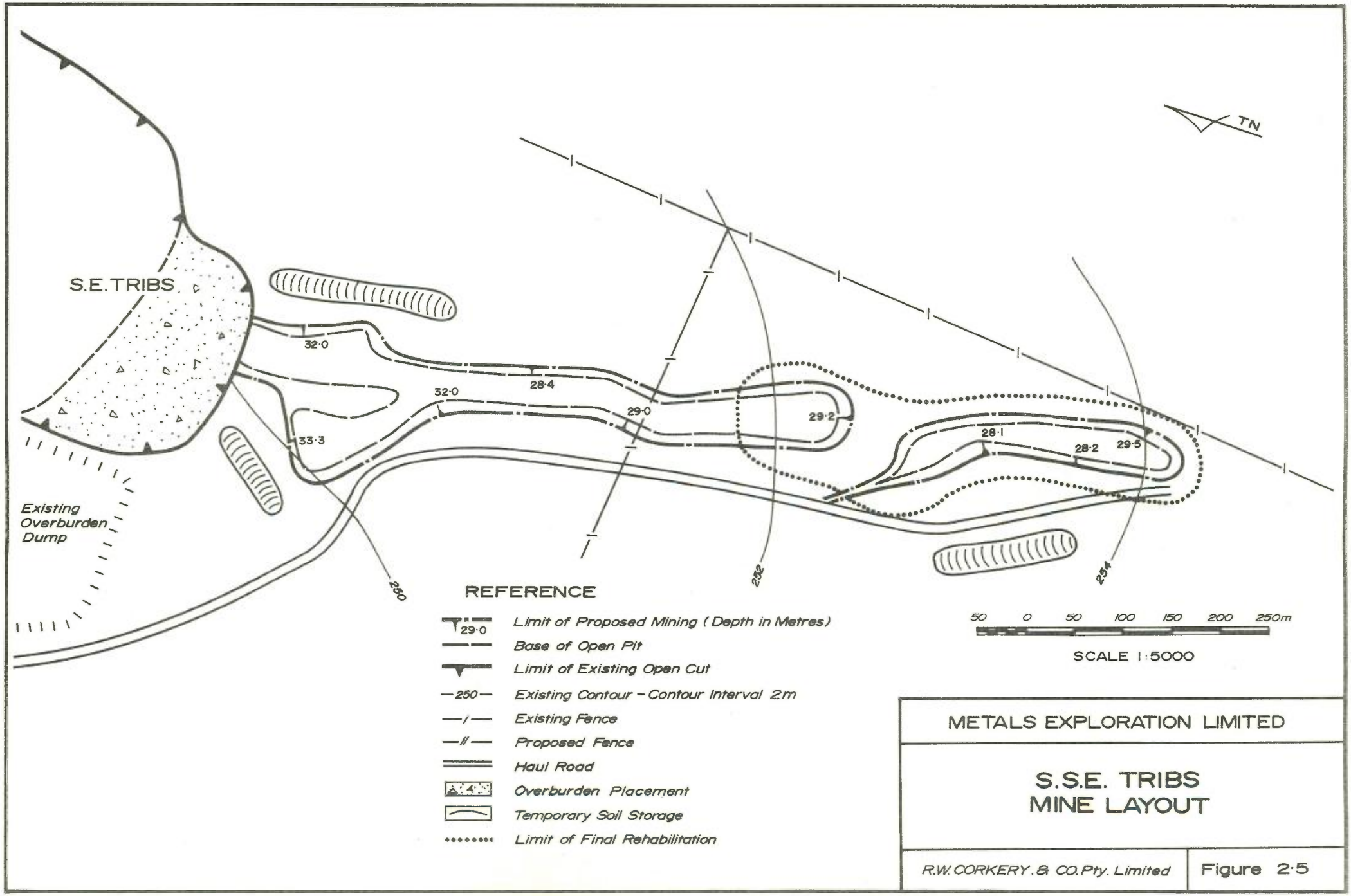
HORIZONTAL SCALE 1:500

METALS EXPLORATION LIMITED

MINE CROSS-SECTIONS

R.W. CORKERY & CO. Pty. Limited

Figure 2·3


S.E. TRIBS
Existing Overburden Dump
TN
32·0
32·0
28·4
29·0
29·2
33·3
28·1
28·2
29·5
250
252
254
REFERENCE
29·0 Limit of Proposed Mining (Depth in Metres)
Base of Open Pit
Limit of Existing Open Cut
250 Existing Contour - Contour Interval 2m
Existing Fence
Proposed Fence
Haul Road
Overburden Placement
Temporary Soil Storage
Limit of Final Rehabilitation
50 0 50 100 150 200 250m
SCALE 1:5000
METALS EXPLORATION LIMITED
S.S.E. TRIBS
MINE LAYOUT
R.W. CORKERY & CO. Pty. Limited
Figure 2·5

CONTINUATION OF
SCHIRMER'S and HARRINGTON'S

254

252

250

33·1

32·6

28·2

32·6

31·7

31·7

31·7

27·7

ROAD DIVERSION
whilst Thulloo Road is Mined
and Rehabilitated

Thulloo Road Unsealed

22·3

28·9

18·8

19·8

20·3

22·6

29·0

30·6

To PROCESSING PLANT

PROPOSED
OVERBURDEN
DUMP

A

A'

30·3

32·0

28·7

32·4

EXISTING
OVERBURDEN DUMP

To "LAVENTE"

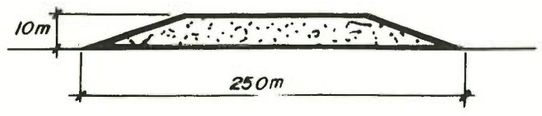
TN

REFERENCE

- 31·7 — Limit of Proposed Mining (Depth in Metres)
- Limit of Possible Mining
- Base of Open Pit
- Limit of Existing Open Cut
- 250 — Existing Contour - Contour interval 2m
- Existing Fence
- Haul Road
- Track
- Temporary Soil Storage
- Limit of Final Rehabilitation
- Trees
- Proposed Fence

50 0 50 100 150 200 250m

SCALE 1:5000



SECTION A-A'

(DIAGRAMATIC)

METALS EXPLORATION LIMITED

N.S.E. TRIBS AND AIRSTRIP/CONTESSA MINE LAYOUT

R.W. CORKERY & CO. Pty. Limited

Figure 2·6

REFERENCE

- Limit of Proposed Mining
- Limit of Possible Mining
- Base of Open Pit
- Wall of Open Pit (Depth in Metres) — 31·1
- 260 — Existing Contour - Contour Interval 2m
- Existing Fence
- Proposed Pit
- Haul Road
- Trees
- Temporary Soil Storage
- Limit of Final Rehabilitation
- Proposed Fence

50 0 50 100 150 200 250m

SCALE 1:5000

TN

PROPOSED OVERBURDEN DUMP

DAM

SILOS & C

PROPOSED OVERBURDEN DUMP

To PROCESSING PLANT

CONTINUATION OF AIRSTRIP / CONTESSA

258 262 260 256 254 252

34·7 37·6 35·7 35·2 38·0 38·5 34·1 35·2 32·6 34·3 36·7 39·5 34·6 34·9 32·2 32·4 30·7 31·0 32·5 28·7 27·2 31·1 32·0 29·2 32·2 28·9 25·6 28·7

METALS EXPLORATION LIMITED

SCHIRMER'S & HARRINGTON'S MINE LAYOUT

R.W. CORKERY & CO. Pty. Limited

Figure 2·7

T TREATMENT PLANT
O OFFICE
S STORE
L LUNCH ROOM
W WORKSHOP
TS TIN STORE

TN

HAUL ROAD

Thullaa Road

HOUSING UNITS

TIN WASH STOCK-PILE

Treatment Plant Site

Water Return

EXISTING OVERBURDEN DUMP

CLEAN WATER

CLEAN WATER

CLEAN WATER

NEW TAILINGS AREA

PUMP

Coarse Tailings to be Re-treated

SLOT

SLOT

SLOT

SLOT

EXISTING TAILINGS DUMP

(Coarse Tailings)

Backfilled with Fine Tailings

REFERENCE

- Limit of Proposed Mining
- Base of Open Pit
- Limit of Existing Open Cut
- Limit of Existing Tailings Dam
- Limit of Retreatment of Tailings
- Existing Fence
- Pipeline
- New Dam Walls
- Gibcripp Proposed Mine Area
- Tailings

50 0 50 100 150 200 m

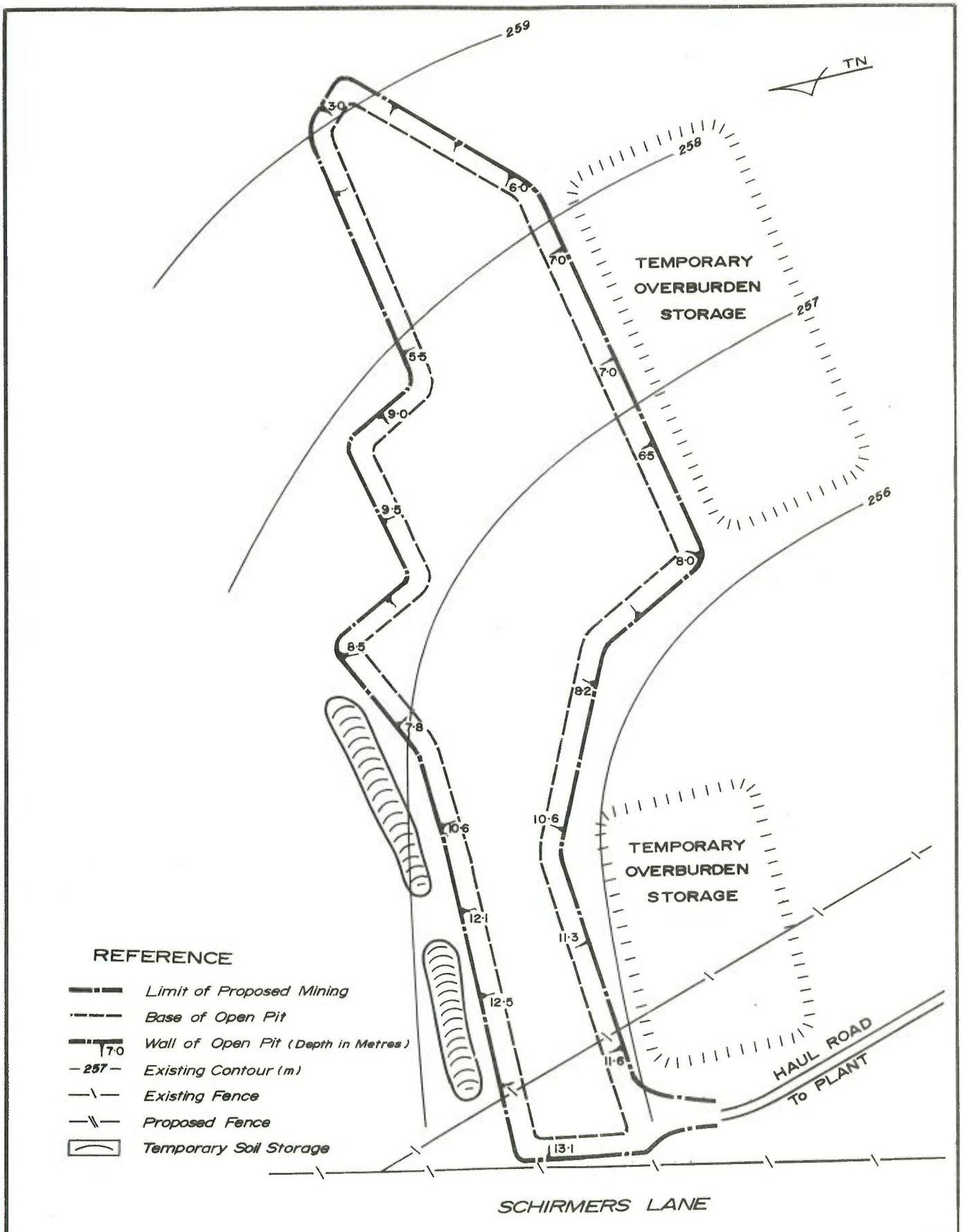
SCALE 1:4000

METALS EXPLORATION LIMITED

GIBCRIPP TREATMENT PLANT & HOUSING LAYOUT

R.W. CORKERY & CO. Pty. Limited

Figure 2·8

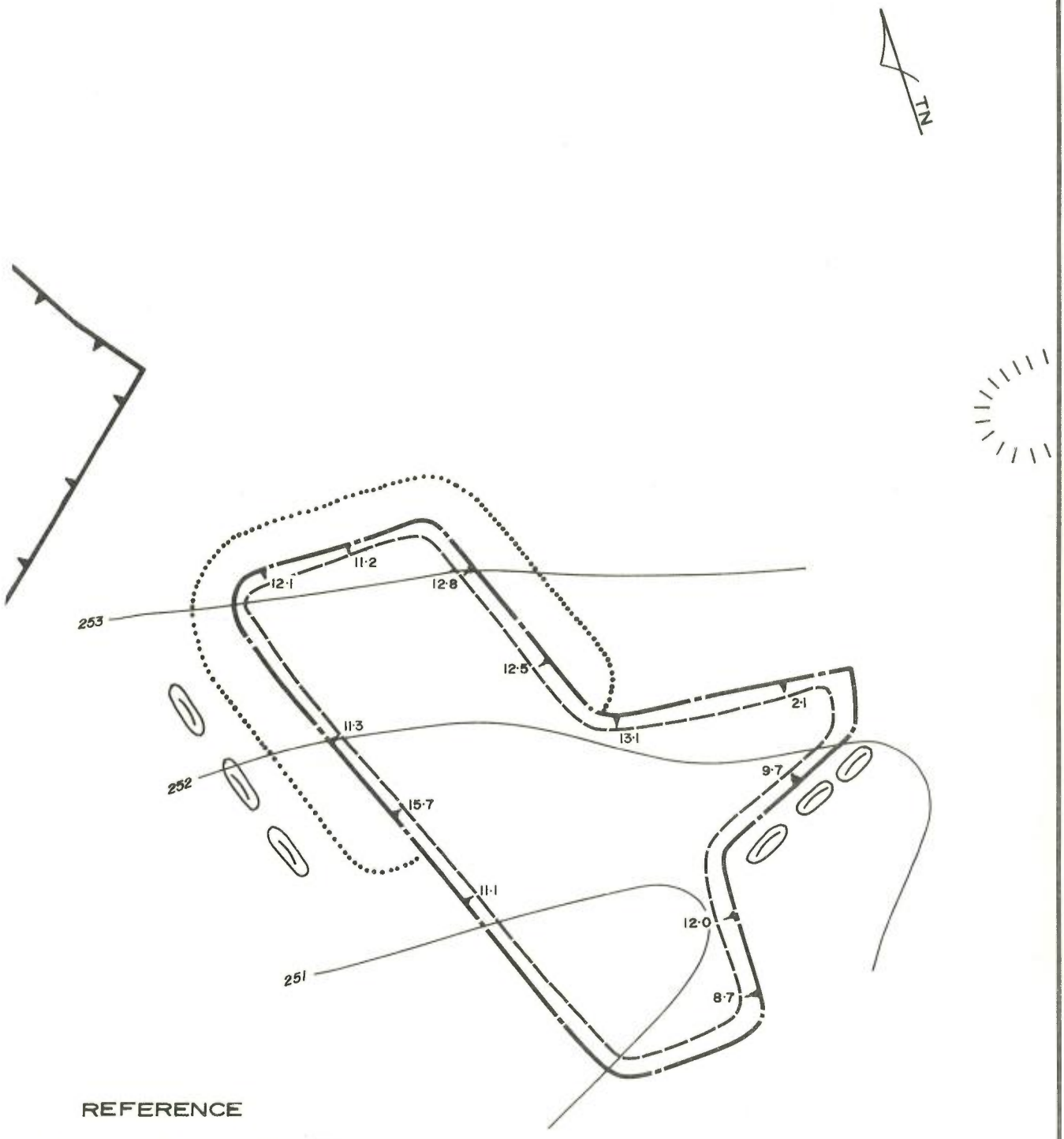


METALS EXPLORATION LIMITED

RESERVE EXTENSION LAYOUT

R.W. CORKERY & CO. Pty. Limited

Figure 2·10



REFERENCE

- Limit of Proposed Mining (Depth in Metres)
- Base of Open Pit
- Limit of Existing Open Cut
- Overburden Dump
- Existing Contours – Contour Interval 1m
- Temporary Soil Storage
- Limit of Final Rehabllitation

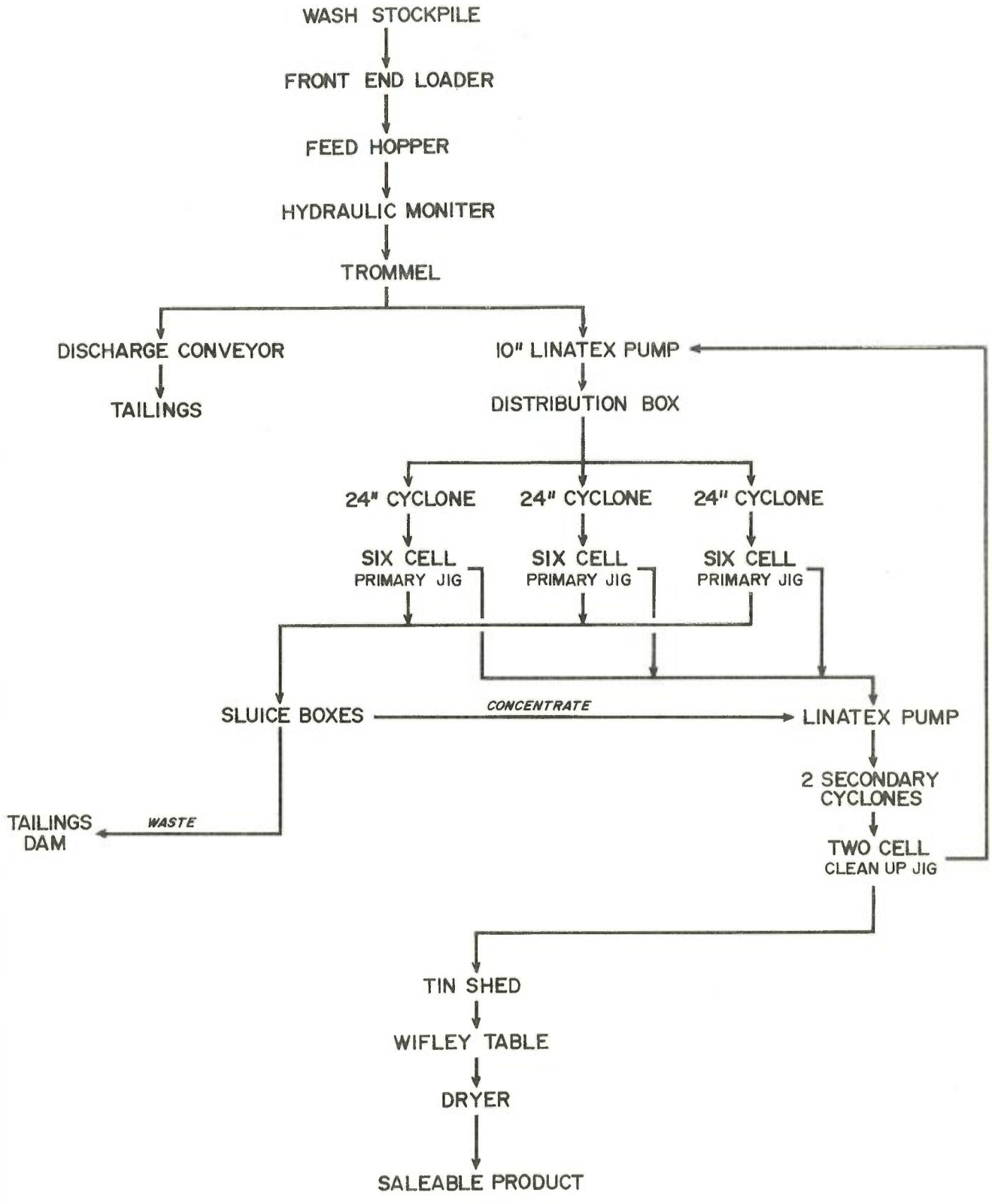
50 0 50m

SCALE 1:2000

METALS EXPLORATION LIMITED

O'KANE'S BLOCK LAYOUT

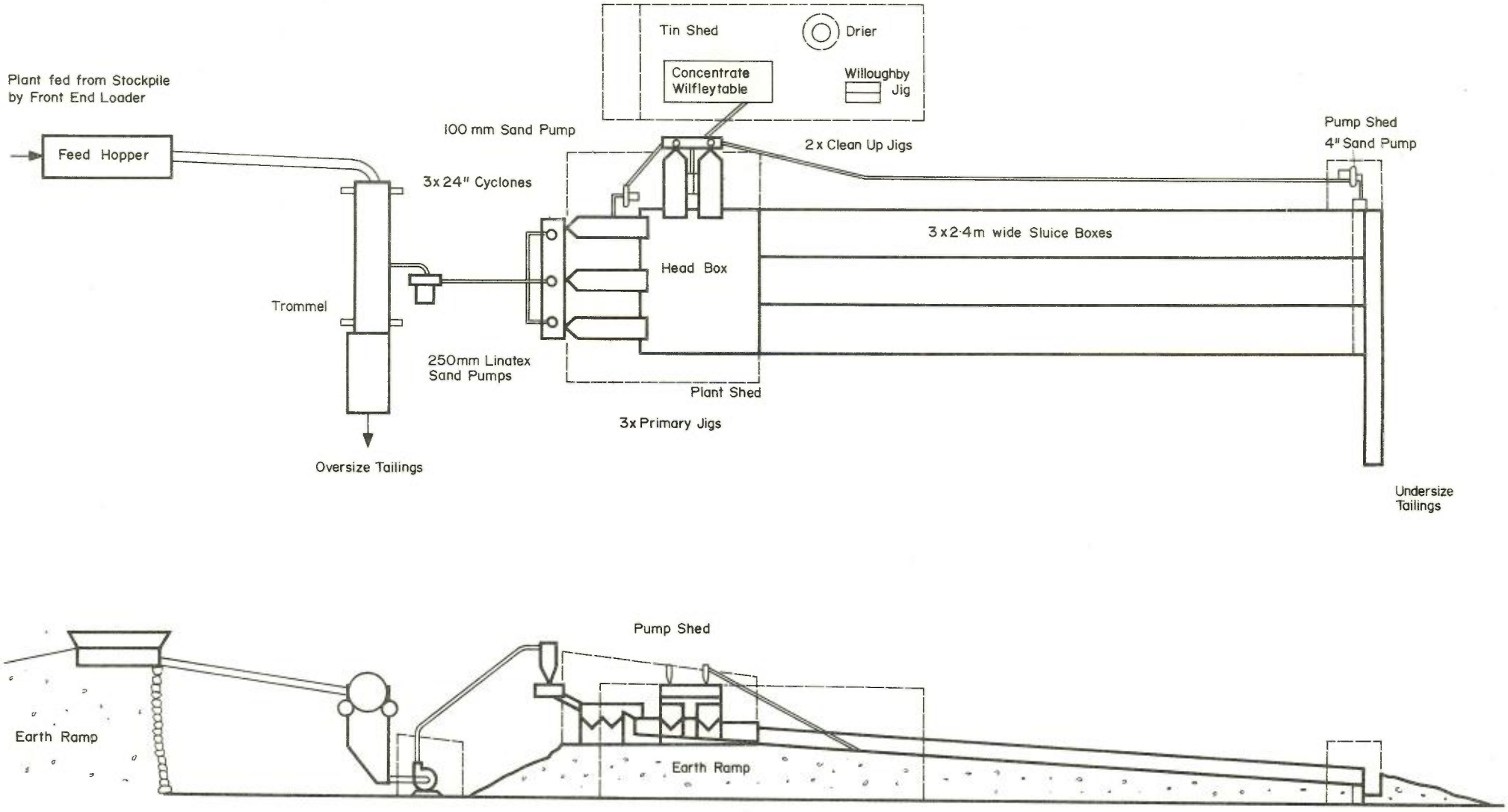
R.W. CORKERY & CO. Pty. Limited | Figure 2·11



METALS EXPLORATION LIMITED

TREATMENT PLANT FLOWSHEET

R.W. CORKERY & CO. Pty. Limited | Figure 2·12

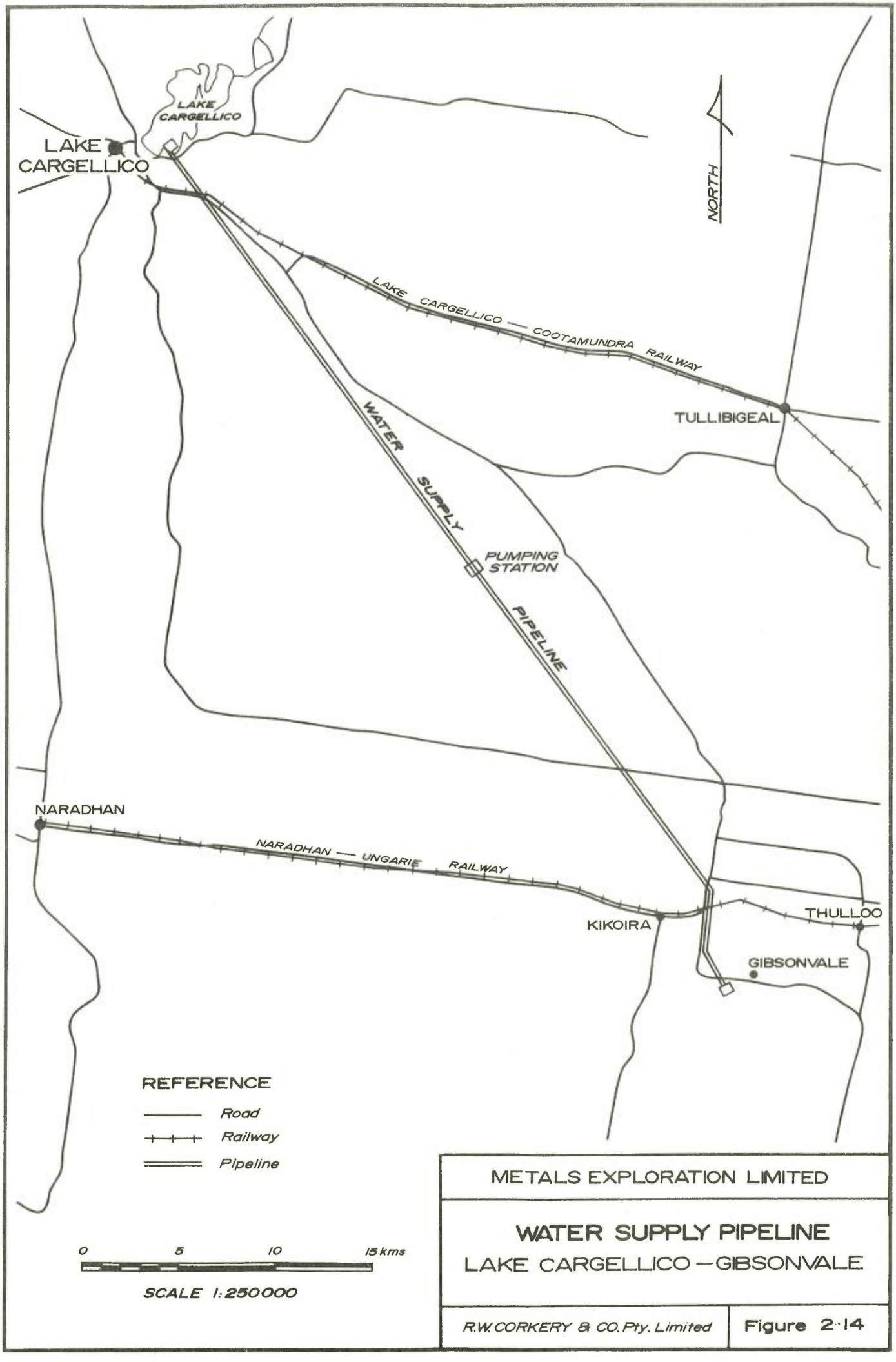


METALS EXPLORATION LIMITED

PLANT LAYOUT

R.W. CORKERY & CO. Pty. Limited

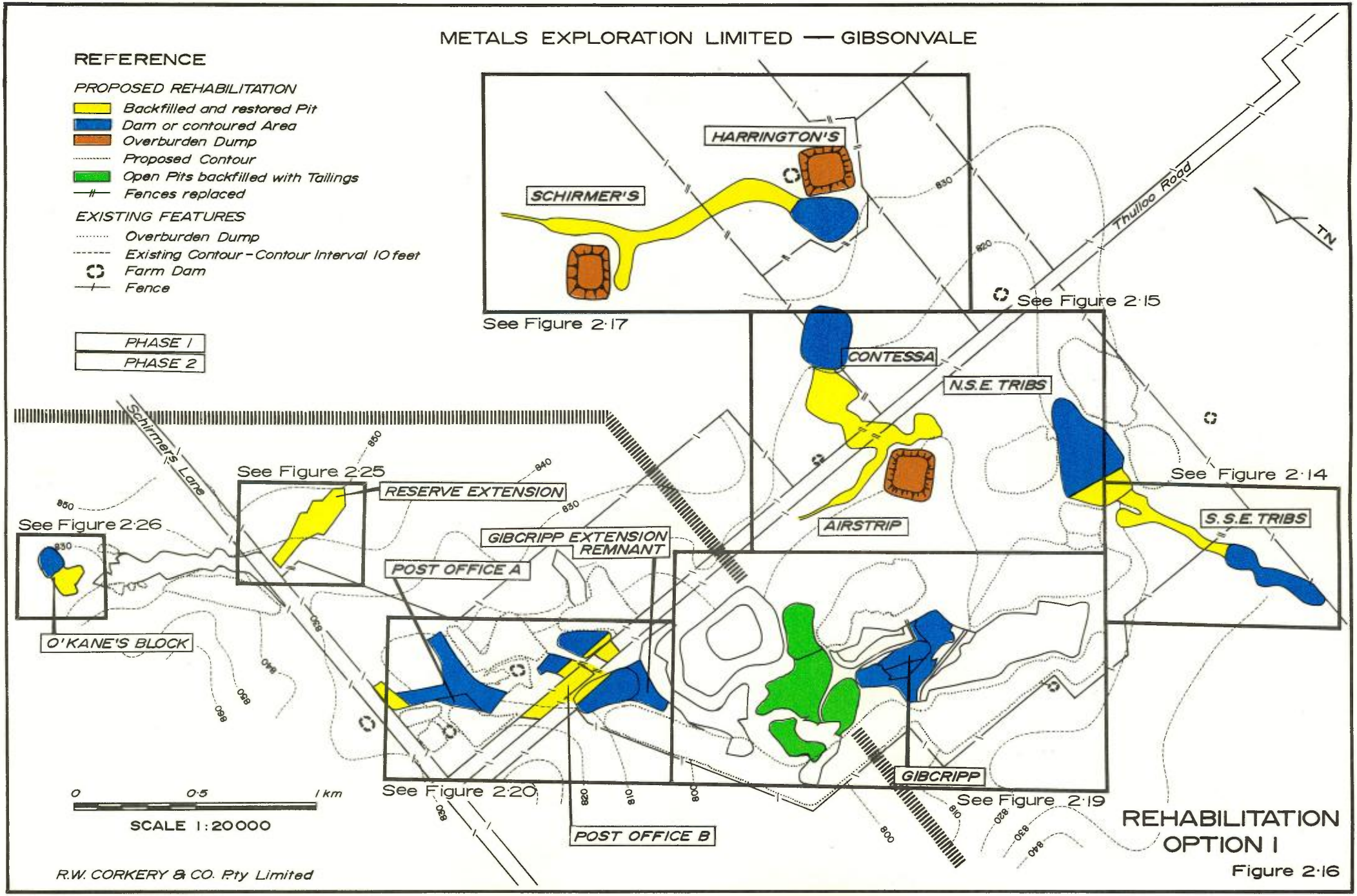
Figure 2·13

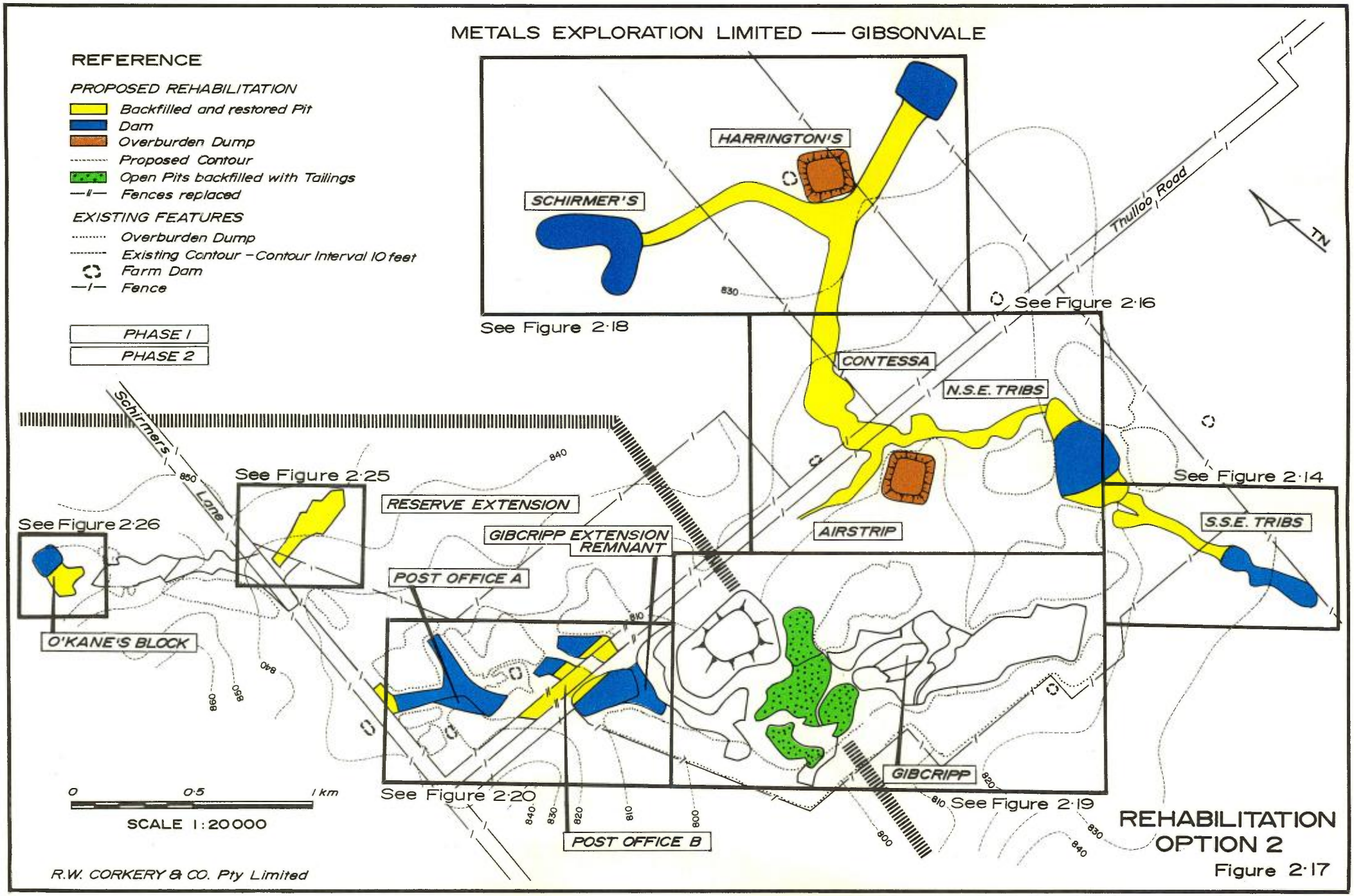


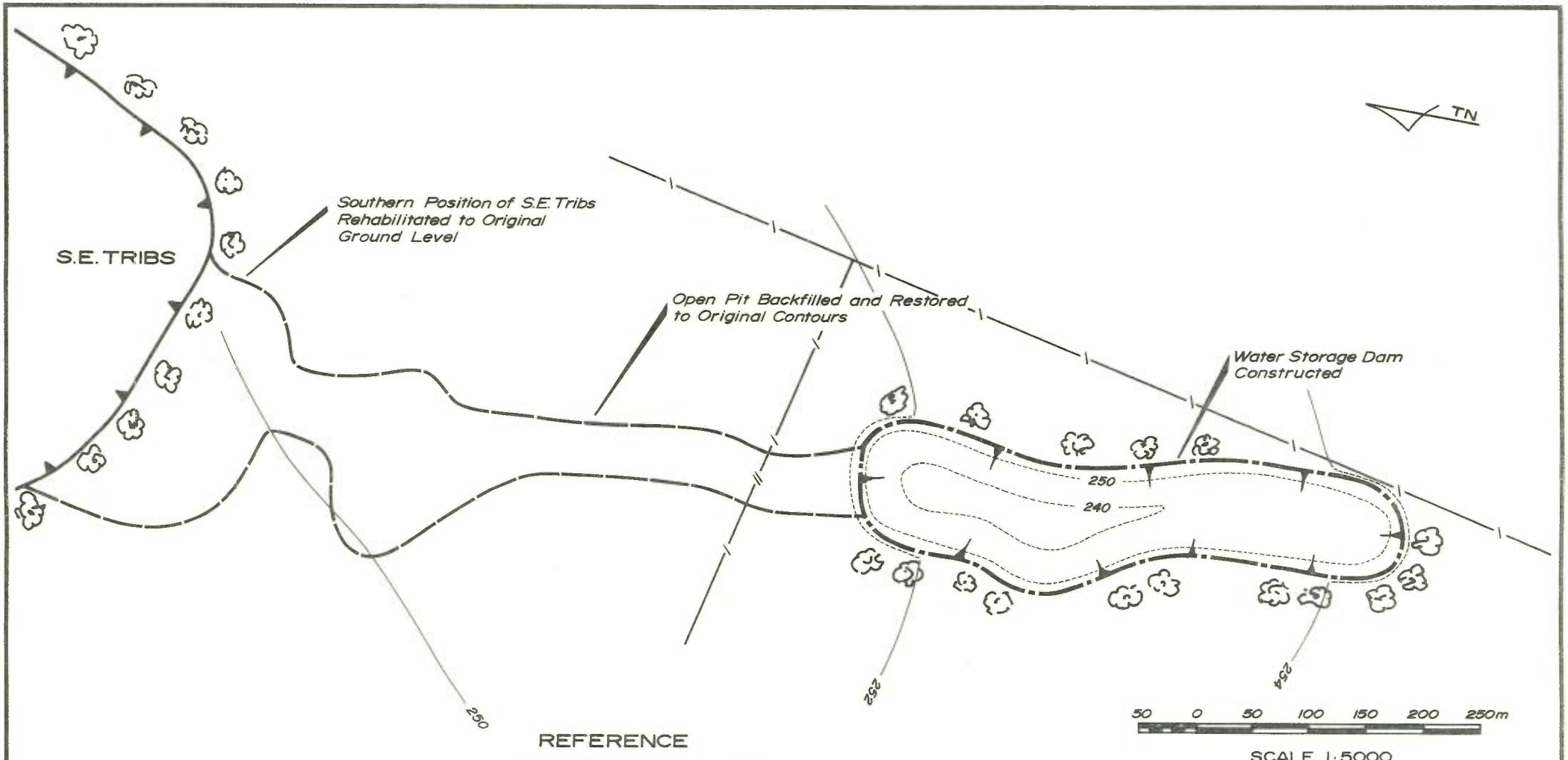
METALS EXPLORATION LIMITED

WATER SUPPLY PIPELINE
LAKE CARGELLICO — GIBSONVALE

R.W. CORKERY & CO. Pty. Limited | Figure 2·14


METALS EXPLORATION LIMITED — GIBSONVALE
REFERENCE
PROPOSED REHABILITATION
Backfilled and restored Pit
Dam or contoured Area
Overburden Dump
Proposed Contour
Open Pits backfilled with Tailings
Fences replaced
EXISTING FEATURES
Overburden Dump
Existing Contour - Contour Interval 10 feet
Farm Dam
Fence
PHASE 1
PHASE 2
HARRINGTON'S
SCHIRMER'S
Thulloo Road
TN
See Figure 2·15
See Figure 2·17
CONTESSA
N.S.E. TRIBS
See Figure 2·14
S.S.E. TRIBS
AIRSTRIP
Schirmer's Lane
See Figure 2·25
RESERVE EXTENSION
See Figure 2·26
GIBCRIPP EXTENSION REMNANT
POST OFFICE A
O'KANE'S BLOCK
GIBCRIPP
See Figure 2·20
See Figure 2·19
POST OFFICE B
0 0·5 1 km
SCALE 1:20000
R.W. CORKERY & CO. Pty Limited
REHABILITATION OPTION 1
Figure 2·16

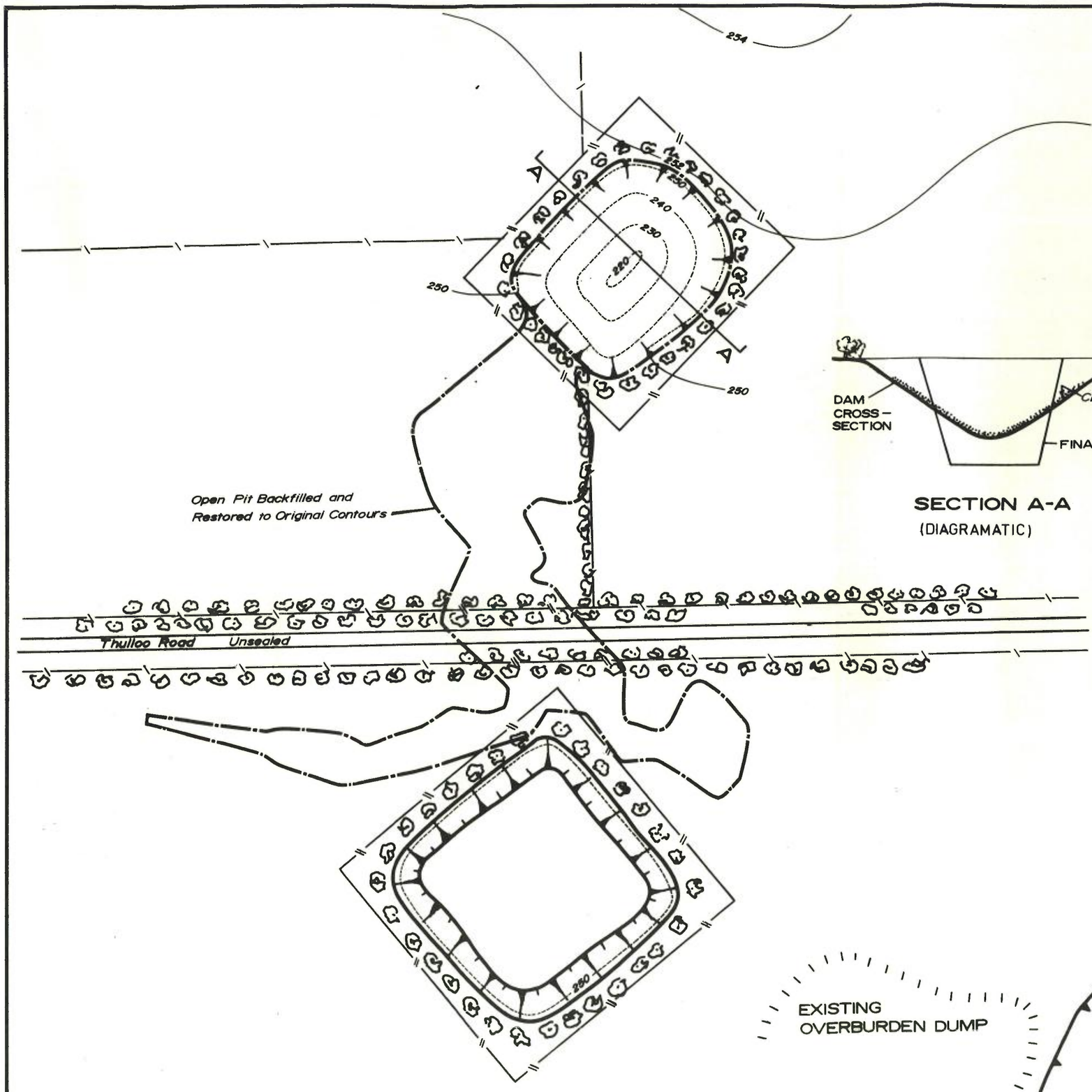

METALS EXPLORATION LIMITED — GIBSONVALE
REFERENCE
PROPOSED REHABILITATION
Backfilled and restored Pit
Dam
Overburden Dump
Proposed Contour
Open Pits backfilled with Tailings
Fences replaced
EXISTING FEATURES
Overburden Dump
Existing Contour – Contour Interval 10 feet
Farm Dam
Fence
PHASE 1
PHASE 2
HARRINGTON'S
SCHIRMER'S
CONTESSA
N.S.E. TRIBS
S.S.E. TRIBS
AIRSTRIP
RESERVE EXTENSION
GIBCRIPP EXTENSION REMNANT
POST OFFICE A
POST OFFICE B
O'KANE'S BLOCK
GIBCRIPP
Schirmers Lane
Thulloo Road
TN
See Figure 2·18
See Figure 2·16
See Figure 2·25
See Figure 2·26
See Figure 2·14
See Figure 2·20
See Figure 2·19
0
0·5
1 km
SCALE 1:20000
R.W. CORKERY & CO. Pty Limited
REHABILITATION OPTION 2
Figure 2·17

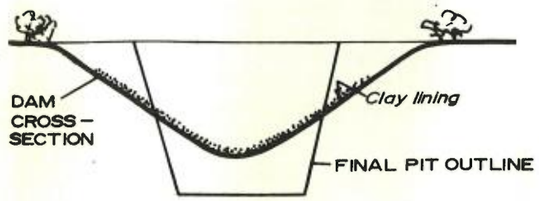


METALS EXPLORATION LIMITED

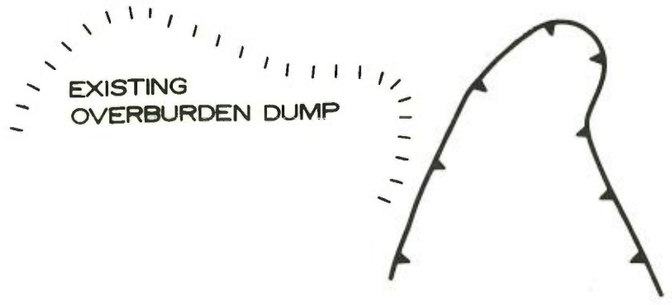
S.S.E. TRIBS REHABILITATION

R.W. CORKERY & CO. Pty. Limited | Figure 2·18





SECTION A-A
(DIAGRAMATIC)



REFERENCE

- Limit of Proposed Mining
- Existing Fence
- Proposed Fence
- 252 Existing Contours - Contour Interval 2m
- 250 Proposed Contours - Contour Interval 10m
- Limit of Existing Open Cut

50 0 50 100 150 200 250m

SCALE 1:5000

METALS EXPLORATION LIMITED

N.S.E. TRIBS AND AIRSTRIP/CONTESSA REHABILITATION - OPTION 1

R.W. CORKERY & CO. Pty. Limited | Figure 2·19

254

252

250

TN

REFERENCE

- Limit of Proposed Mining
- Existing Fence
- Proposed Fence
- 252 Existing Contours - Contour Interval 2m
- 250 Proposed Contours
- Limit of Existing Open Cut

Thulloo Road Unsealed

Open Pit Backfilled and Restored to Original Contours

EXISTING OVERBURDEN DUMP

Northern Position of S.E. Tribs Rehabilitated to Original Ground Level

50 0 50 100 150 200 250m

SCALE 1:5000

METALS EXPLORATION LIMITED

N.S.E. TRIBS AND AIRSTRIP/CONTESSA REHABILITATION - OPTION 2

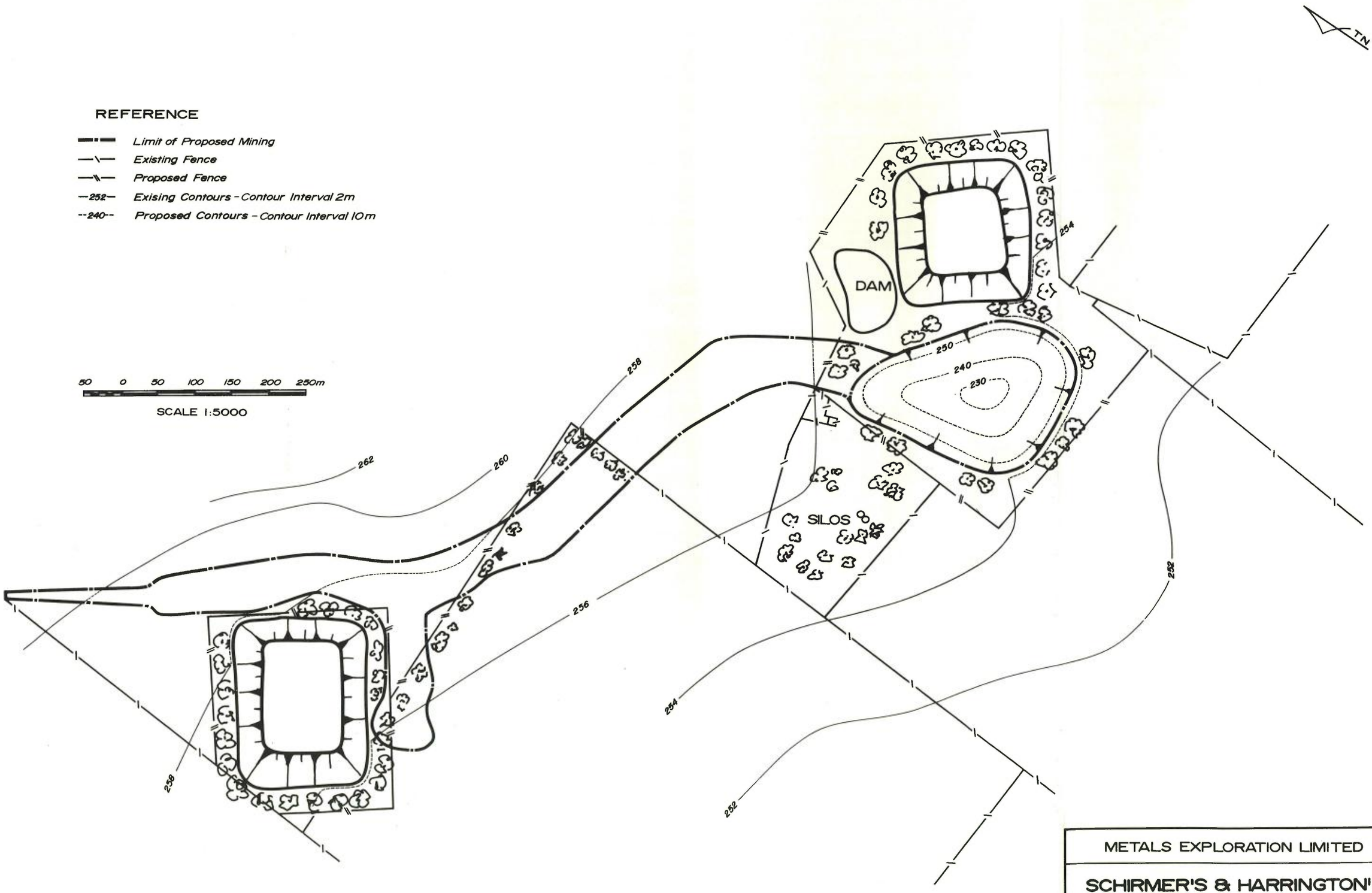
R.W. CORKERY & CO. Pty. Limited | Figure 2·20

REFERENCE

- *Limit of Proposed Mining*
- *Existing Fence*
- *Proposed Fence*
- —252— *Exising Contours - Contour Interval 2m*
- --240-- *Proposed Contours - Contour Interval 10m*

50 0 50 100 150 200 250m

SCALE 1:5000



METALS EXPLORATION LIMITED

SCHIRMER'S & HARRINGTON'S REHABILITATION OPTION 1

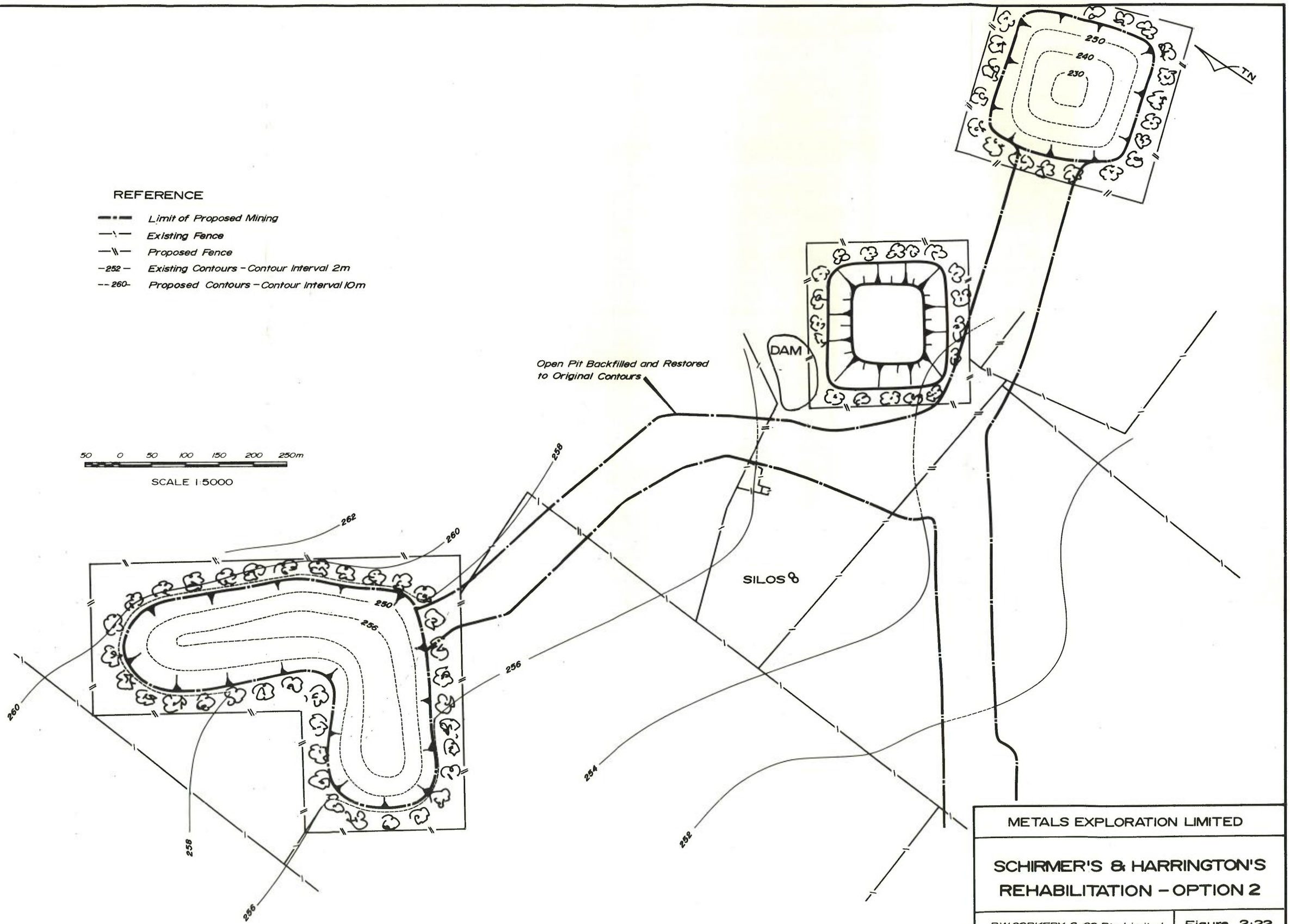
R.W. CORKERY & CO. Pty. Limited | Figure 2·21

REFERENCE

- Limit of Proposed Mining
- Existing Fence
- Proposed Fence
- 252 — Existing Contours – Contour Interval 2m
- 260 — Proposed Contours – Contour Interval 10m

50 0 50 100 150 200 250m

SCALE 1:5000

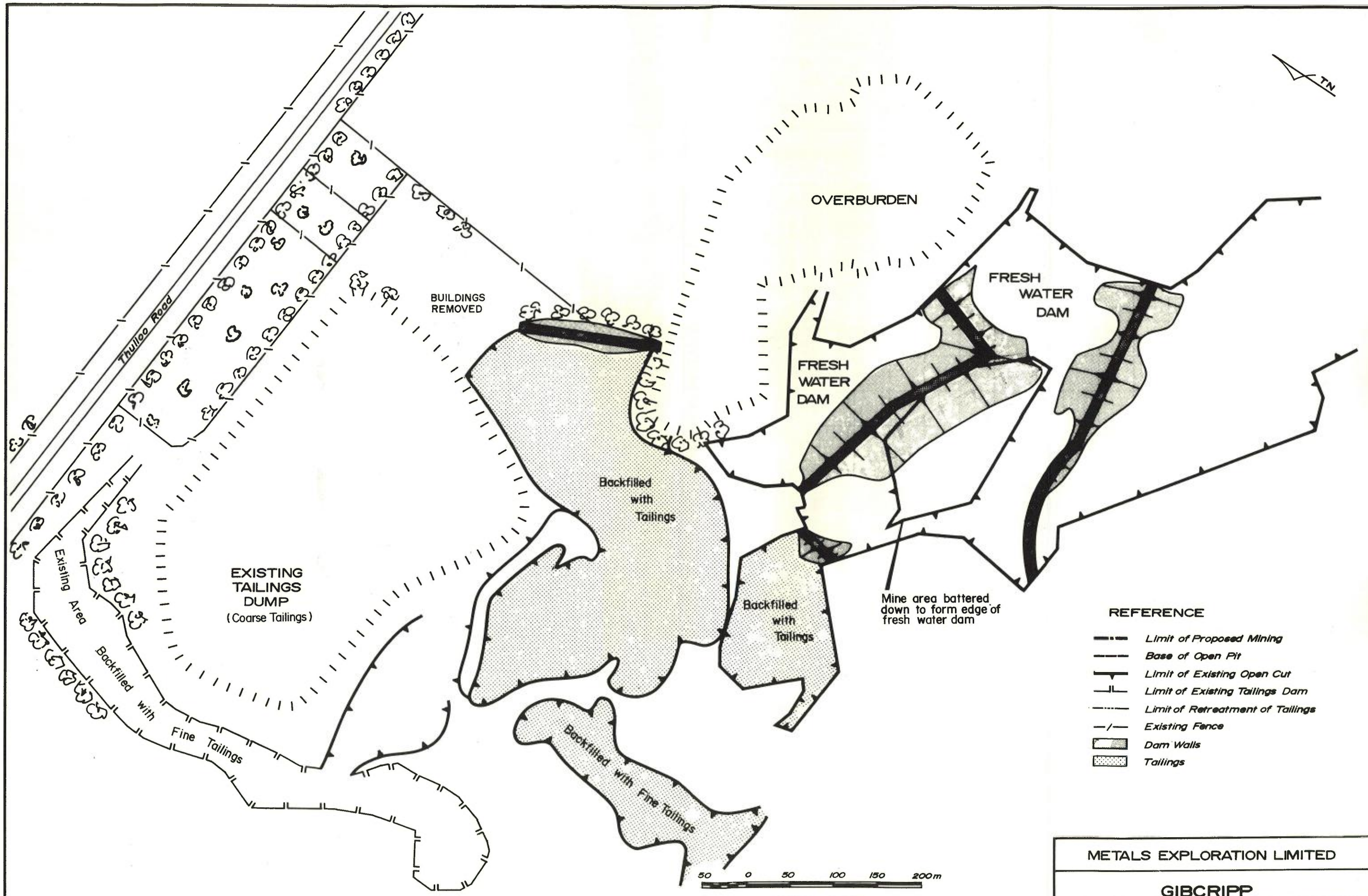


METALS EXPLORATION LIMITED

SCHIRMER'S & HARRINGTON'S REHABILITATION – OPTION 2

R.W. CORKERY & CO. Pty. Limited

Figure 2·22

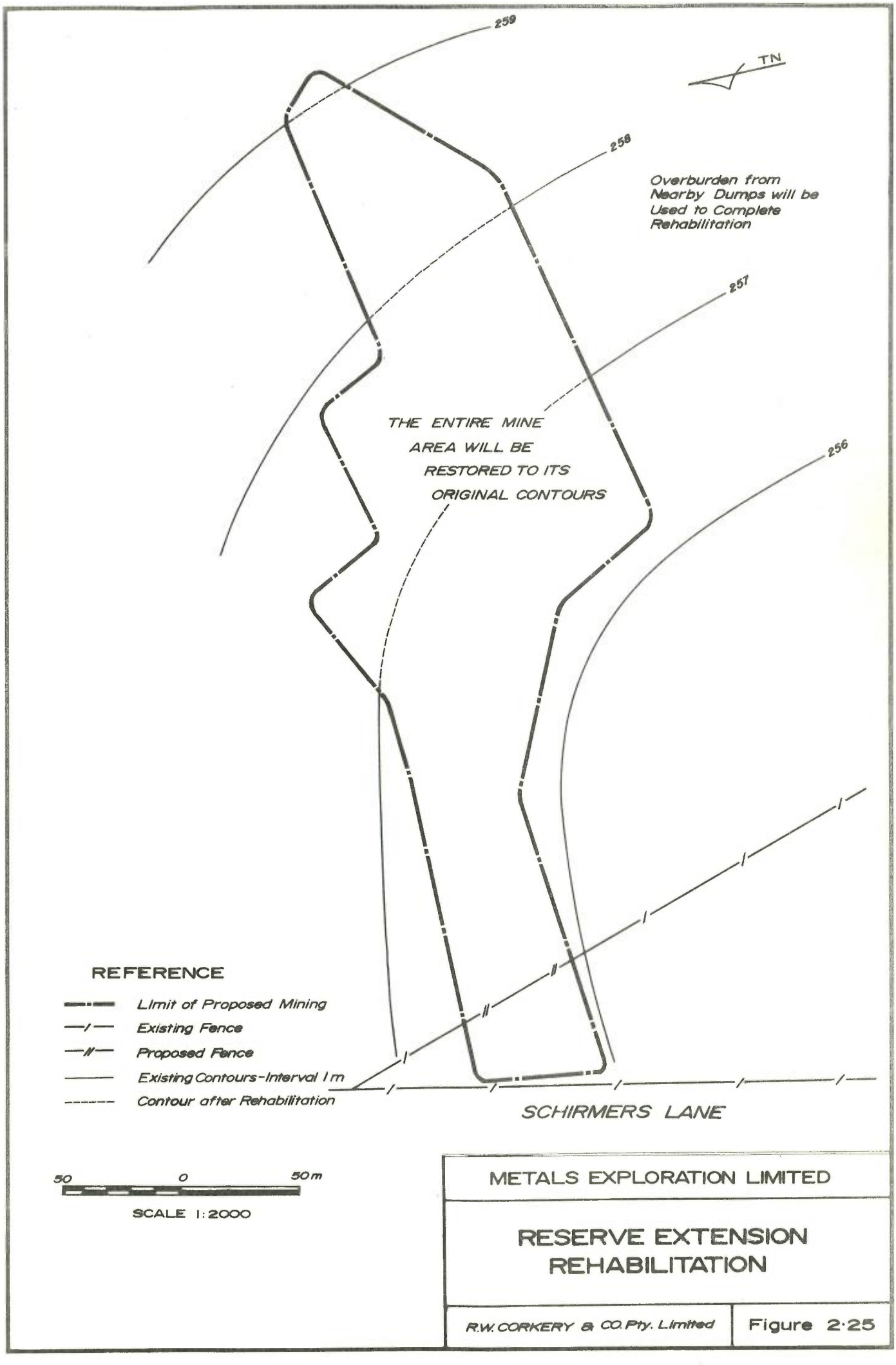


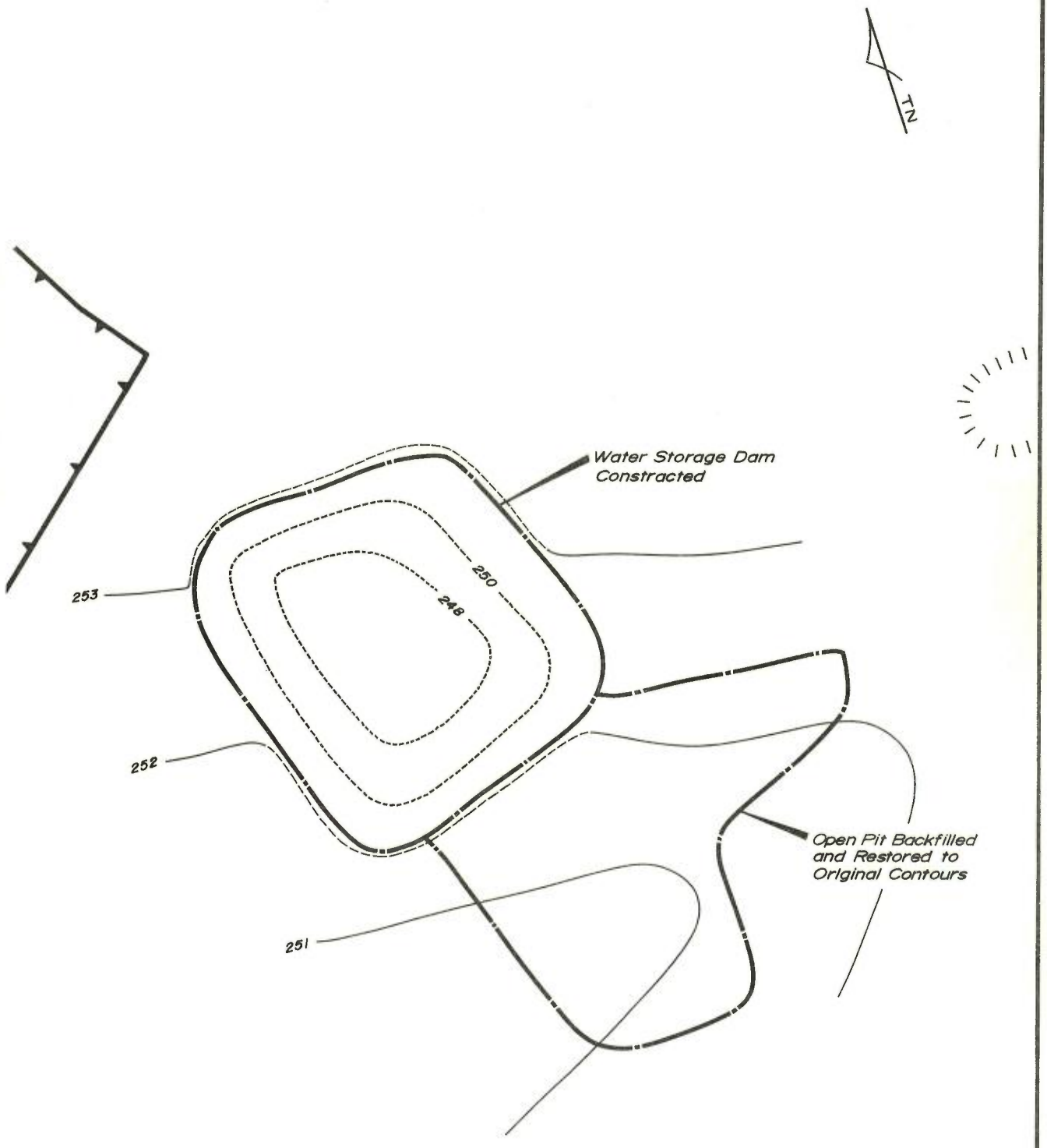
METALS EXPLORATION LIMITED

GIBCRIPP TREATMENT PLANT & HOUSING REHABILITATION

R.W. CORKERY & CO. Pty. Limited

Figure 2·23


259
258
257
256
TN
Overburden from Nearby Dumps will be Used to Complete Rehabilitation
THE ENTIRE MINE AREA WILL BE RESTORED TO ITS ORIGINAL CONTOURS
REFERENCE
Limit of Proposed Mining
Existing Fence
Proposed Fence
Existing Contours-Interval 1m
Contour after Rehabilitation
SCHIRMERS LANE
50 0 50m
SCALE 1:2000
METALS EXPLORATION LIMITED
RESERVE EXTENSION REHABILITATION
R.W. CORKERY & CO. Pty. Limited
Figure 2·25



REFERENCE

- Limit of Proposed Mining
- Existing Contour - Contour Interval 1 m
- Contour after Rehabilitation
- Limit of Existing Open Cut

50 0 50m

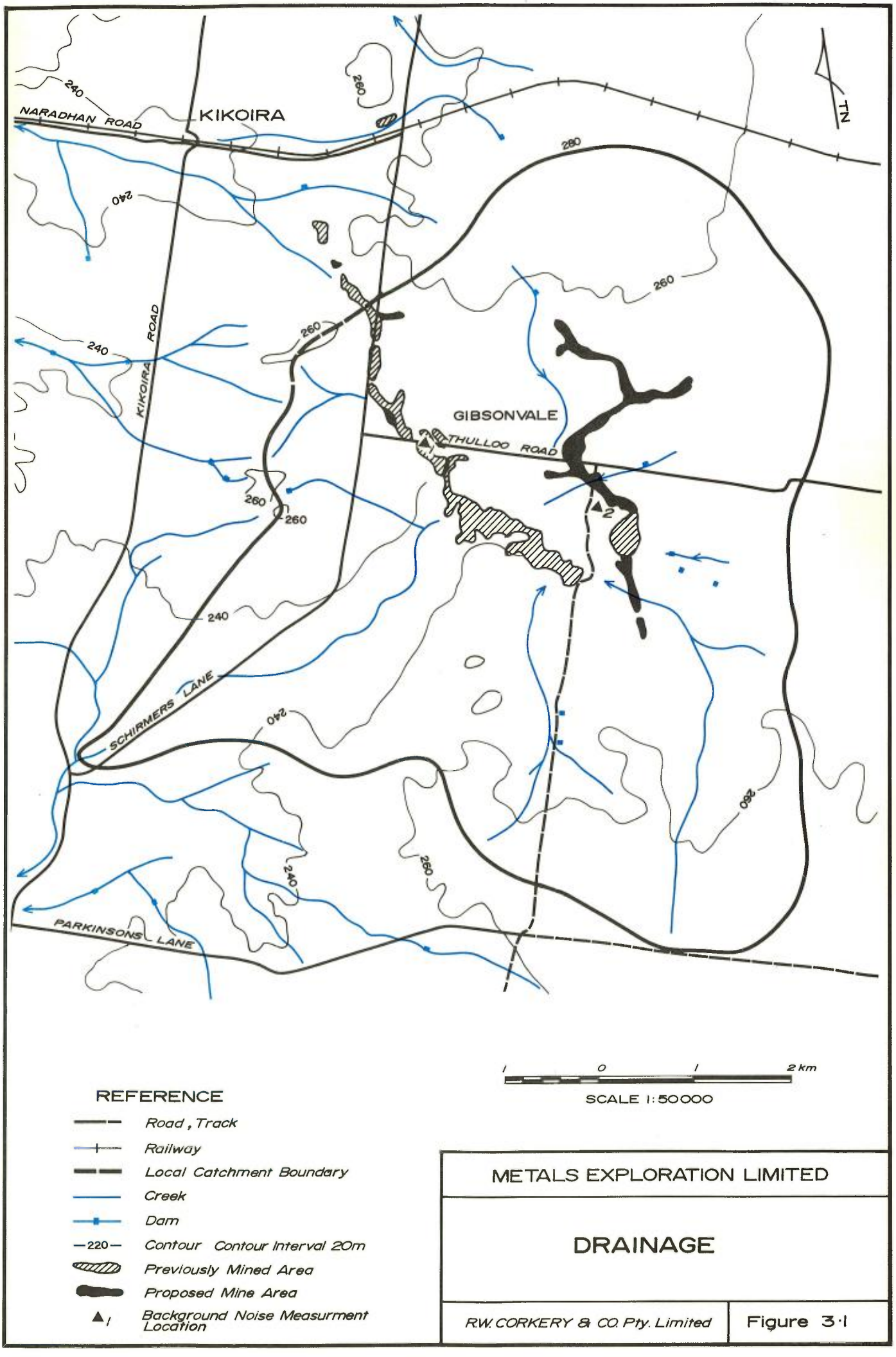
SCALE 1:2000

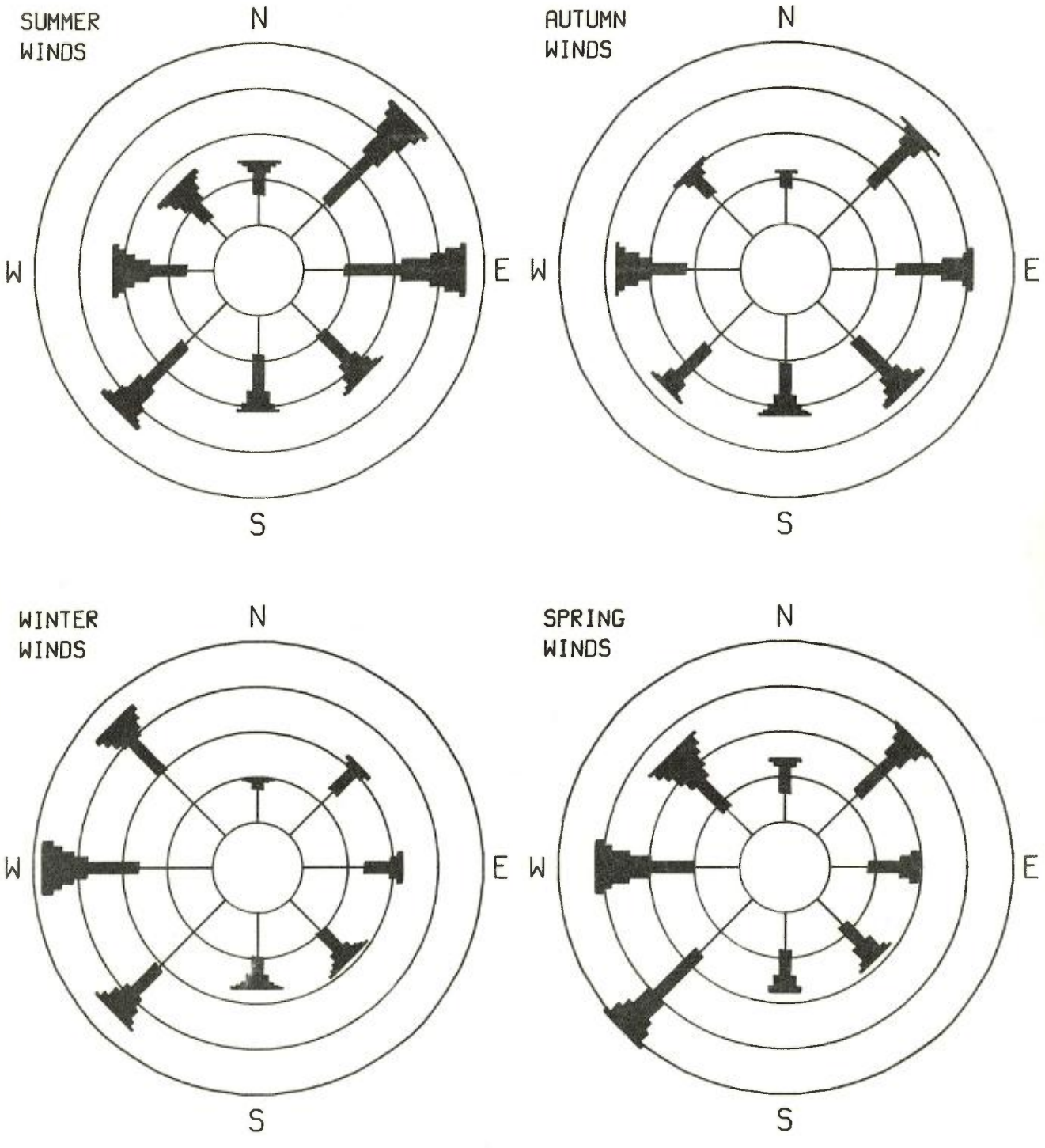
METALS EXPLORATION LIMITED

O'KANE'S BLOCK REHABILITATION

R.W. CORKERY & CO. Pty. Limited

Figure 2·26


NARADHAN ROAD
KIKOIRA
KIKOIRA ROAD
GIBSONVALE
THULLOO ROAD
SCHIRMERS LANE
PARKINSONS LANE
240
260
TN
1 0 1 2 km
SCALE 1:50000
REFERENCE
Road, Track
Railway
Local Catchment Boundary
Creek
Dam
220 Contour Contour Interval 20m
Previously Mined Area
Proposed Mine Area
Background Noise Measurment Location
METALS EXPLORATION LIMITED
DRAINAGE
R.W. CORKERY & CO. Pty. Limited
Figure 3·1



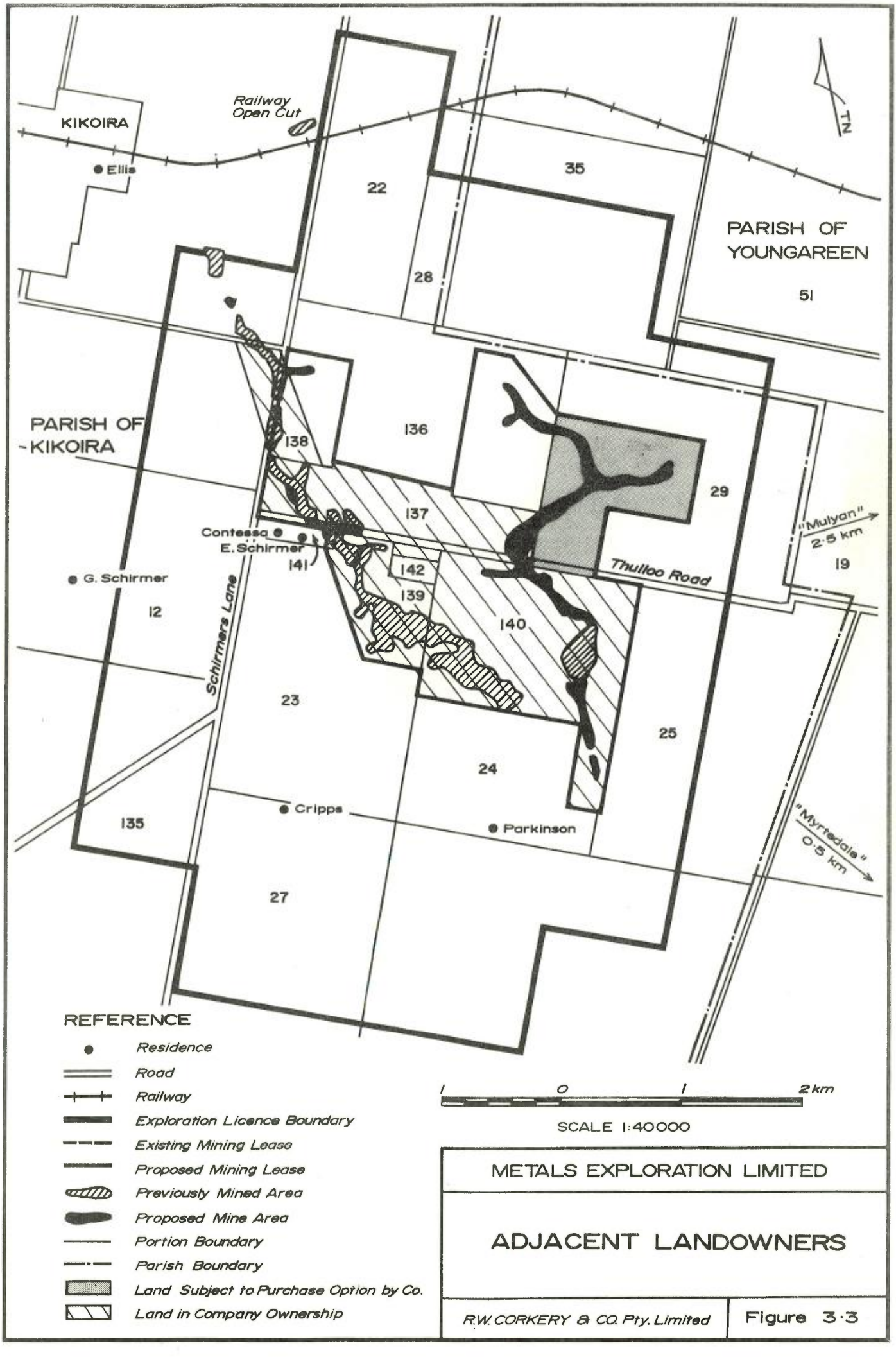
COMPUTER PLOTTED BY GEOCOM PTY. LTD., SYDNEY

METALS EXPLORATION LIMITED

WIND - SPEED AND DIRECTION

NARADHAN P.O.

R.W. CORKERY & CO. PTY. LTD. | Fig. 3.2


KIKOIRA
Railway Open Cut
Ellis
TN
22
35
PARISH OF YOUNGAREEN
28
51
PARISH OF KIKOIRA
138
136
29
137
Contessa
E. Schirmer
141
142
139
140
Thulloo Road
"Mulyan" 2·5 km
19
G. Schirmer
12
Schirmers Lane
23
25
24
Cripps
Parkinson
135
27
"Myrtedale" 0·5 km
REFERENCE
Residence
Road
Railway
Exploration Licence Boundary
Existing Mining Lease
Proposed Mining Lease
Previously Mined Area
Proposed Mine Area
Portion Boundary
Parish Boundary
Land Subject to Purchase Option by Co.
Land in Company Ownership
1 0 1 2km
SCALE 1:40000
METALS EXPLORATION LIMITED
ADJACENT LANDOWNERS
R.W. CORKERY & CO. Pty. Limited
Figure 3·3

METALS EXPLORATION LIMITED

EIS
779

The mining and processing of
alluvial tin at Gibsonvale, NSW

Borrower's name	Date	

RAECO

EIS 779

METALS EXPLORATION LIMITED

EIS
779

The mining and processing of
alluvial tin at Gibsonvale, NSW