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GLENGARRY MINING N.L.
WATTLE GULLY GOLD MINES N.L.
SOUTHWEST GOLD MINES N.L.

BADGEBUP GOLD PROJECT
WESTERN AUSTRALIA

ADDENDUM

TO NOTICE OF INTENT LODGED BY
ASSOCIATED GOLD FIELDS N.L.
AND
SOUTHWEST GOLD MINES N.L.
(MAY, 1986)

August, 1988

FILE COPY

Prepared by
Glengarry Mining N.L.

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to the State Mining Engineer, 29th August 1986

INTRODUCTION

1.1 INTRODUCTION

This proposal has been prepared by the Manager of the Badgebup Joint Venture, Glengarry Mining N.L. (Glengarry), and sets out details of a proposed gold mining and treatment operation based on the established reserves of the Jinka's Hill and Dingo Hill ore bodies near Badgebup in Western Australia.

A development proposal for the Badgebup project was previously presented in a document entitled "Badgebup Gold Project, Notice of Intent" prepared by Associated Gold Fields N.L. in 1986. The Notice of Intent was circulated to various Government departments at the time and in a letter to The State Mining Engineer dated August 29, 1986, the Department of Conservation and Environment advised that the project was environmentally acceptable, subject to certain recommendations set out in the letter. A copy of the letter is appended (Appendix A).

In 1987 ownership of the project passed to the current joint venturers. The new owners have refined the development proposal and have relocated some of the proposed facilities to create a more compact and efficient operation.

This addendum includes details of the new ownership of the project, its geological setting and a full description of the project as now proposed. The overall scope of the project is similar to that previously proposed and it is considered that the impact of the project on the natural and social environment will not differ from that previously described. For a description of the existing environment and the likely impact of the project, reference should be made to the Notice of Intent, a copy of which is attached.

1.2 OBJECTIVE

The project's objective is to establish a 200,000 tonne per annum gold mining operation at Badgebup and to mine and treat the known ore reserves at Jinka's Hill and Dingo Hill. If further ore reserves are proved up in the Badgebup district they would also be mined and the ore processed in the treatment plant. Open-cut gold mines will be developed at Jinka's Hill and Dingo Hill and the ore processed in a conventional C.I.P. treatment plant adjacent to the Jinka's Hill pit. The Badgebup area is well served by existing roads and S.E.C. power is available at the site. The town of Katanning is 36 kilometres away and has excellent housing and support facilities available so minimal new infrastructure is required.

1.3 OWNERSHIP

The Badgebup Gold Project is a joint venture between Glengarry Mining N.L. (47.5%), Wattle Gully Gold Mines N.L. (47.5%) and Southwest Gold Mines N.L. (5%). Glengarry is manager of the joint venture.

Glengarry is a wholly-owned subsidiary of Folkestone Gold N.L. Folkestone Gold N.L. and the other two joint venture parties are all listed public companies with majority Australian ownership.

The head office location for each of the three parties is:

Glengarry Mining N.L.
12 Nairn Street
FREMANTLE, W.A. 6160

Wattle Gully Gold Mines N.L.
7th Floor, The Forrest Centre
221 St. George's Terrace
PERTH, W.A. 6000

Southwest Gold Mines N.L.
Ground Floor
524 Hay Street
PERTH, W.A. 6000

The table below sets out details of the various tenements subject to the joint venture:

<u>Tenement No.</u>	<u>Area</u>	<u>Status</u>	<u>Holder</u>
M70/210	68 ha.	Approved	Glengarry Mining N.L. (475/1000) Wattle Gully Gold Mines N.L. (475/1000) Southwest Gold Mines N.L. (50/1000)
M70/211	315 ha.	Approved	As above
G70/7	7 ha.	Approved	As above
G70/8	6 ha.	Approved	As above
G70/9	7 ha.	Approved	As above
L70/6	40.47 ha.	Approved	As above
E70/18	48.96 sq km	Approved	Associated Gold Fields N.L. *
M70/408	100 ha.	Application	Glengarry Mining N.L. (50/100) Wattle Gully Gold Mines N.L. (50/100)

* Transfer to Glengarry Mining N.L. and Wattle Gully Gold Mines N.L. is in progress.

GEOLOGICAL ENVIRONMENT

2.1 REGIONAL SETTING

The Badgebup Gold Project is located within the Western Gneiss Terrain of the Archaen Yilgarn Block of Western Australia. Age dating has indicated that the rocks within the project area are of similar age to the greenstones which host most of the gold deposits in the Eastern Goldfields. Petrologically these rocks are higher grade metamorphic equivalents of the greenstones.

A dissected laterite profile covers the areas with mainly pallid zone material exposed at the surface. The depth of weathering varies from 0-50 metres. There are only sparse outcrops from granulite, chert and dolerite in the area.

2.2. GEOLOGY

The area is underlain by a sequence of gently east dipping, north west trending, mafic to felsic granulites which have been intruded by discordant sheets of archaen adamellite. Easterly trending dolerite dykes of proterozoic age intrude this sequence. The granulites are metamorphic derivatives of rocks that were probably of sedimentary and volcanogenic origin.

Gold mineralisation is confined to two or more shallow east dipping felsic granulite units containing minor sulphidic chert bands and quartzite intercalations there in an apparent close spatial relationship between the auriferous granulites and an adamellite sill.

Mine ore reserves are 410,000 tonnes at 3.0 g/t (measured and indicated resources total 750,000 tonnes at 3.0 g/t).

2.3 HYDROLOGY

The Badgebup project site is in the upper reaches of the Blackwood drainage basin. Surface drainage from the project area flows by small creeks into the Coblinine River which is highly saline. The local creeks are generally dry, only flowing after heavier than average winter rains or summer thunderstorms.

There is no permanent surface water in the area, due to the low rainfall, high evaporation and slight relief. Many farmers have small dams to water their sheep, but as they dry up quickly in the summer, they are not considered to be permanent surface water. Saline ground water is widespread through this wheat belt area but it is not generally suitable for agricultural application due to high salinity levels.

PROJECT DESCRIPTION

3.1 MINING

Mining will be an open pit operation using dump trucks and an excavator. Pre-mine development including the removal and stockpiling of the topsoil will be carried out using scrapers and dozers.

Waste rock from each pit will be stockpiled adjacent to the pit and contoured to blend with the local landscape. Drilling has indicated that any extraction of deeper ore would be from a decline from within the pit and not from a deepening of the pit. All known ore occurrences in this geological environment are small of the order of 100,000 to 200,000 tonnes so that it is relatively easy to blend the waste dump into the surrounding environment.

When mining is completed in the area the topsoil will be spread over the contoured waste dump and it will be cultivated and sown with either wheat or oats. It is intended that the land will be completely rehabilitated farm land with the exception of the open pits.

A fence will be erected on the eastern side of the waste area, so that the mining area is completely fenced in while mining operations are in force.

On completion of mining from the open pits a substantial fence will be erected around the pits as a safety measure and this will enable the farmer to carry out normal farming operations on the rest of the ground previously affected by mining operations.

Mining will have a minimal effect on rainwater run-off into nearby dams. However it is intended to install ditches along the perimeter of the pit walls to re-route any run-off into the drainage system using a culvert where necessary.

3.2 ORE PROCESSING

It is now proposed to locate the treatment plant immediately south of the Jinka's Hill pit on land which is available for purchase from the local landowner.

The treatment plant and facilities to treat 200,000 tonnes of ore per year will be arranged generally as shown in Figure 2 (Plant Area Site Plan). The plant area of 5.19 hectares will be completely fenced off with a substantial fence having gates to the tailings dam and the Wolyaming Road on the west.

This arrangement includes:

- (a) A two-stage crushing plant to crush R.O.M. ore to minus 10mm and store it in a closed fine ore bin.
- (b) A 500KW single ball mill in closed circuit with hydrocyclones arranged to grind ore to 80% minus 75 microns in a slurry which is 40% solids by weight. This slurry will be screened free of trash before pumping to the agitation section.

- (c) A carbon-in-pulp plant designed to match a residence time of 24 hours.
- (d) A tailings disposal and storage system including scavenger screen tailings pump and pipelines to allow the slurry to be pumped to all points around the perimeter of a walled settlement area of 7 hectares. A decant facility and return water pump and piping is provided to gather and return clear surplus water to the plant for reuse.
- (e) An atmospheric Zadra Elution System and gold room and smelting furnace for the recovery of gold from loaded carbon.
- (f) A reagent mixing and storage system.

Dust control will be by way of watering of roads and moistening of ore during crushing and handling and when stockpiled.

Chemicals will be handled, stored and reticulated to accord with current industry practice.

A drain will be installed around the plant using the natural contours of the land to collect any excess water or spillage in a sump that can be drained when required (Figure 2).

On completion of mining after the plant has been removed, the area will be cleaned up so that it can once again be used as farmland.

3.3 TAILINGS DAM

The location of the tailings dam is shown in Figure 2. It will be constructed to accord with Mines Department guidelines.

3.4 SUPPORT FACILITIES

These include a site office, workshop/store, laboratory, power supply (ex S.E.C.W.A.), and ablution block. Operating staff will be drawn from nearby farms or towns and will not be accommodated at the mine site.

3.5 WATER SUPPLY

The project water requirement for ore treatment will be approximately 650 kilolitres per day. The local saline groundwater is suitable for ore processing and it is planned to develop a small borefield in low-lying ground about one kilometre northwest of the plant. There is no existing use for this water. Badgebup is not within the Proclaimed Area subject to the Rights in Water and Irrigation Act and special bore licencing arrangements are not necessary.

About 10,000 litres per day of fresh water will be required for the gold room and domestic purposes. This will be obtained from the public water supply in Katanning and transported by road to the site.

A tailings dam will be constructed on a site to the south of the treatment plant. The site has been selected because of the poor agricultural quality of the soil, freedom from drainage problems and minimal visual impact. The walls of the dam will be constructed from impervious clay overburden stripped from the Jinka's Hill open cut. Care will be taken to ensure that the dam is constructed in such a way that there is no leakage through or below the dam walls. A collector drain will be installed around the outer perimeter of the wall to trap any fugitive effluent.

Effluent and waste water from the ablation block will be run into a standard septic system constructed to local authority requirements.

Waste oil, containers and other solid waste will be disposed of at a site approved by the Shire of Katanning or buried on site.

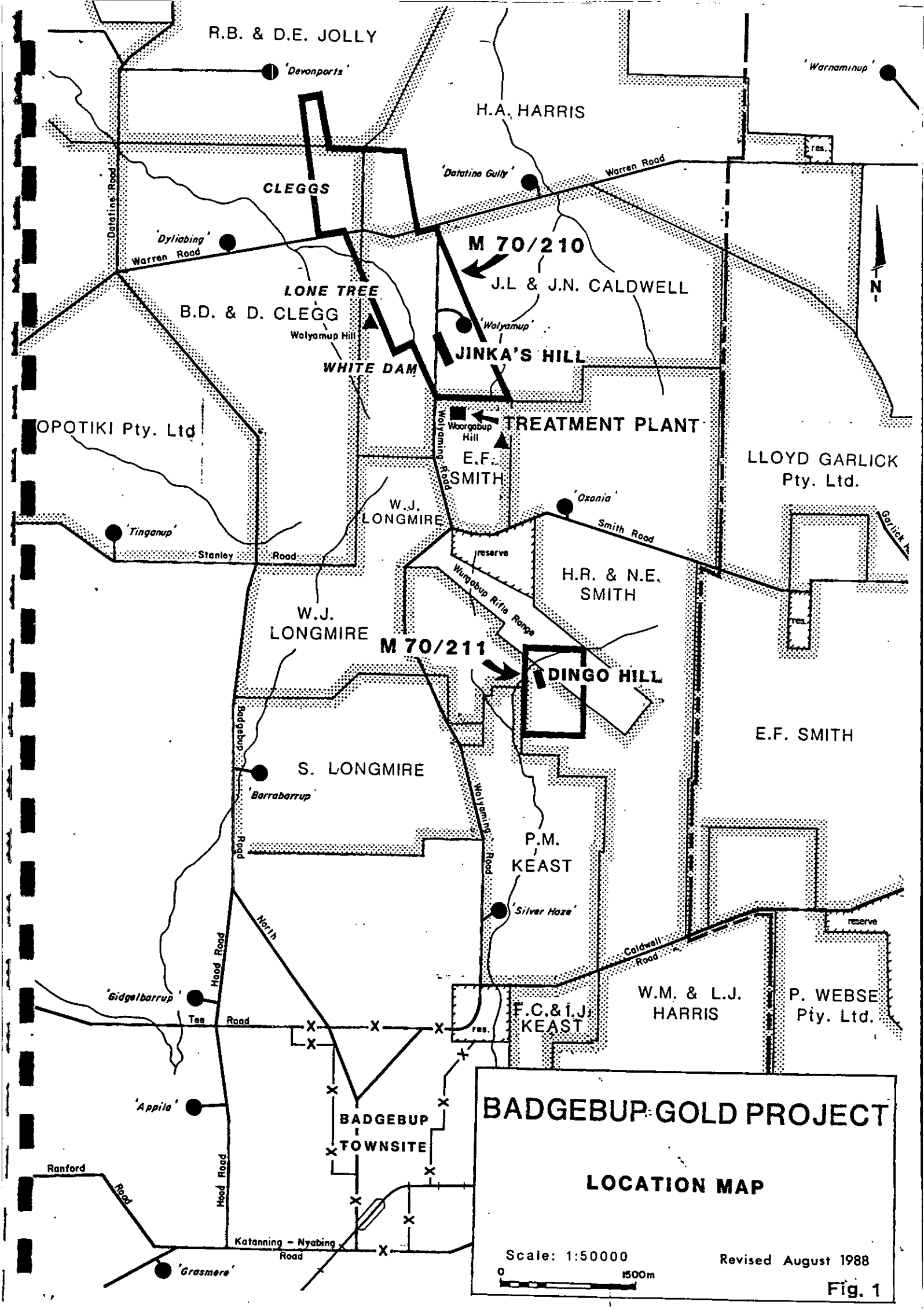
3.9 LAND REQUIREMENTS

The total area of land required for the project is 30 hectares. The land is currently all freehold farmland under private ownership. Agreement has been reached with each of the three private landowners who are affected by the project on the terms of compensation to be paid for damage and loss they will suffer as a result of the project activities.

The schedule below lists the affected landowners and the area of their land that will be affected.

LAND REQUIREMENTS

<u>Facility</u>	<u>Area Required</u>	<u>Location</u>	<u>Owner</u>
Jinka's Hill pit and waste dump	10 ha.	Kojonup Loc. 678	J.L. & J.N. Caldwell
Dingo Hill pit and waste dump	6 ha.	Kojonup Loc. 7564	H.R. & N.E. Smith
Dingo Hill ore haulage road	1 ha.	Kojonup Loc's. 1347, 7525, 5327	H.R. & N.E. Smith
Treatment Plant	5 ha.	Kojonup Loc. 7564	E.F. Smith
Tailings Pipeline	1 ha.	Kojonup Loc. 7564	E.F. Smith
Tailings Dam	7 ha.	Kojonup Loc. 7564	E.F. Smith



R.B. & D.E. JOLLY

H.A. HARRIS

CLEGGs

M 70/210

LONE TREE

J.L. & J.N. CALDWELL

B.D. & D. CLEGG

JINKA'S HILL

WHITE DAM

TREATMENT PLANT

OPOTIKI Pty. Ltd

E.F. SMITH

LLOYD GARLICK Pty. Ltd.

W.J. LONGMIRE

H.R. & N.E. SMITH

M 70/211

DINGO HILL

W.J. LONGMIRE

E.F. SMITH

S. LONGMIRE

P.M. KEAST

F.C. & I.J. KEAST

W.M. & L.J. HARRIS

P. WEBSE Pty. Ltd.

BADGEBUP TOWNSITE

BADGEBUP GOLD PROJECT

LOCATION MAP

Scale: 1:50000

Revised August 1988



Fig. 1

3.6 WORKFORCE

Plant

1 x Site Manager
1 x Maintenance Tradesman
2 x Crusher Operators - alternate maintenance assistants
2 x Loader Operators (2 shifts)
1 x Laboratory Technician
1 x Sample Prep
2 x General Hands (2 shifts)
4 x Wet Plant Operatos (2 shifts)

Pit

1 x Excavator Operator
2 x Dump Truck Drivers
1 x Geologist
1 x Sampler
1 x Pit Supervisor

3.7 TRANSPORTATION

Access to the mining operation is from Wolyaming Road which joins two main roads running east from Katanning, the Nyabing Road and Warren Road.

The Badgebup ore treatment plant will be sited adjacent to the major ore resource at Jinka's Hill and no material from the pit will be hauled on public roads. A short length of about 100 metres of Wolyaming Road will have to be deviated around the northern end of the Jinka's Hill pit. This has been agreed in principle with the Katanning Shire Council and the landowner concerned.

An agreement will be reached with the Katanning Shire on the possible use of the Wolyaming Road by the company. Discussions have already been held with the Shire Engineer.

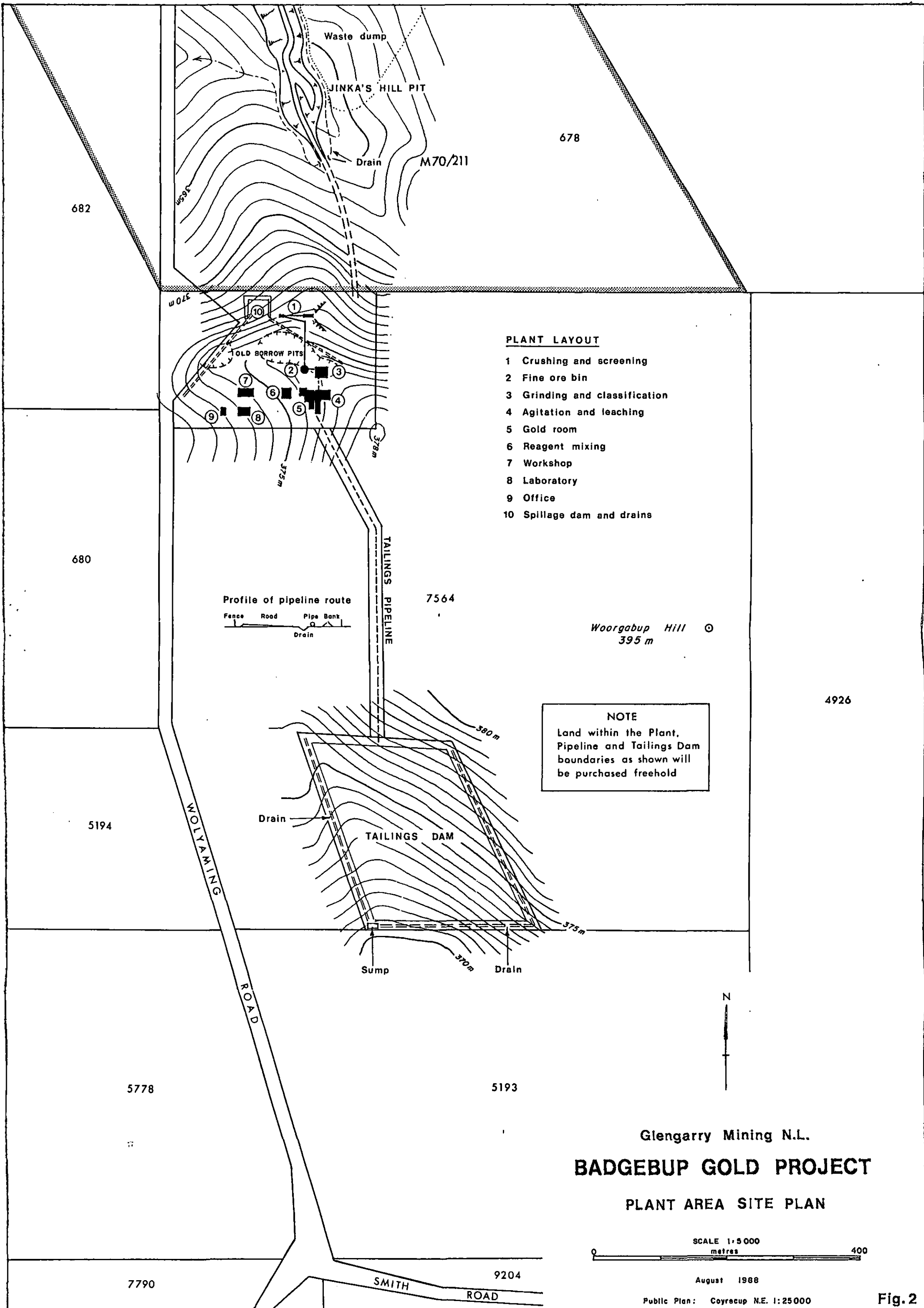
The S.E.C. grid line passes just to the west of the mine site.

Currently there are not water supply lines in the region.

3.8 WASTE PRODUCTS

Waste products will consist of 760,000 cubic metres of clay overburden and waste rock and 170,000 cubic metres of mill tailings.

Waste rock from each pit will be stockpiled adjacent to the pit and contoured to blend with the local landscape. When stockpiling is complete the waste dumps will be covered with a layer of previously stockpiled topsoil and reseeded with grasses and other vegetation. In the later stages of mining it may be possible to dump some of the waste rock back into mined-out sections of the open pit.



Waste dump

JINKA'S HILL PIT

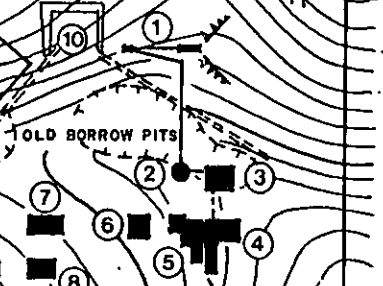
Drain

M70/211

678

682

M70/211



OLD BORROW PITS

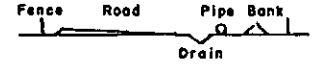
M70/211

M70/211

PLANT LAYOUT

- 1 Crushing and screening
- 2 Fine ore bin
- 3 Grinding and classification
- 4 Agitation and leaching
- 5 Gold room
- 6 Reagent mixing
- 7 Workshop
- 8 Laboratory
- 9 Office
- 10 Spillage dam and drains

Profile of pipeline route



7564

Woorgabup Hill 395 m

4926

NOTE
Land within the Plant, Pipeline and Tailings Dam boundaries as shown will be purchased freehold

Drain

TAILINGS DAM

380 m

5194

WOOLLYAMING ROAD

Sump

Drain

375 m

370 m

5778

5193



Glengarry Mining N.L.

BADGEBUP GOLD PROJECT

PLANT AREA SITE PLAN

SCALE 1:5000 metres



August 1988

Public Plan: Coyrecup N.E. 1:25000

7790

9204

SMITH ROAD

ROAD

Fig.2

APPENDIX A

Letter from the Department of Conservation and Environment

to

The State Mining Engineer

29th August 1986



Department of
CONSERVATION and ENVIRONMENT

State Mining Engineer
Department of Mines

Attention: Mr E Shenton

your ref. 5759/84
our ref. 85/86/004006 WC:cc
enquiries W CARR

NOTICE OF INTENT - BADGEBUP GOLD PROJECT ML 70/210, 211

I refer to your letter of 1 August 1986 concerning the above proposal.

It is generally considered that this proposal is environmentally acceptable and conforms with present industry standards. However the following should be considered in the development of the project.

1. Rehabilitation

- 1.1 It is proposed that the mine site, except for open pits, are left in a suitable condition to permit farming. This would require establishment of satisfactory soil conditions on waste dumps, the tailings dam, backfilled open cuts and other disturbed areas. It would be essential that the top 150 mm to 200 mm of soil were recovered from proposed waste dump and tailings dam areas. This should be stockpiled for later respreading over the disturbed areas.
- 1.2 The NOI indicates that stability of the tailings dump to wind and water erosion will be a rehabilitation goal. Because of the saline process water, it would be important to cover the completed tailings areas with a layer of coarse rock (say 1 to 2 m thick) before the final topsoil layer is distributed. This action would reduce surface salt effects that could retard plant growth.
- 1.3 To aid in rehabilitation, overburden dumps and the tailings dam should be shaped during construction so that they blend in with the surrounding topography.

2. Haul Roads

The haul road to the Dingo Hill Mine should be designed and managed so that it does not impede drainage to farm dams or cause dust effects to adjacent crops.

3. Tailings Disposal

3.1 Groundwater monitoring bores should be established around the perimeter of tailings disposal areas to determine if surface water storages or crop productivity could be affected by localised increases in groundwater levels. The Company should make a commitment to reducing such a groundwater rise if it occurs.

3.2 If surface seepage occurs from tailings dam walls, the Company should make a commitment to confining the flow, returning any excess to the dam and carrying out engineering to minimise the seepage.

3.3 The Company should consider reuse of tailings decant water in the process. This would reduce both water storage in the tailings and the potential for seepage from the tailings disposal site.

3.4 The occurrence of bird mortalities should be monitored and the results reported to the Department of Mines.

4. Treatment Plant

Dust control will be necessary to avoid traffic hazards on Wolyaming Road and dust effects on adjacent vegetation.

5. Mining Activities

5.1 The effects from airblast and noise from blasting and from general mining/processing activity on nearby residents should be monitored and maintained within reasonable levels.

5.2 Final stability of open pits should be considered.

D H VIOL
ACTING DIRECTOR

29 August 1986

ASSOCIATED GOLD FIELDS N.L.
SOUTHWEST GOLD MINES N.L.

BADGEBUP GOLD PROJECT
WESTERN AUSTRALIA
NOTICE OF INTENT

May 1986

H.D. Kennedy,
Chairman,
Associated Gold Fields N.L.

J.M. Clema,
Chairman,
Southwest Gold Mines N.L.

ASSOCIATED GOLD FIELDS NL

(Incorp. in N.S.W.)

96 Parry Street
East Perth, W.A. 6005
P.O. Box 8260, Perth, Stirling Street, W.A. 6000
Telephone (09) 328 3600
Facsimile (09) 328 6362

May 8, 1986

Department of Conservation and Environment,
B.P. House,
1 Mount Street,
PERTH, W.A., 6000

ATTENTION: Mr W. Carr

Dear Sir,

Re: Badgebup Gold Project - Notice of Intent

We enclose for your attention eight copies of the above Notice of Intent.

If you have any queries on the content of the report, please call Mr Clemen or myself at this office.

Yours faithfully,



P.J. HOGARTH,
ADMINISTRATIVE OFFICER.

Encl.

ASSOCIATED GOLD FIELDS NL

(Incorp. in N.S.W.)

96 Parry Street
East Perth, W.A. 6005
P.O. Box 8260, Perth, Stirling Street, W.A. 6000
Telephone (09) 328 3600
Facsimile (09) 328 6362

May 8, 1986

Mr J. Clema,
Southwest Gold Mines N.L.,
G.P.O. Box D181,
PERTH, W.A., 6000

Dear John,

Re: Badgebup Gold Project - Notice of Intent

Enclosed for your records is a copy of the above Notice of Intent.

The Notice has been submitted to the Department of Conservation and Environment in Perth. They will refer it to other Departments for comments and recommendations and in due course to the Environmental Protection Authority for approval.

Yours sincerely,



P.J. HOGARTH,
ADMINISTRATIVE OFFICER.

Encl.

ASSOCIATED GOLD FIELDS NL

(Incorp. in N.S.W.)

96 Parry Street
East Perth, W.A. 6005
P.O. Box 8260, Perth, Stirling Street, W.A. 6000
Telephone (09) 328 3600
Facsimile (09) 328 6362

July 1, 1986

The Director,
Department of Mines,
Mineral House,
66 Adelaide Terrace,
PERTH, W.A., 6000

Dear Sir,

Re: Mining Leases 70/210 and 70/211
Badgebup Gold Project Notice of Intent

We enclose for your attention a copy of the Notice of Intent for the above project.

The Notice has also been submitted to the Department of Conservation and Environment.

If you have any queries concerning the Notice or the Badgebup project, please refer them to this office.

Yours faithfully,



P.J. HOGARTH,
ADMINISTRATIVE OFFICER.

Encl.

ASSOCIATED GOLD FIELDS NL

(Incorp. in N.S.W.)

96 Parry Street
East Perth, W.A. 6005
P.O. Box 8260, Perth, Stirling Street, W.A. 6000
Telephone (09) 328 3600
Facsimile (09) 328 6362

July 14, 1986

Mr T. Ruland,
Shire Clerk,
Katanning Shire Council,
Austral Terrace,
KATANNING, W.A., 6317

Dear Sir,

Re: BADGEBUP GOLD PROJECT - NOTICE OF INTENT

We enclose for your attention a copy of the Notice of Intent for the above project.

The Notice has been submitted to the Department of Conservation and Environment and they have requested that we forward this copy to you. I understand they will contact you in the near future for your comments on the Notice.

Please note that the plant lay out as shown on the plan is schematic only, as negotiations with the various landowners are still in progress and the area of land to be included in the plant site has not been fully determined.

Yours faithfully,



ADMINISTRATIVE OFFICER.

Encl.

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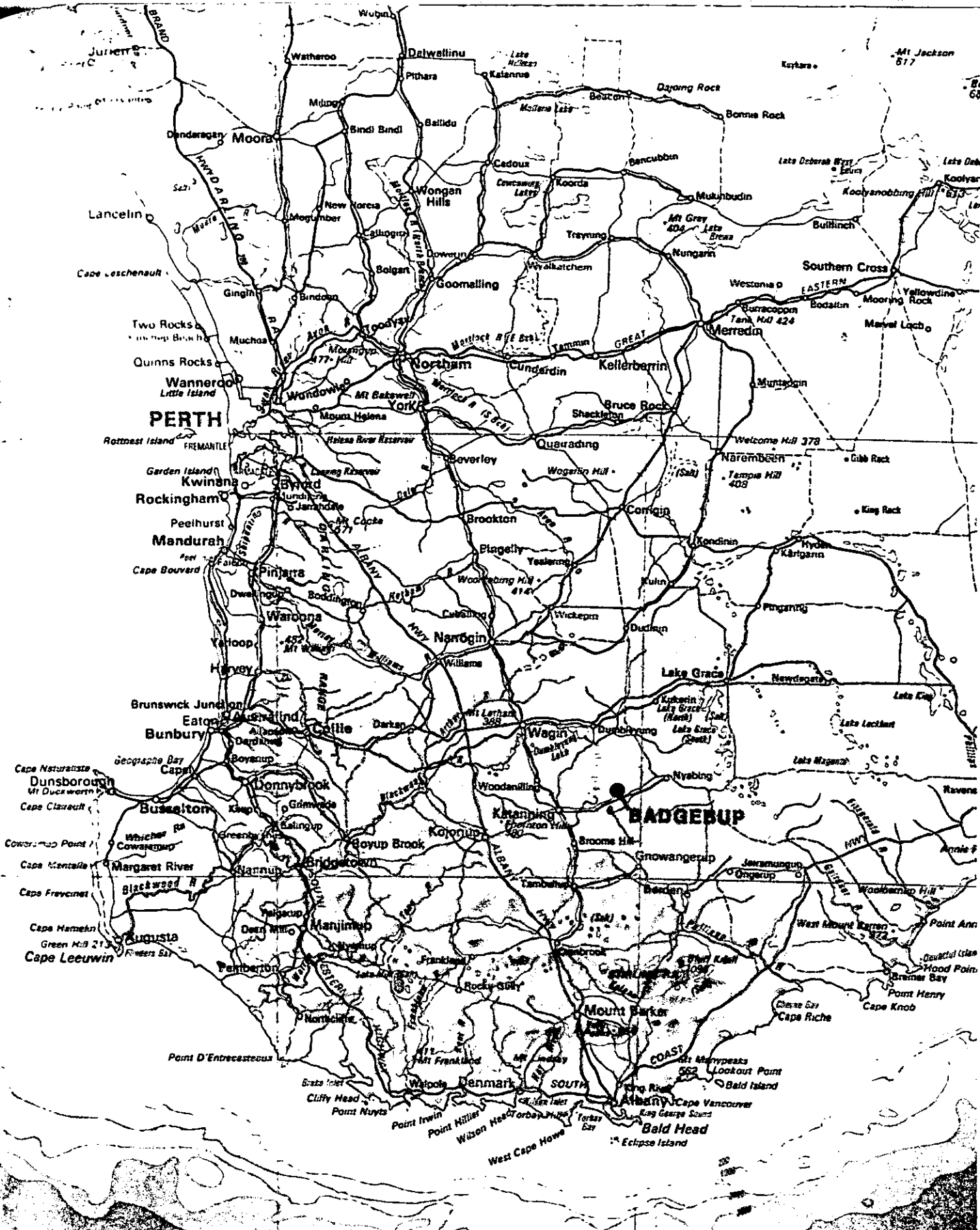
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BADGUBUP GOLD PROJECT

REGIONAL LOCATION

Scale: 1:2,500,000 Date: April '86.

0 75 kms

Figure 1

1.0 TITLE AND OWNERSHIP

Badgebup Gold Project

The Project is 70% owned by Associated Gold Fields N.L. and 30% owned by Southwest Gold Mines N.L. The Head Office of Associated Gold Fields N.L. is:

5th Floor,
169 Miller Street,
NORTH SYDNEY, N.S.W., 2060
Telephone: (02) 957 2177

and the Head Office of Southwest Gold Mines N.L. is:

Ground Floor,
524 Hay Street,
PERTH, W.A., 6000
Telephone: (09) 325 8799

The local office for Associated Gold Fields N.L. who is the Project Manager is:

96 Parry Street,
EAST PERTH, W.A., 6000
Telephone: (09) 328 3600
Fax: (09) 328 6362

Both Associated Gold Fields N.L. and Southwest Gold Mines N.L. are Australian publicly listed Mineral Exploration Companies with majority Australian ownership. Otter Exploration N.L. has a 33.6% interest in Associated Gold Fields N.L. and a 6.4% interest in Southwest Gold Mines N.L. giving it an indirect 25.40% equity in the project. Otter has established and operated since 1983 a successful gold recovery plant at Griffins Find near the town of Lake Grace some 70 kilometres north west of the planned Badgebup operation.

Otter Exploration N.L., Associated Gold Fields N.L. and Southwest Gold Mines N.L. all have two common directors. The same professional staff responsible for the construction and running of the Griffins Find Plant will be involved in the construction and commissioning of the Badgebup operation.

It is the Companies' wish to bring the mine into production as soon as possible, using various consulting and engineering contractors. When the plant is commissioned Associated Gold Fields N.L. will control and manage all aspects of gold production.

The deposit is located near the township of Katanning as shown on the Regional Location Map (Figure 1).

Since 1979, various geological studies have been completed and gold exploration work is continuing in the general project area. Both Associated Gold Fields N.L. and Southwest Gold Mines N.L. hold or

have an interest in various mining and exploration tenements in the Lake Grace - Katanning area.

2.0 BASIS OF PROPOSAL

The Badgebup Gold Project will be a small open cut mining and ore treatment operation located on private farm land with the work force housed in the township of Katanning. The project life is expected to be four years from the start-up date unless further economic ore reserves are proven within that period.

3.0 GENERAL PROJECT DESCRIPTION

3.1 History, Location and Access

3.1.1 History

Consequent to the discovery of significant mineralisation at Griffins Find (Lake Grace) in July of 1979 by Otter Exploration N.L., Otter in joint venture with an associated company, Allstate Explorations N.L. commenced regional prospecting aimed at locating further occurrences of gold mineralisation in the surrounding district. This joint venture was later incorporated as Associated Gold Fields N.L.

In August 1979 assay results received from two stream samples collected from the Datatine Road road reserve adjacent to the north west corner of Kojonup Location 675 and the south west corner of Kojonup Location 3136 contained anomalous quantities of gold.

The Jinkas Hill deposits themselves have no surface expression and were discovered by drilling a soil anomaly which was probably derived from a small gold bearing outcrop which occurs to the east of the Jinkas Hill deposit and which was discovered in November 1979. Eight samples from that outcrop averaged 7.4g gold/tonne.

The surface expression of the Dingo Hill deposit was not discovered until March 1980 when seven samples of float assayed an average of 7.44g gold/tonne.

Although the area lies adjacent to the Holland Track, which was the overland route taken by the majority of Eastern States prospectors to the gold discoveries at Coolgardie and Kalgoorlie during the gold rushes of the early 1890's there is remarkably little evidence of former prospecting in the region. None of the deposits discovered by Associated Gold Fields N.L. showed any evidence of former prospecting. However old prospect pits which have been discovered on Flora and Fauna Reserve 24072 were sunk on the mineralised horizon which extends between the Jinkas Hill deposits and the Dingo Hill deposits. Another small pit located on the summit of Jinkas Hill was apparently excavated by a former Goldfields prospector, George Yarro Bilston, whilst searching (Circa 1900) for buried treasure supposedly from the wreck of the Gilt Dragon. Mr Bilston is also credited with excavating the pits on the Flora and Fauna Reserve, in the period between 1899 - 1904.

The only other evidence of former prospecting was in May 1957 when Eugene Joseph Cantwell, a farmer of

Dumbleyung, applied for a prospecting area for copper (PA 390 PP) in the south west corner of Kojonup Location 3248. This locality is immediately on strike from the Cleggs deposit. The 'copper' discovered by Mr Cantwell apparently turned out to be epidote and the prospecting area was withdrawn in August of that year.

The area of the proposed operation at Jinkas Hill was first settled by the Warren family in 1898 when Pastoral Lease No's 48/3603 - 48/3607 inclusive were acquired by R.W.A. Warren. These Leases and the surrounding vacant Crown land were gradually acquired or converted to freehold titles (Kojonup Locations 672 - 682) in the period 1905 - 1918 by the Warren family. The existing freehold property owners are descendants of the original settlers.

3.1.2 Location

The Badgebup Gold Project is situated 300 kilometres south east of Perth, Western Australia. The location is at latitude $30^{\circ}32'20''S$ and longitude $117^{\circ}55'00''E$ (Figure 1). The Badgebup Gold Project is situated about 36 kilometres east north east of the township of Katanning. The Jinkas Hill deposits are contained within Kojonup Land Location 678 which forms portion of the private (freehold) farming property of J.L. and J.N. Caldwell of 83 Conroy Street, Katanning and the Dingo Hill deposit situated 3.5 kilometres southerly is contained wholly within Kojonup Location 7533 which forms portion of the private (freehold) farming property of H.R. and N.E. Smith of Badgebup via Katanning.

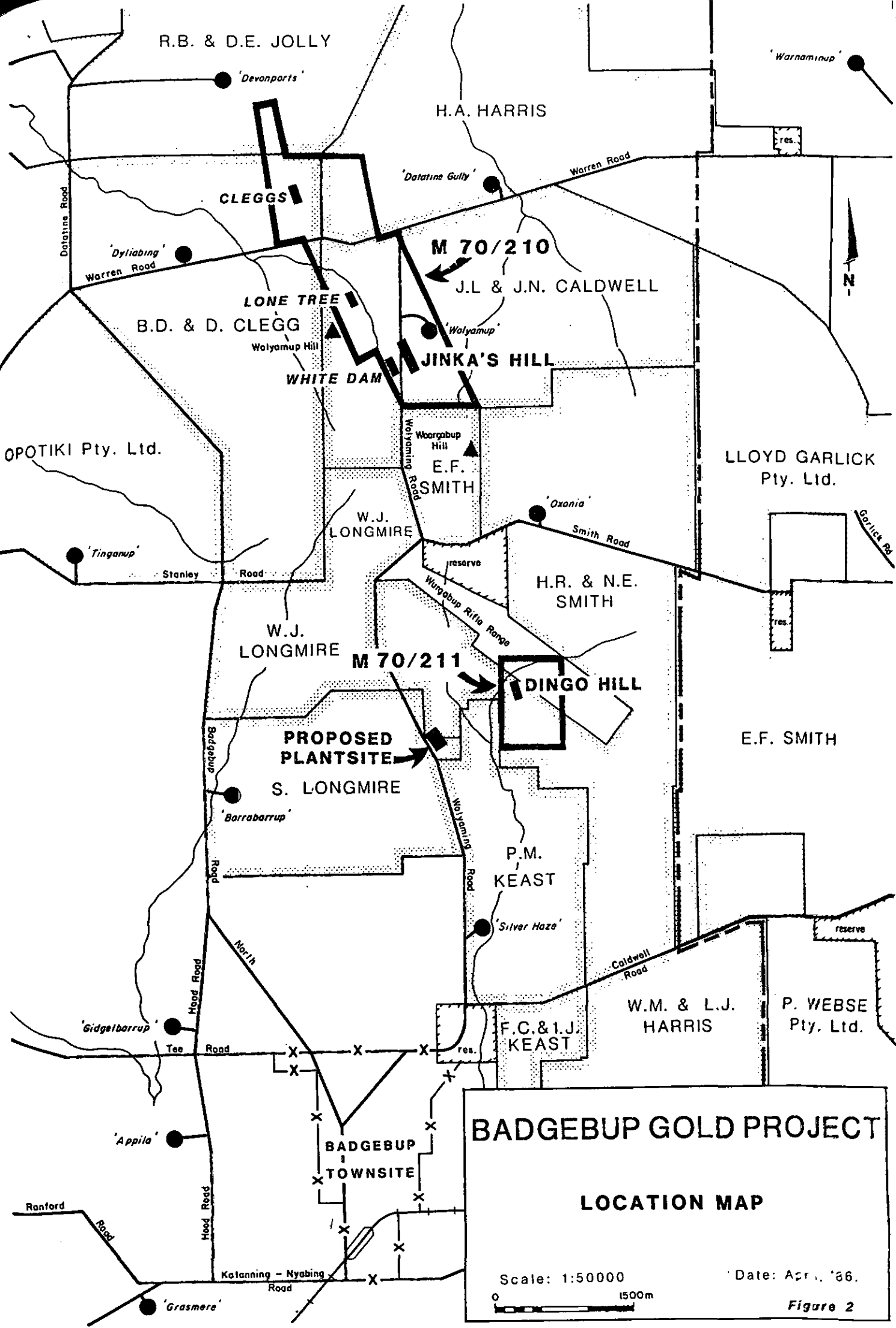
3.1.3 Access

The project site is well serviced by all transport systems. There is a good quality gravel airstrip located at the township of Katanning. Westrail's Badgebup Siding on the Katanning to Nyabing Line is located six kilometres southerly from the Dingo Hill deposits.

The bitumen Katanning - Nyabing Road is situated next to the rail line and the gravel roads in the area of the Project are of a good quality. In addition the Warren Road which passes 1.5 kilometres north of the Jinkas Hill deposit is bitumenised from Katanning to within three kilometres of the proposed mill site.

3.2 Mining Techniques and Ore Grade

The gold project is of a small size and has an expected operating life of four years based on established ore



R.B. & D.E. JOLLY

H.A. HARRIS

'Warnaminup'

CLEGG'S

'Datatine Gully'

Warren Road

Datatine Road

'Dyliabing'

Warren Road

M 70/210

J.L. & J.N. CALDWELL

LONE TREE

B.D. & D. CLEGG

Wolyamup Hill

'Wolyamup'

JINKA'S HILL

WHITE DAM

OPOTIKI Pty. Ltd.

LLOYD GARLICK Pty. Ltd.

Wolyamup Road

E.F. SMITH

W.J. LONGMIRE

'Oxonia'

Smith Road

'Tingarup'

Stanley Road

H.R. & N.E. SMITH

W.J. LONGMIRE

M 70/211

DINGO HILL

PROPOSED PLANTSITE

S. LONGMIRE

E.F. SMITH

Badgebup Road

'Barrabarrup'

P.M. KEAST

'Silver Haze'

Hood Road

North

Caldwell Road

'Gidgelbarrup'

Tee Road

F.C. & I.J. KEAST

W.M. & L.J. HARRIS

P. WEBSE Pty. Ltd.

'Appila'

BADGEBUP TOWNSITE

BADGEBUP GOLD PROJECT

LOCATION MAP

Scale: 1:50000

Date: April '86.



Figure 2

Ranford Road

Katanning - Nyabing Road

'Grasmere'

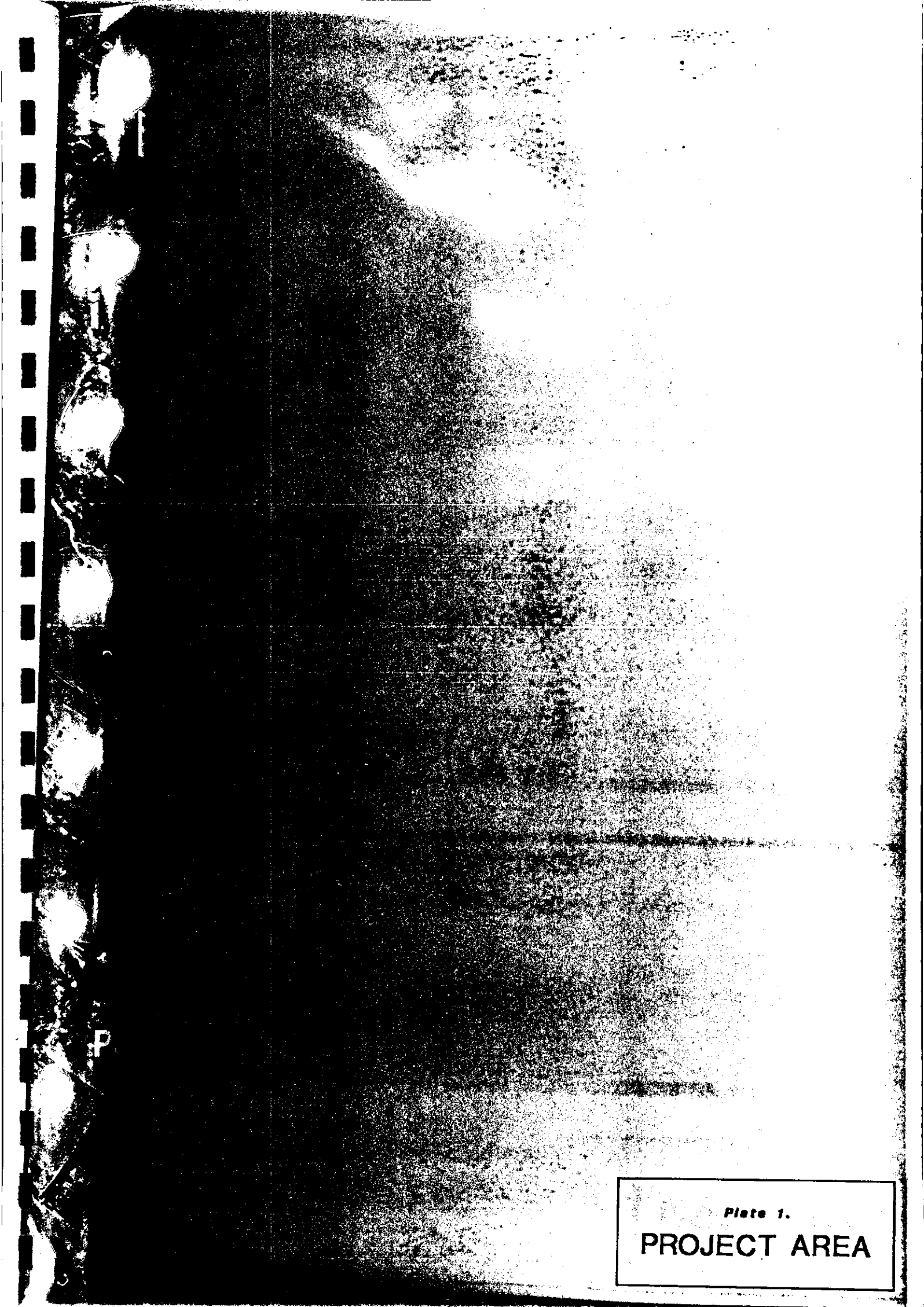
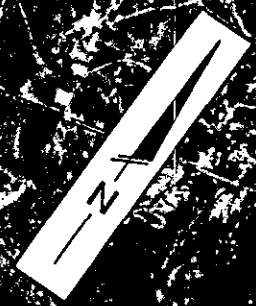
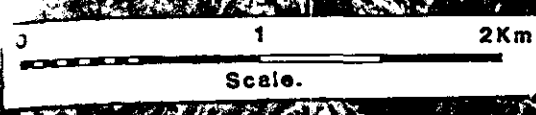


Plate 1.
PROJECT AREA



WOLYAMUP HILL

ML 70 211

JINKAS HILL

WOORGABUP HILL

PLANT SITE

DINGO HILL
ML 70 210

WARREN ROAD

WOLYAMING ROAD

reserves. The project is based on the mining of gold ore bodies which are exposed at the surface. The geologic resource which is based on approximately 280 drill holes has been calculated for each deposit as approximately:

<u>Deposit</u>	<u>Tonnes</u>	<u>Grade (g Au/tonne)</u>	<u>Classification</u>
Jinkas Hill	335,605	3.06	Probable
Dingo Hill	336,800	2.02	Possible
Cleggs	157,537	2.6	Possible
Lone Tree	300,000	1.7	Possible
White Dam	<u>72,050</u>	<u>2.6</u>	Possible
Total identified resource to max. 40m depth	<u>1,201,991</u>	<u>2.34</u>	Possible/Probable

Probable mining reserves have been calculated for two of these deposits as follows:

<u>Deposit</u>	<u>Tonnes</u>	<u>Grade (g Au/tonne)</u>	<u>Waste:Ore Ratio</u>
Jinkas Hill	230,600	3.39	4:1
)	167,100	2.46	5:1
Dingo Hill)	or		
)	74,100	4.13	5.1:1

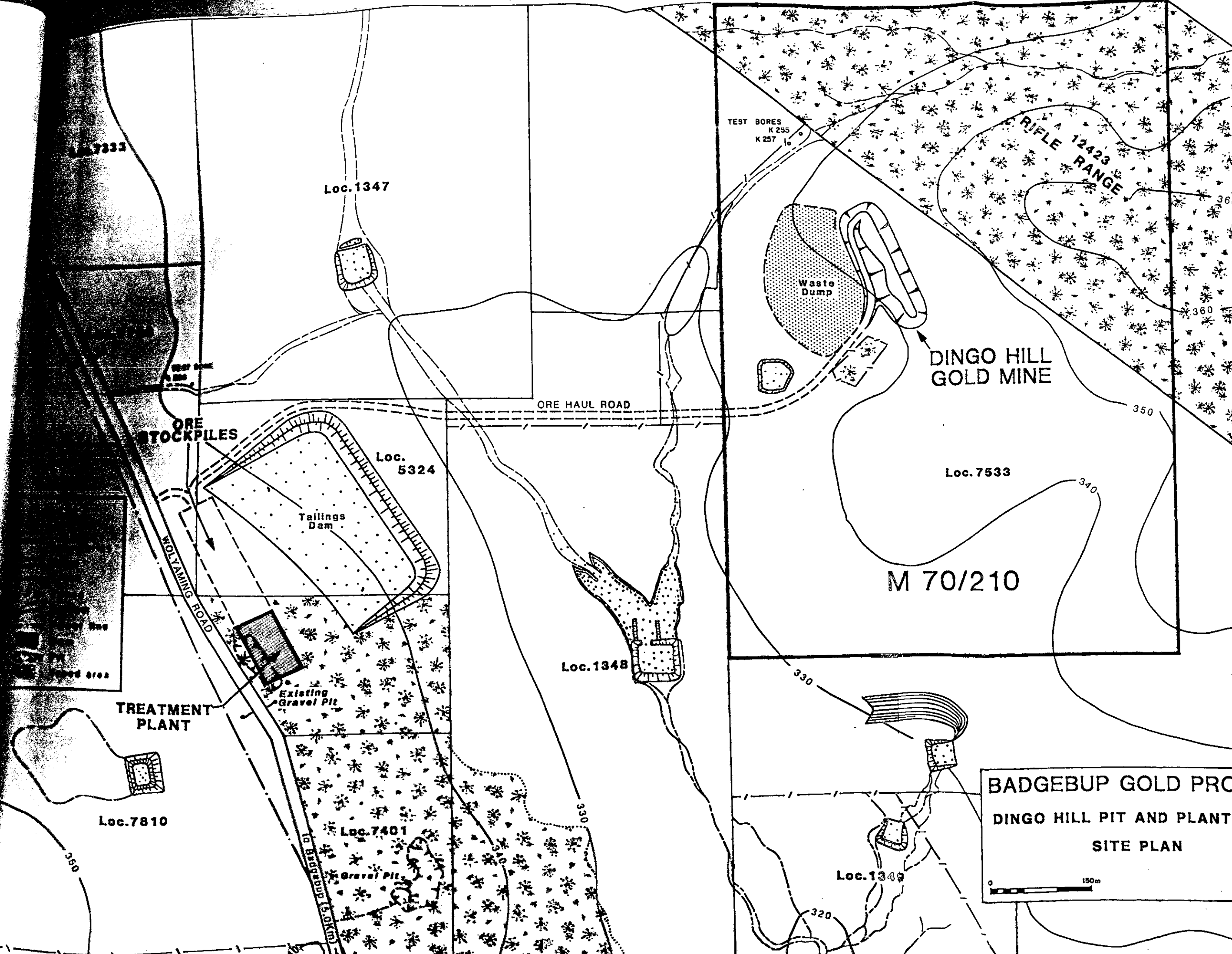
Further drilling is needed on some of the other areas for which a geologic resource has been calculated before a useable mining reserve can be determined.

The ore will be mined by open cut methods to a depth of about 30 metres. It is proposed that the actual mining will be carried out by a mobile bucket excavator which will load directly into two conventional trucks for stockpiling at the primary crusher. Waste rock associated with the open cut design at this stage is expected to be about five times the tonnage of the actual ore mined. Mining will be done under contract.

The treatment plant and its associated facilities, including the tailings storage, is expected to occupy an area of less than 10 hectares. Associated Gold Fields N.L. will operate the mining and crushing sections during day shift only, and the rest of the operation will run continuously.

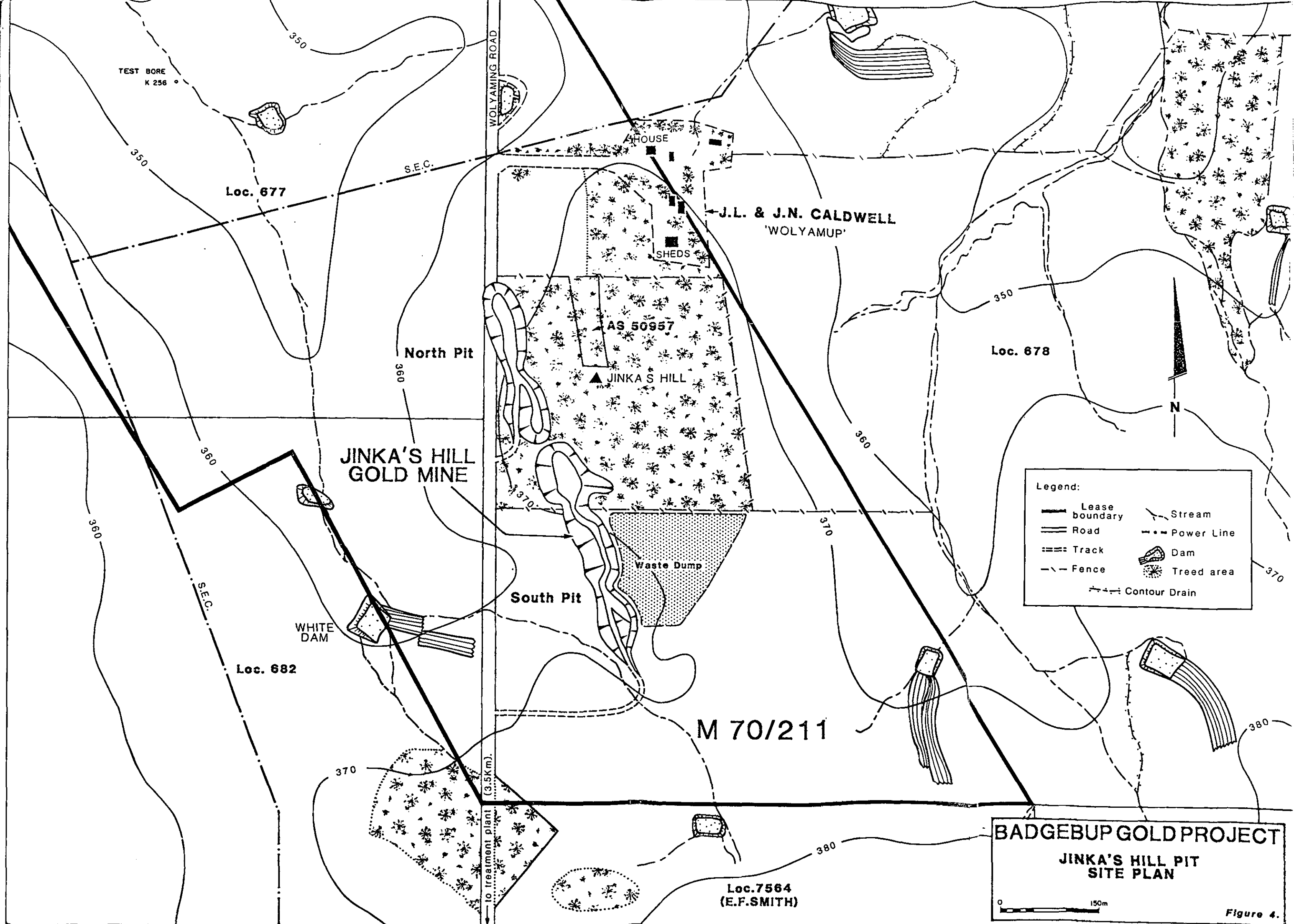
3.3 Power Supply

Electrical power will be drawn from the local S.E.C. grid and is expected to peak at 600 KVA.



**BADGEBUP GOLD PRC
DINGO HILL PIT AND PLANT
SITE PLAN**

0 150m



Legend:

Lease boundary	Stream
Road	Power Line
Track	Dam
Fence	Treed area
Contour Drain	

BADGEBUP GOLD PROJECT
JINKA'S HILL PIT
SITE PLAN

0 150m

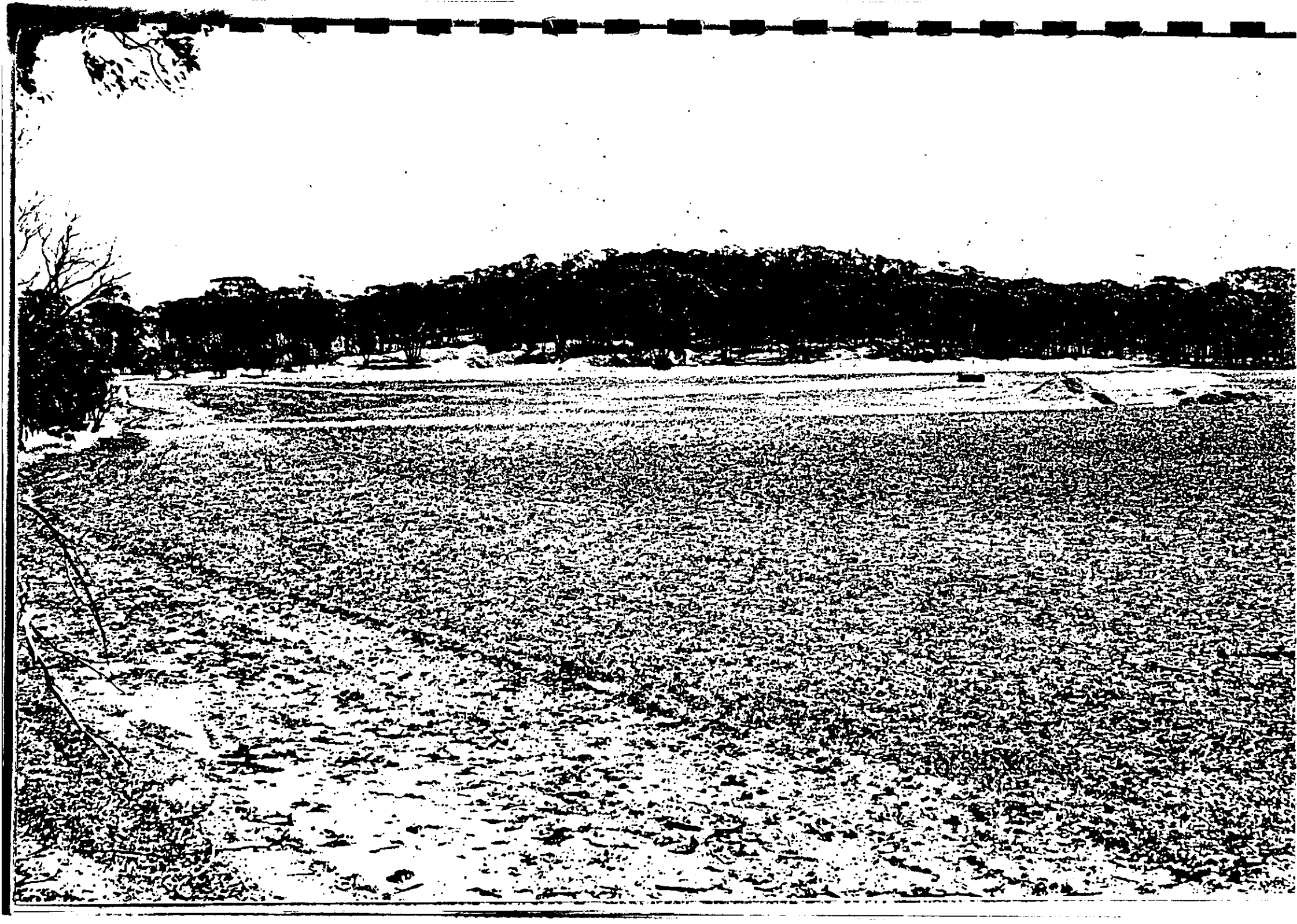
Figure 4.

WOLV... 10-1

NORTH



Plate 2.
JINKA'S HILL



COUNT

plate 3
**DINGO HILL
AND
TREATMENT PLANT
SITE**



3.4 Ore Treatment

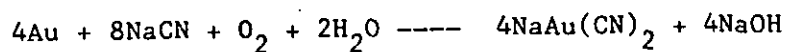
The gold extraction plant will be located on private land 1 kilometre from the Dingo Hill open cut. The plant will be of a standard carbon in pulp design incorporating:

- (a) Crushing, screening and milling circuits.
- (b) Cyanidation and gold adsorption.
- (c) Tailings disposal.

Refer to the Process Flowsheet (Figure 5) for a schematic of the carbon in pulp circuit.

3.4.1. Hydrometallurgical Circuit

The overall chemical equation, generally accepted, for the dissolution of gold in weak cyanide solutions is Elsner's equation.

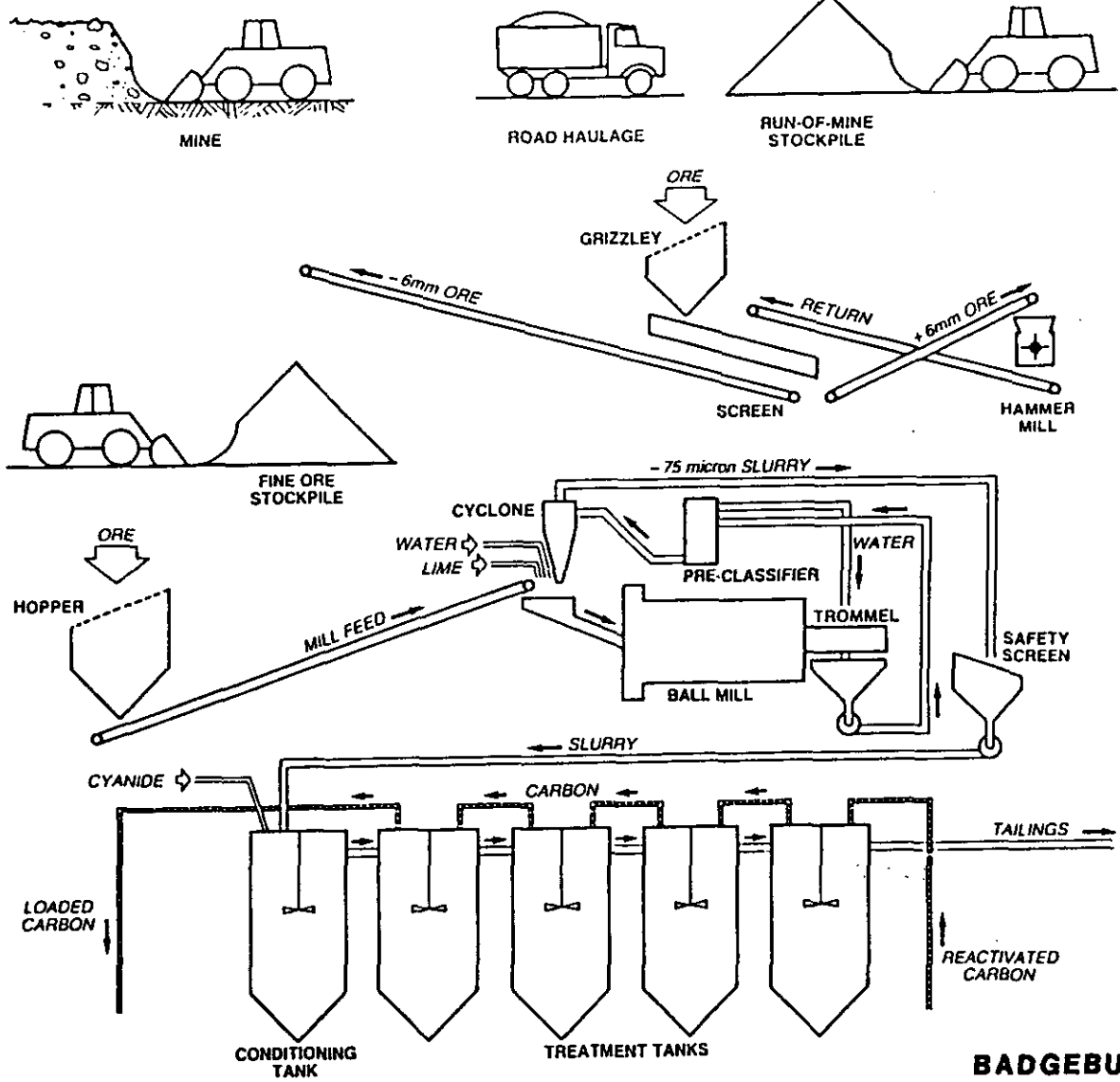


When the gold has dissolved, the pulp moves from the leach vessels to the adsorption tanks.

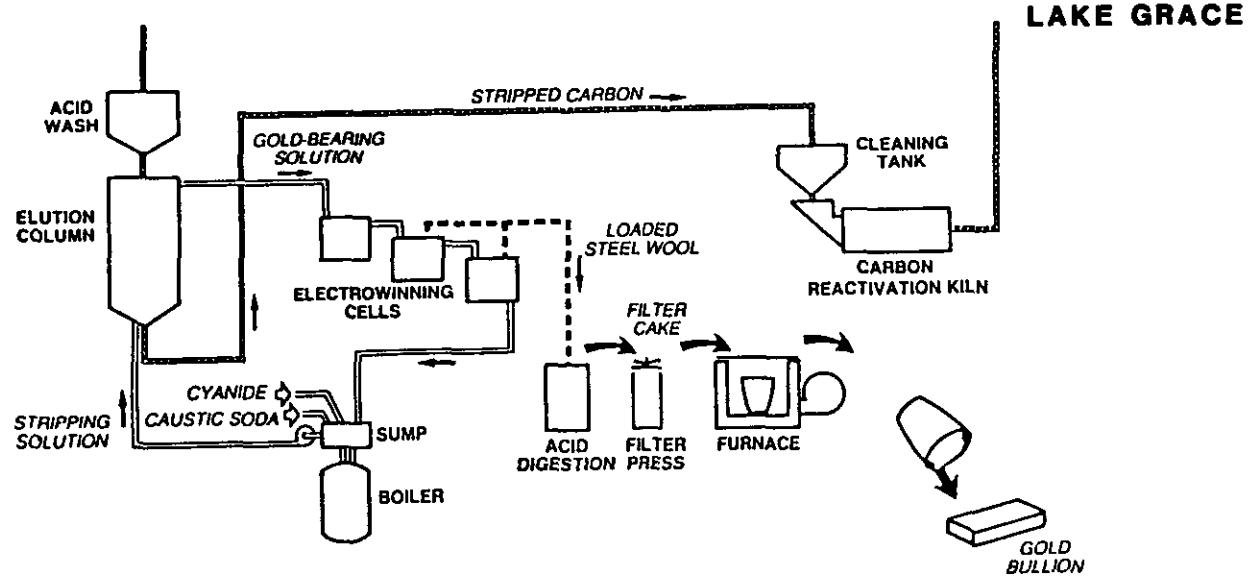
In these tanks the granular carbon (usually between 6 and 16 mesh) is moved counter-current to the cyanide pulp. Counter-current operation is used because the amount of gold that is adsorbed on the carbon is in equilibrium with the residual gold concentration in the solution, and therefore low gold tailings in the final stage can be obtained only if the pulp in this stage is contacted with fresh carbon. The gold is adsorbed onto the carbon as gold cyanide complex, $\text{Au}(\text{CN})_2$, either in the calcium auro-cyanide or hydrogen aurocyanide form, depending on the pH of the cyanide solution and the concentration and character of the "spectator" actions present.

Carbon removed from the adsorption tanks will be transferred to Otter Exploration N.L.'s existing Gold Treatment Plant at Lake Grace for desorption and recovery of gold.

Gold recovery from the activated carbon is accomplished by desorbing the gold values from the carbon and electro-winning the values from the resulting strip solutions. This permits repeated use of the carbon. The process, employs a 1.0 per cent NaOH, 0.5 per cent NaCN strip solution at near 100 degrees C to desorb the gold from the carbon. The precious metal values contained in the strip solution are electrowon from the solution, and the barren solution recycled for additional stripping. About 24 hours of desorbing is required to recover the gold from the carbon.



BADGEBUP



LAKE GRACE

**BADGEBUP GOLD PROJECT
SCHEMATIC FLOWSHEET**

Figure 5.

Barren tailings will be pumped to a tailings dam constructed adjacent to the plant site. Material in the tailings pulp will contain about equal quantities of solids and water. The water will be recovered and recirculated to the treatment plant. All waste water products from the plant, excluding sewage, will be disposed of through the tailings pipe.

3.5 Mine and Mill Water Supply

A localised saline ground water supply system comprised of a borefield (about six bores), pumping, piping and storage, will be installed as no surface water is available in the area. The exact layout of the borefield will be decided after completion of test drilling. Additional water will be drawn from the open pits.

The estimated requirements for ground water by the process plant will be approximately 500 tonnes per day.

Four test wells were drilled in the general area to test flow rates and chemical analysis of the ground water for the district.

The following analysis was obtained.

<u>Sample Number</u>	<u>Na (ppm)</u>	<u>Mg</u>	<u>Cl</u>	<u>Ca</u>	<u>Fe</u>	<u>TDS</u>	<u>pH</u>
K-255	3580	730	7270	210	1	15130	7.55
K-256	1460	475	3830	270	1	8780	7.7
K-257	3210	710	6740	48	1	14650	7.69
K-258	2420	320	4330	195	1	8600	7.4

Water for human consumption will be pumped and carted from the closest standpipe location.

4.0 BENEFITS EMANATING FROM PROPOSED PROJECT

The proposed Project will develop two open cut mines of modest size and reasonable gold grade within the near future. Production rates planned are on a scale satisfactory to financial considerations, while simultaneously creating a minimum of disruption in the area.

Transport of the work force, equipment and consumables can be managed by the existing road network.

People of the Katanning area will be offered employment both during construction and for day and shift work on the plant. The Companies believe that the establishment of a mining operation in the Katanning area will have a beneficial economic impact on the community.

Employment levels as indicated by the Metallurgical Feasibility Study are as follows:

- Operations General Foreman
- Maintenance General Foreman
- Clerk - Storeman
- Tradesmen (three)
- Operators (eight)

TOTAL of 14 people

The contract mining company that will be retained to excavate the open pit is expected to have a work force of six men.

Drilling results strongly suggest that deeper ore extensions exist, and these could be extracted using open stope techniques. Such extensions would prolong the total life of the Project.

Further exploration and development of these reserves will take place during the open cut mining period.

The Project is expected to generate profits for the Companies, and will provide a base for increased mineral exploration in the South West region. The State of Western Australia will benefit from the increased regional activity, payroll taxes and various other payments.

5.0 PREVAILING ENVIRONMENTAL CONDITIONS

5.1 The Environmental Consultant

A suitable Environmental Consultant will be retained by the Companies to study the existing environment. Copies of all such studies will be made available when received. This consultant will also be retained to supervise the environmental management of the Project when the mine is in production.

5.2 Location and Land Use

The Badgebup Project is located within the Great Southern Wheatbelt system. Refer to the aerial photograph (Plate No. 1) for a general view of the mine site location. Land in the Badgebup district has been extensively cleared and is used for wheat and sheep farming. Other land uses in the area include a reserve of some 126 hectares used as a rifle range by the Wurgabup Rifle Club and a Flora and Fauna Reserve of 49 hectares adjoining the Rifle Range.

5.3 Geographic Controls

The topography and vegetation of the district is typical of the Great Southern Wheatbelt region, see Plates 2 and 3 and Figure 6. Most of the natural vegetation has been replaced by farming paddocks, leaving natural bush only in reserves or areas unsuitable for agriculture.

Topography within the Badgebup area is gently undulating with maximum relief of about 70 metres over a distance of three kilometres.

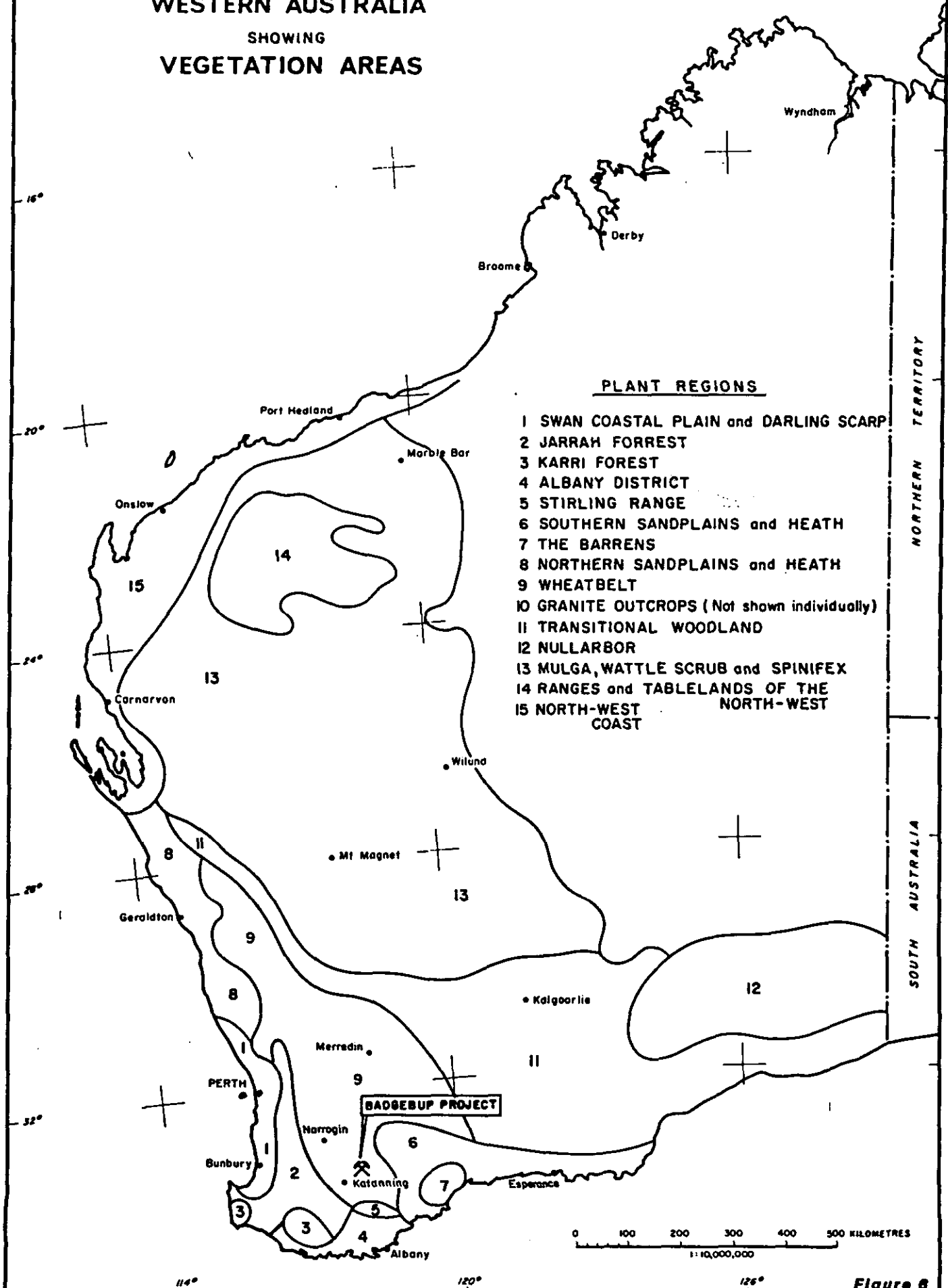
The area consists of clay or sandy soils, cropped on a rotational basis. Drainage of the paddocks is generally not well defined, with excess runoff of rain water eventually draining into salt lake systems north and south of the Project area.

5.4 Flora

As already noted, the majority of land in the area has previously been cleared for farming. The proposed treatment site includes an area of partially cleared land adjoining Wolyaming Road which has previously been used as a source of gravel for road construction.

Reserve 24072 (48.5144 ha.) for the purpose of conservation of flora and fauna exists about midway between the Jinkas Hill and Dingo Hill mine sites and is two kilometres north of the proposed mill site. The reserve is surrounded on three sides by completely cleared farmland and adjoins Reserve 12423 (the Wurgabup Rifle Range) on the other. No operations are planned in or adjacent to the flora and fauna reserve, hence it is

WESTERN AUSTRALIA
 SHOWING
VEGETATION AREAS



PLANT REGIONS

- 1 SWAN COASTAL PLAIN and DARLING SCARP
- 2 JARRAH FORREST
- 3 KARRI FOREST
- 4 ALBANY DISTRICT
- 5 STIRLING RANGE
- 6 SOUTHERN SANDPLAINS and HEATH
- 7 THE BARRENS
- 8 NORTHERN SANDPLAINS and HEATH
- 9 WHEATBELT
- 10 GRANITE OUTCROPS (Not shown individually)
- 11 TRANSITIONAL WOODLAND
- 12 NULLARBOR
- 13 MULGA, WATTLE SCRUB and SPINIFEX
- 14 RANGES and TABLELANDS OF THE NORTH-WEST
- 15 NORTH-WEST COAST

NORTHERN TERRITORY
SOUTH AUSTRALIA

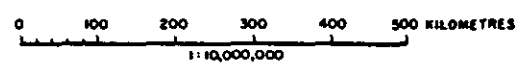


Figure 6

WESTERN AUSTRALIA
SHOWING
RAINFALL
ANNUAL AVERAGE IN MILLIMETRES

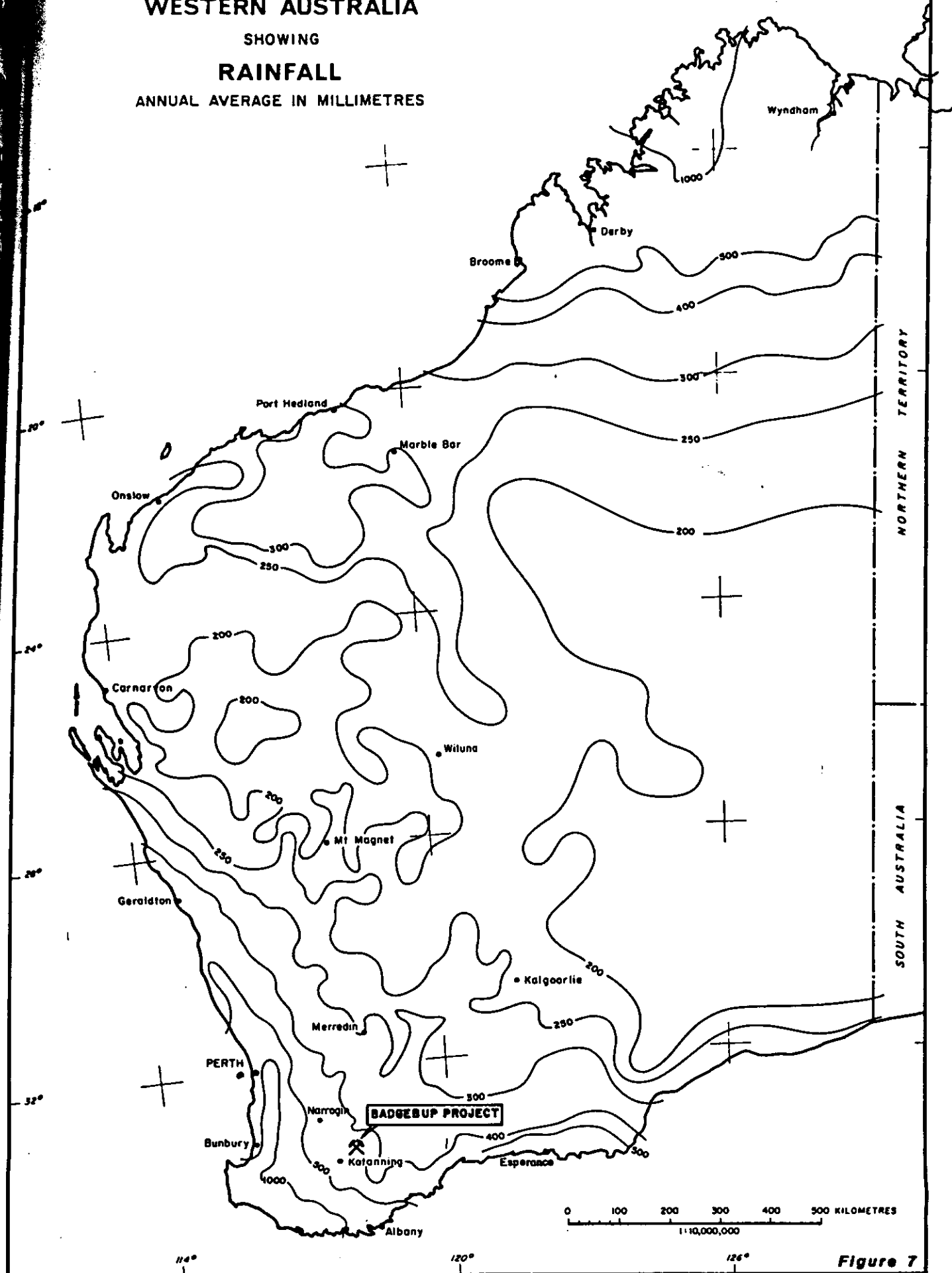


Figure 7

WESTERN AUSTRALIA
 SHOWING
 EVAPORATION
 ANNUAL AVERAGE IN MILLIMETRES

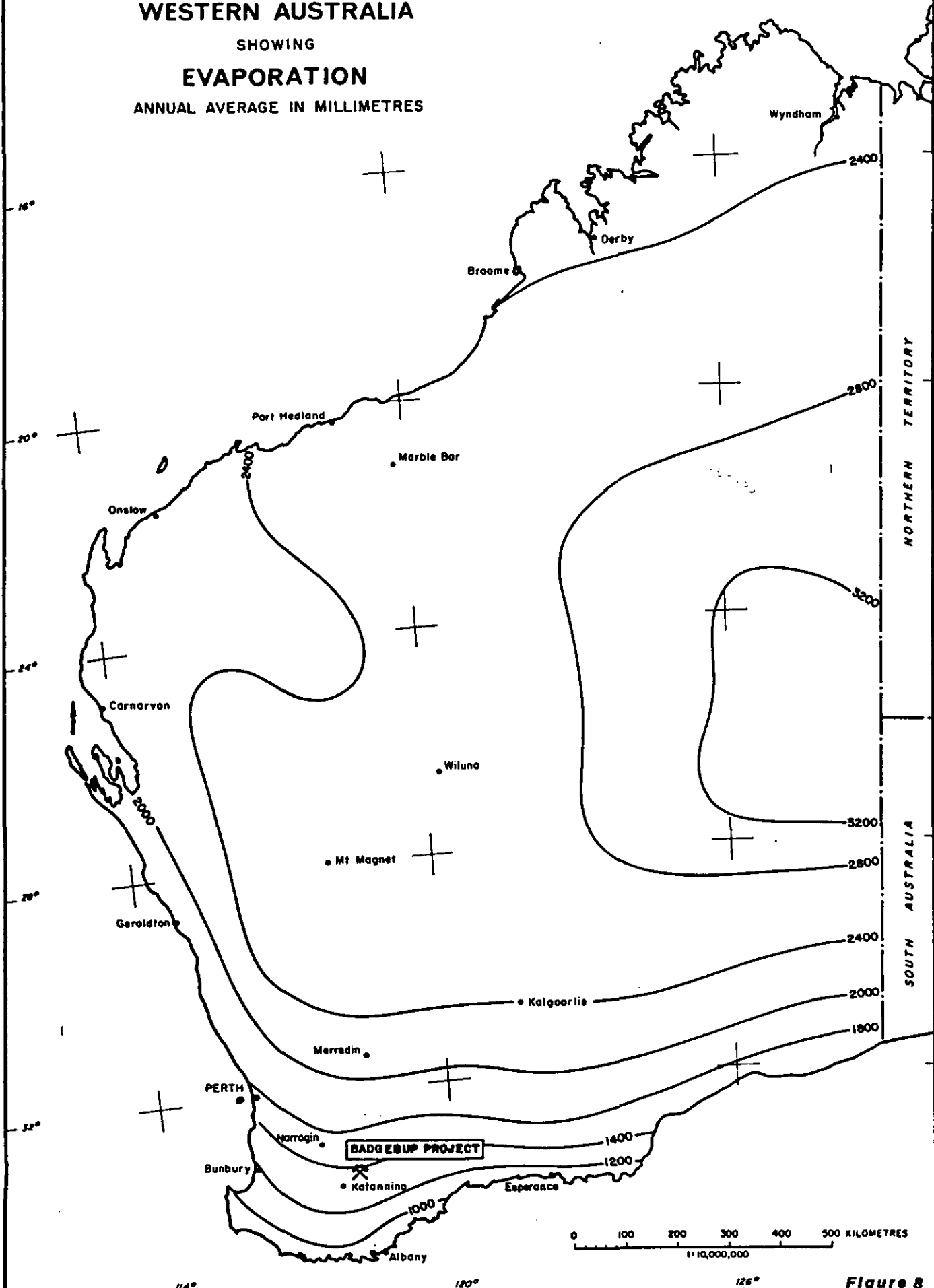


Figure 8

SEISMOGRAPH RECORDING STATIONS

- Three component
- Single component

EARTHQUAKES 1873-1977

- Magnitude
- 3.5-4.9
 - 5.0-5.9
 - >5.9

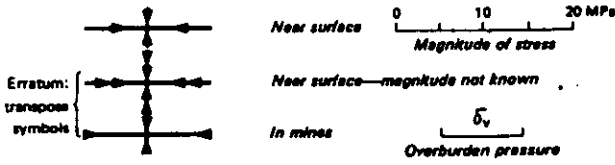
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FOCAL MECHANISMS

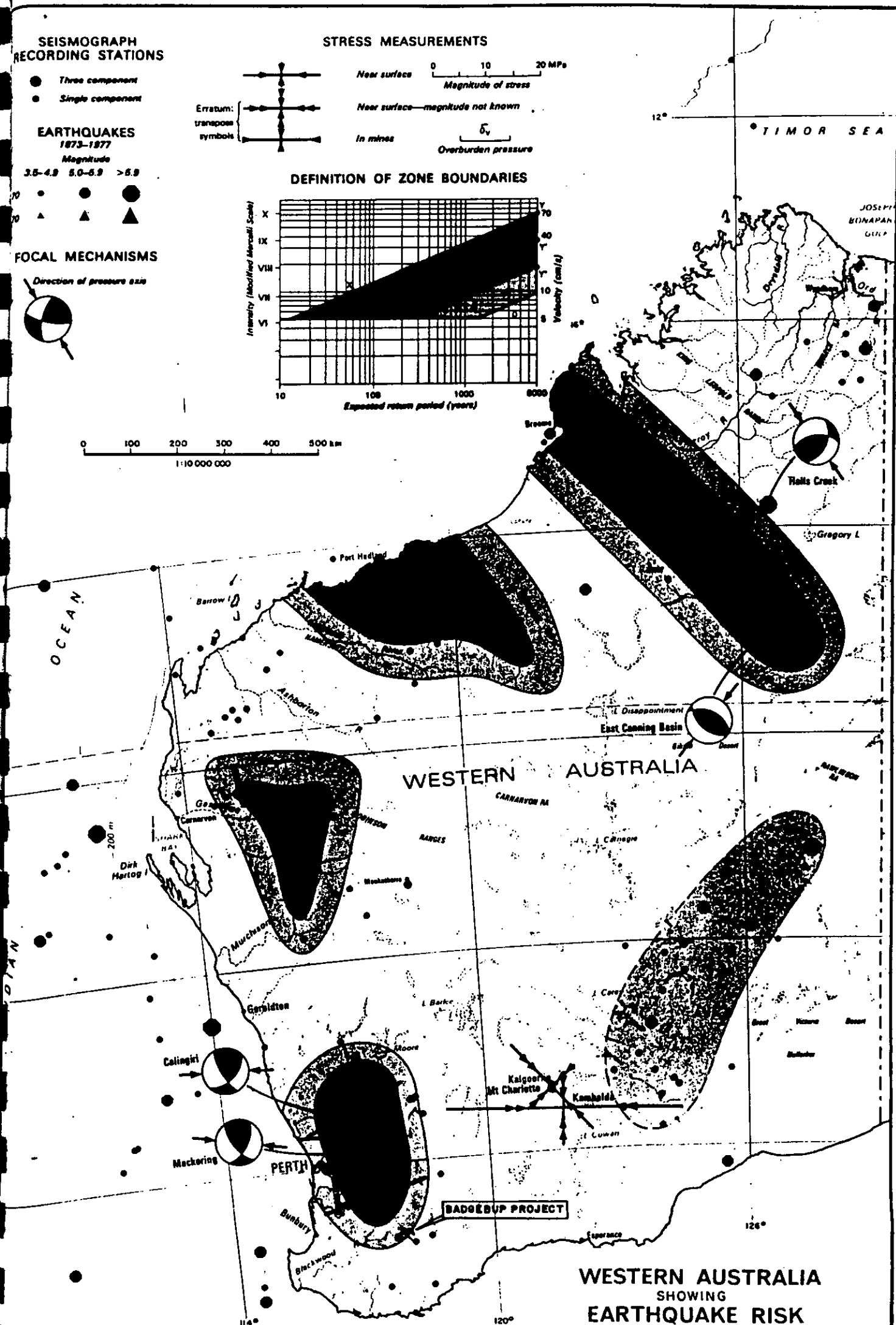
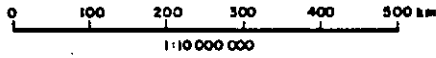
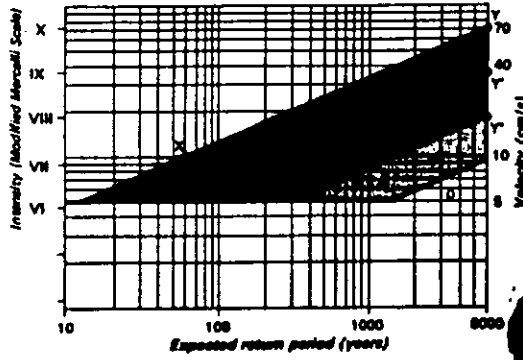
Direction of pressure axis



STRESS MEASUREMENTS



DEFINITION OF ZONE BOUNDARIES



**WESTERN AUSTRALIA
SHOWING
EARTHQUAKE RISK**

Figure 9

6.0 ENVIRONMENTAL IMPACT OF THE PROJECT AND PROPOSED CONTROL

6.1 Introduction

The total impact of the Project may be assessed by a consideration of the Project's effects on the following:

- (a) The permanent effects of the mining complex on the environment.
- (b) The effect of waste products during and after operation of the mine and mill.
- (c) The effect of the Project on present land usage and on the residents of the area and other communities.
- (d) The working environment within the proposed complex.

The precautions planned to avoid or minimise deleterious effects are discussed below.

6.2 Permanent Effects of the Mining Complex on the Natural Environment

The open pits and tailings dump constitute the principal permanent effects. Because of the limited life of the mine, buildings, plant and equipment will be removed when production ceases. The area around each of the pits will be rehabilitated, making it suitable for wheat and sheep farming activities. All ground water supply piping and reticulation and the tailings transport system will be removed from the area when the mining operation is completed.

The impact on the local flora and fauna will be minimal and temporary because of the limited size of the project and its limited life span. Any of the native animal population that are displaced by the project should return when the mine site is decommissioned.

6.2.1 Decommissioning of Mine and Plant

The Companies are aware of their responsibilities under the Mines Regulation Act for the abandonment of the mine and will act accordingly. The tailings dump in particular will be managed during and after the mining operation ceases. Rehabilitation of the tailings dump will continue until it is in a stable condition, particularly with regard to wind and water erosion.

The mine sites, except for the open pits, will be left in a suitable condition to permit farming to recommence.

Back filling of large portions of the open pits is proposed at this stage, unless further geological

investigations reveal economic ore extensions emanating from the existing workings.

6.3 Industrial Waste Products

A typical sample of the oxidised ore from the mine has the following analysis.

<u>Typical Assay</u>	<u>Weight %</u>
SiO ₂	58.5
Al ₂ O ₃	16.8
Fe ₂ O ₃	12.1
LOI	8.74
K ₂ O	1.88
MgO	0.196
Na ₂ O	0.46
CaO	0.031

<u>Typical Assay</u>	<u>ppm</u>
Mn	110
Pb	65
Cu	60
Zn	60
Ni	5
Co	5
As	5

About 2 kilograms of lime and 1.5 kilograms of sodium cyanide will be used in the treatment of each tonne of ore. No other reagents will be used at the Badgebup site.

The actual mining procedure will require very little blasting activity, so nitrates from ANFO blasting agents will be minimal.

6.3.1 Tailings Disposal

The tailings pulp will contain about equal quantities of saline ground water and ground ore.

A small on-site tailings dam is proposed by the Companies for tailings disposal (see Figure 3). Tailings at a later stage of the operation will be deposited inside the open cuts where suitable, to minimise land surface usage.

During the life of the mine the tailings dam will contain varying amounts of free surface saline water. The high salinity of water in the tailings dam due to evaporation will preclude its use by resident birds and

visiting waterfowl.

Access to the tailings dam by ground dwelling animals will be prevented by suitable fencing.

The Companies will segment the tailings down into several ponds so that disposal on a rotational basis is possible, and will minimise the risk of loss of tailings through a failed wall.

Figure 9 shows that the Badgebup Project is outside the areas of earthquake risk, and therefore this factor will not influence the tailings dam design.

6.3.2 Solid Waste

As the waste rock will be in a coarse broken form, the fugitive dust loss will be minimised.

Mine development waste rock will be stored close to the open pit site and contoured into the landscape and covered with 150mm of top soil. Where possible, waste rock may be back filled into the open cut mine. Scrap materials and refuse of a solid nature will be buried or incinerated in accordance with the requirements of the Katanning Shire Council.

Dust control around and within the treatment plant will conform to requirements of the W.A. Clean Air Act (1971) and the Mines Regulation Act. As the treatment plant is predominantly a wet leaching process only the crushing and screening plant will need attention.

6.3.3 Mill Tailings Effluent

The tailings pulp will be pumped to the tailings dump in a slurry containing about equal quantities of water and solids. The free cyanide in the tailings is at a concentration typical of gold leaching operations and is expected to quickly break down under the effect of natural degradation.

The height of the tailings walls will be sufficient to contain the run off from any rainfall. The tailings site selected will be assessed by the Companies as required by the Department of Conservation and the Environment, the Mines Department, and the Public Works Department.

The figures taken from Australia's Rainfall and Runoff Flood Analysis and Design (The Institution of Engineers, Australia) for the recurrence interval and rainfall intensity are as follows:

12 Hour duration, 2 year recurrence 36 mm.

12 Hour duration, 50 years recurrence 84 mm.
72 Hour duration, 2 year recurrence 58 mm.
72 Hour duration, 50 years recurrence 108 mm.

The above statistical data will be utilised when the tailings pond causeways are designed.

The tailings disposal system will require an effluent disposal licence under rights in Water and Irrigation Act, administered by the Public Work Department. At a suitable time during the Soil and Rock Engineering Study the Companies will approach the Public Works Department for a licence.

6.3.4 Gaseous Waste

All equipment at the plant will be electrically driven by power supplied by the S.E.C.

6.4 Natural Degradation of Cyanide (Ponding)

Existing practice is to direct the cyanide containing pulp to the tailings disposal area. Providing that the pond has a adequate retention time, the operation of natural environmental forces can effect some reduction in the concentration of a number of pollutants, including cyanide. These forces include photodecomposition by sunlight, acidification by the carbon dioxide in the air, oxidation by oxygen in the air, dilution and absorption on solids, and microbe action.

With the reduction in excess cyanide ion concentration, secondary metal precipitation reactions may be expected to occur. The effectiveness of natural degradation in a tailings pond has been impressively demonstrated by Dome Mines, in northern Ontario. (Scott J.S., Ingles J.C. "Removal of Cyanide from Gold Mill Effluents", 13th Annual Meeting, Canadian Mineral Processors, pp. 14-15 1981).

At that mine, waste barren solution containing about 100 mg/L total cyanide has dropped to a level of about 0.1mg/L during the summer months.

6.5 Human Wastes

Effluent and waste water from the ablution block will be run into a standard septic system of a suitable size to accommodate the predicted volume.

7.0 EFFECTS OF THE PROJECT ON LAND USE AND RESIDENTS

7.1 Land Use

The total area of land required for the project is 22 hectares. Of this approximately 16 hectares is currently used for wheat and sheep farming and the balance of 6 hectares is land which has remained uncleared due to its unsuitability for cultivation or grazing. The table below sets out the various land requirements for the project.

<u>Location</u>	<u>Land Requirement (hectares)</u>
Jinkas Hill, pit and waste dump	8
Dingo Hill, pit and waste dump	5
Dingo Hill, ore haul road	1
Treatment plant and stockpile area	2
Tailings dam	<u>6</u>
TOTAL:	22

The various features of the project will be laid out in such a way that they should cause minimal disruption to the day to day activities of the farmers concerned.

While production will be lost on the farmland listed above, in each case it represents less than one percent of the land held by the individual farmers and should have a negligible impact on the viability of their operations.

7.2 Permanent Residents

The Companies believe that the effect of the Badgebup Project will be beneficial to the general Katanning community. The obvious benefit will be:

- Increased employment.
- Increased income for local service industries.
- Increased expenditure in shops and stores.

Disadvantages to permanent residents will be minimised by the management and appear to be:

- Increased activity in the area and in the township of Katanning

Some localised noise emission from the mining operation requires consideration for the farm homesteads in the immediate area.

requirements are adhered to.

The health of the employees will be maintained as required by the Mines Department and the Public Health Department, and all personnel will be made aware of safety precautions, and issued with modern protective safety clothing and equipment. Special care will be made to protect the staff from hazards associated with the use of sodium cyanide.

7.4 Dust Control

The Treatment Plant will be of a conventional carbon-in-leach design with crushing, grinding, screening, cyanidation, and carbon adsorption. Dust control will be applied to the crushing and screening circuits. Chemical preparation will be carried out in a correct and ventilated manner. The Companies' Management will discuss the various requirements with officers of the Clean Air Section of the Public Health Department and the Mines Department.

7.5 The Living Environment

As the work force will be living in the township of Katanning, they will conform to the council requirements as does any other citizen.

The township of Katanning offers excellent facilities and amenities, including:

- Sport Clubs
- Country Clubs
- Hotels
- Motels
- Restaurants
- All transport facilities
- Primary School and many Government Departments.

As the Project will have a total number of employees of less than 30, it is not expected that any overload of Katanning facilities will occur.

8.0 OTHER ENVIRONMENTAL SAFEGUARDS

The land area required by the Project will be strictly limited to the minimum required.

All work force involved in the various stages of the Project will be made aware of the local environmental requirements and possible damage they could do.

APPENDIX A

Letter from the Minister for Cultural Affairs,
April 14th, 1981



OFFICE OF THE MINISTER FOR EDUCATION
CULTURAL AFFAIRS AND RECREATION
PARLIAMENT PLACE
WEST PERTH, 6005

14th April, 1981.

Mr G.V. Blackburn,
Regional Geologist,
Otter Exploration N.L.,
125 Edward Street,
EAST PERTH. W.A. 6000.

Dear Mr Blackburn,

Aboriginal Site S0957 - Jinka's Hill

I refer to your application to the Trustees of the Western Australian Museum to disturb site S0957 in accordance with Section 18 of the Aboriginal Heritage Act, received at the Museum on 10th April.

I have received advice from the Trustees and wish to inform you, that in accordance with my powers under Section 18(3) of the Aboriginal Heritage Act as amended, I hereby give consent to your company's use of the land designated as Aboriginal Site S0957 in the following terms:

Given that the site is of historical significance under Section 39(2)(b) of the Aboriginal Heritage Act, the site should not be disturbed for exploration purposes but may be disturbed or destroyed for the purposes of mining, subject to the Western Australian Museum being given the opportunity, at your company's expense, to arrange for an adequate archaeological survey and salvage, where appropriate, of this and other sites within your lease.

Yours sincerely,

A handwritten signature in black ink, appearing to read "W. Grayden".

BILL GRAYDEN, M.L.A.
MINISTER FOR CULTURAL AFFAIRS

NOI

261

BADGEBUP GOLD PROJECT

ASSOCIATED GOLD FIELDS N.L.
SOUTHWEST GOLD MINES N.L.

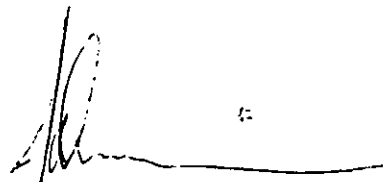
BADGEBUP GOLD PROJECT
WESTERN AUSTRALIA
NOTICE OF INTENT

May 1986

FILE : 838/88



H.D. Kennedy,
Chairman,
Associated Gold Fields N.L.



J.M. Clema,
Chairman,
Southwest Gold Mines N.L.

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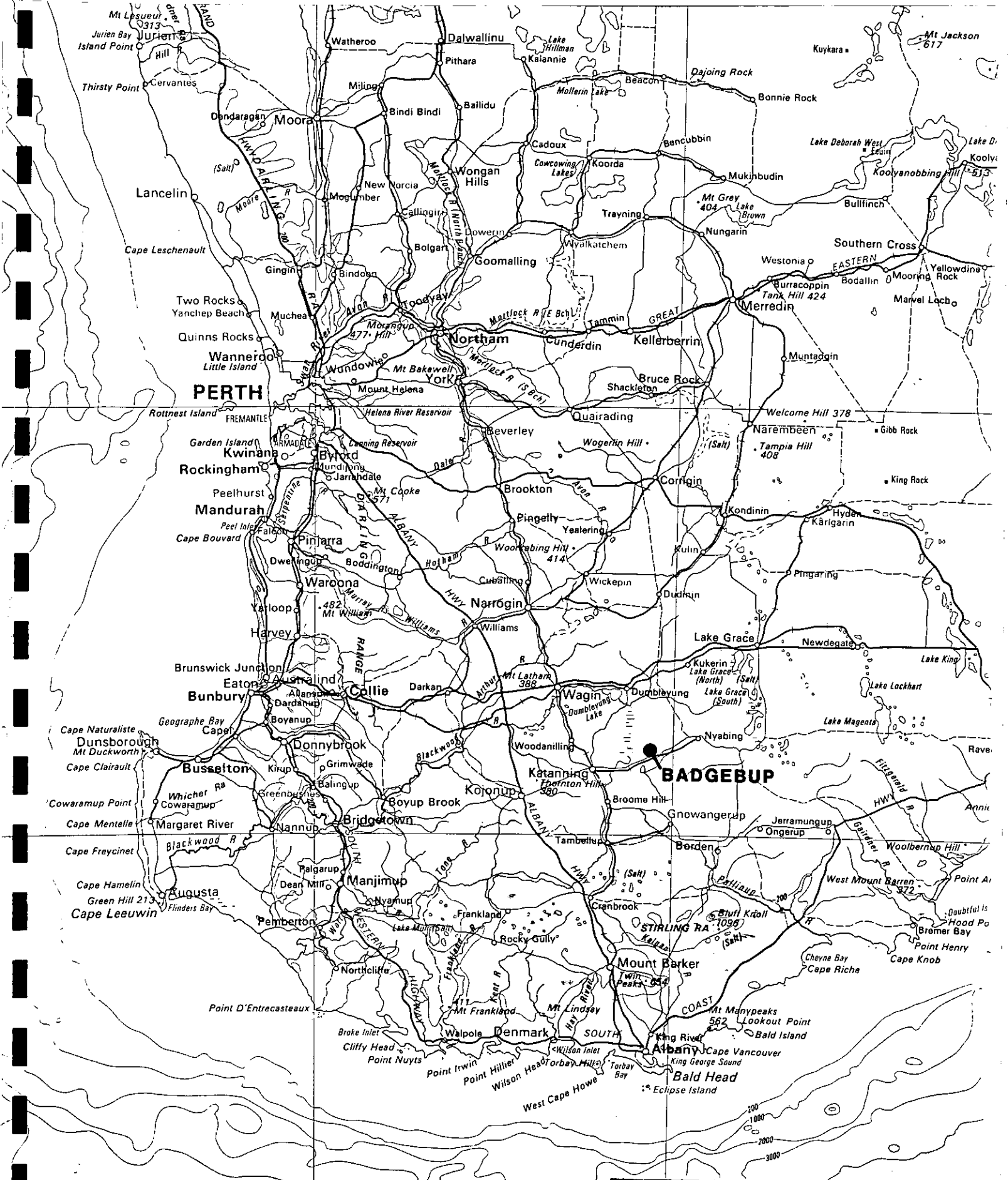
NOTE:

PLATE 1	Aerial view of Project Area
PLATE 2	Jinkas Hill
PLATE 3	Dingo Hill and Proposed Plant Site

It was not possible to obtain colored prints of Plates 2 and 3 for inclusion in this copy

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BADGEBUP GOLD PROJECT
REGIONAL LOCATION

Scale:
 1:2,500,000

0 75 kms

Figure 1

1.0 TITLE AND OWNERSHIP

Badgebup Gold Project

The Project is 70% owned by Associated Gold Fields N.L. and 30% owned by Southwest Gold Mines N.L. The Head Office of Associated Gold Fields N.L. is:

5th Floor,
169 Miller Street,
NORTH SYDNEY, N.S.W., 2060
Telephone: (02) 957 2177

and the Head Office of Southwest Gold Mines N.L. is:

Ground Floor,
524 Hay Street,
PERTH, W.A., 6000
Telephone: (09) 325 8799

The local office for Associated Gold Fields N.L. who is the Project Manager is:

96 Parry Street,
EAST PERTH, W.A., 6000
Telephone: (09) 328 3600
Fax: (09) 328 6362

Both Associated Gold Fields N.L. and Southwest Gold Mines N.L. are Australian publicly listed Mineral Exploration Companies with majority Australian ownership. Otter Exploration N.L. has a 33.6% interest in Associated Gold Fields N.L. and a 6.4% interest in Southwest Gold Mines N.L. giving it an indirect 25.40% equity in the project. Otter has established and operated since 1983 a successful gold recovery plant at Griffins Find near the town of Lake Grace some 70 kilometres north west of the planned Badgebup operation.

Otter Exploration N.L., Associated Gold Fields N.L. and Southwest Gold Mines N.L. all have two common directors. The same professional staff responsible for the construction and running of the Griffins Find Plant will be involved in the construction and commissioning of the Badgebup operation.

It is the Companies' wish to bring the mine into production as soon as possible, using various consulting and engineering contractors. When the plant is commissioned Associated Gold Fields N.L. will control and manage all aspects of gold production.

The deposit is located near the township of Katanning as shown on the Regional Location Map (Figure 1).

Since 1979, various geological studies have been completed and gold exploration work is continuing in the general project area. Both Associated Gold Fields N.L. and Southwest Gold Mines N.L. hold or

have an interest in various mining and exploration tenements in the Lake Grace - Katanning area.

2.0 BASIS OF PROPOSAL

The Badgebup Gold Project will be a small open cut mining and ore treatment operation located on private farm land with the work force housed in the township of Katanning. The project life is expected to be four years from the start-up date unless further economic ore reserves are proven within that period.

3.0 GENERAL PROJECT DESCRIPTION

3.1 History, Location and Access

3.1.1 History

Consequent to the discovery of significant mineralisation at Griffins Find (Lake Grace) in July of 1979 by Otter Exploration N.L., Otter in joint venture with an associated company, Allstate Explorations N.L. commenced regional prospecting aimed at locating further occurrences of gold mineralisation in the surrounding district. This joint venture was later incorporated as Associated Gold Fields N.L.

In August 1979 assay results received from two stream samples collected from the Datatine Road road reserve adjacent to the north west corner of Kojonup Location 675 and the south west corner of Kojonup Location 3136 contained anomalous quantities of gold.

The Jinkas Hill deposits themselves have no surface expression and were discovered by drilling a soil anomaly which was probably derived from a small gold bearing outcrop which occurs to the east of the Jinkas Hill deposit and which was discovered in November 1979. Eight samples from that outcrop averaged 7.4g gold/tonne.

The surface expression of the Dingo Hill deposit was not discovered until March 1980 when seven samples of float assayed an average of 7.44g gold/tonne.

Although the area lies adjacent to the Holland Track, which was the overland route taken by the majority of Eastern States prospectors to the gold discoveries at Coolgardie and Kalgoorlie during the gold rushes of the early 1890's there is remarkably little evidence of former prospecting in the region. None of the deposits discovered by Associated Gold Fields N.L. showed any evidence of former prospecting. However old prospect pits which have been discovered on Flora and Fauna Reserve 24072 were sunk on the mineralised horizon which extends between the Jinkas Hill deposits and the Dingo Hill deposits. Another small pit located on the summit of Jinkas Hill was apparently excavated by a former Goldfields prospector, George Yarro Bilston, whilst searching (Circa 1900) for buried treasure supposedly from the wreck of the Gilt Dragon. Mr Bilston is also credited with excavating the pits on the Flora and Fauna Reserve, in the period between 1899 - 1904.

The only other evidence of former prospecting was in May 1957 when Eugene Joseph Cantwell, a farmer of

Dumbleyung, applied for a prospecting area for copper (PA 390 PP) in the south west corner of Kojonup Location 3248. This locality is immediately on strike from the Cleggs deposit. The 'copper' discovered by Mr Cantwell apparently turned out to be epidote and the prospecting area was withdrawn in August of that year.

The area of the proposed operation at Jinkas Hill was first settled by the Warren family in 1898 when Pastoral Lease No's 48/3603 - 48/3607 inclusive were acquired by R.W.A. Warren. These Leases and the surrounding vacant Crown land were gradually acquired or converted to freehold titles (Kojonup Locations 672 - 682) in the period 1905 - 1918 by the Warren family. The existing freehold property owners are descendants of the original settlers.

3.1.2 Location

The Badgebup Gold Project is situated 300 kilometres south east of Perth, Western Australia. The location is at latitude $30^{\circ}32'20''S$ and longitude $117^{\circ}55'00''E$ (Figure 1). The Badgebup Gold Project is situated about 36 kilometres east north east of the township of Katanning. The Jinkas Hill deposits are contained within Kojonup Land Location 678 which forms portion of the private (freehold) farming property of J.L. and J.N. Caldwell of 83 Conroy Street, Katanning and the Dingo Hill deposit situated 3.5 kilometres southerly is contained wholly within Kojonup Location 7533 which forms portion of the private (freehold) farming property of H.R. and N.E. Smith of Badgebup via Katanning.

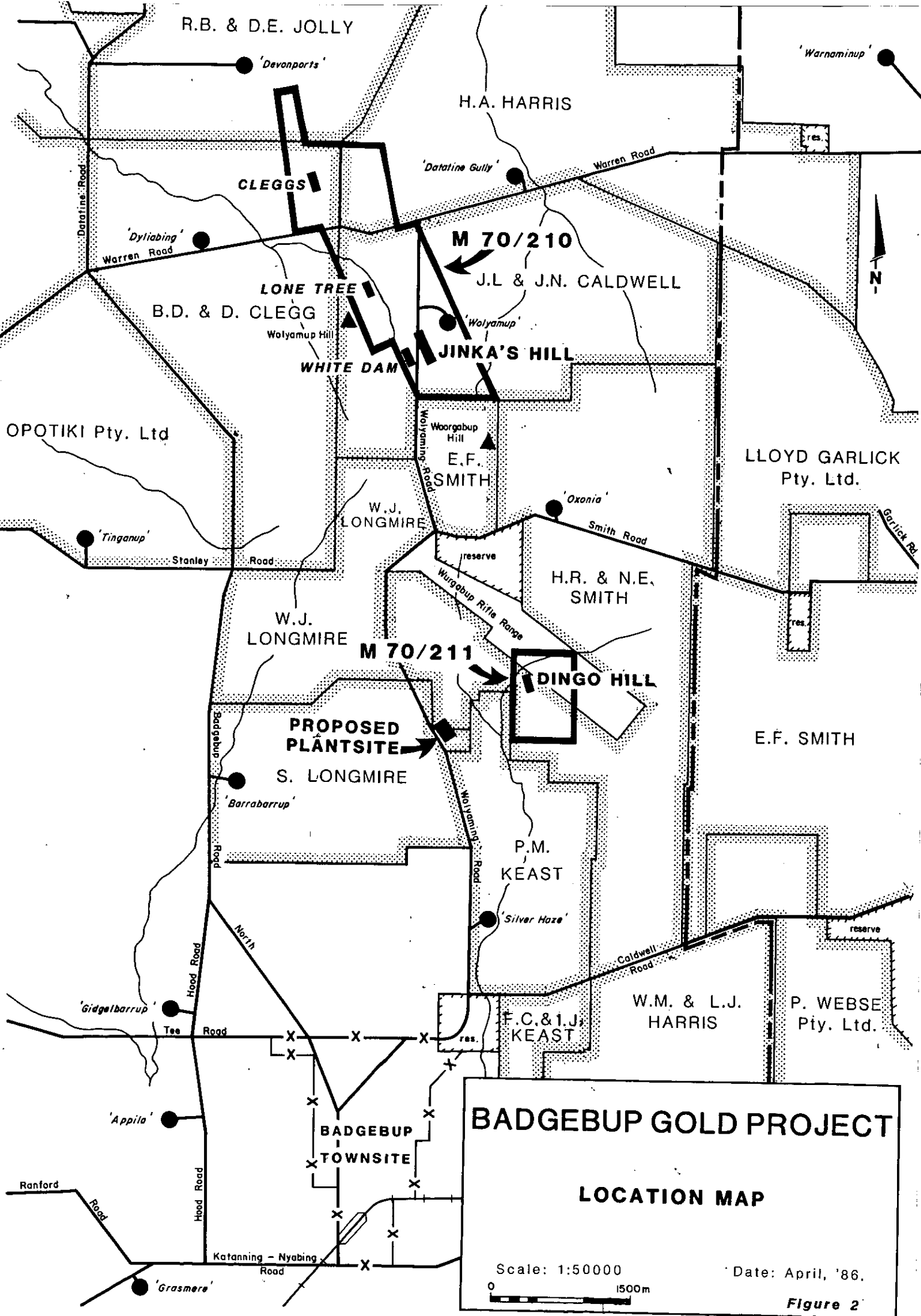
3.1.3 Access

The project site is well serviced by all transport systems. There is a good quality gravel airstrip located at the township of Katanning. Westrail's Badgebup Siding on the Katanning to Nyabing Line is located six kilometres southerly from the Dingo Hill deposits.

The bitumen Katanning - Nyabing Road is situated next to the rail line and the gravel roads in the area of the Project are of a good quality. In addition the Warren Road which passes 1.5 kilometres north of the Jinkas Hill deposit is bitumenised from Katanning to within three kilometres of the proposed mill site.

3.2 Mining Techniques and Ore Grade

The gold project is of a small size and has an expected operating life of four years based on established ore



R.B. & D.E. JOLLY

'Devonports'

H.A. HARRIS

'Warnaminup'

CLEGG'S

'Datatine Gully'

Warren Road

'Dylabing'

Warren Road

M 70/210

J.L & J.N. CALDWELL

LONE TREE

B.D. & D. CLEGG

Wolyamup Hill

'Wolyamup'

JINKA'S HILL

WHITE DAM

Wolyamup Road

Woorgabup Hill

E.F. SMITH

OPOTIKI Pty. Ltd

LLOYD GARLICK Pty. Ltd.

'Tinganup'

Stanley Road

W.J. LONGMIRE

'Oxania'

Smith Road

H.R. & N.E. SMITH

W.J. LONGMIRE

M 70/211

DINGO HILL

PROPOSED PLANTSITE

S. LONGMIRE

Badgebup Road

'Barrabarrup'

P.M. KEAST

'Silver Haze'

E.F. SMITH

'Gidgelbarrup'

Tee Road

Hood Road

North

Caldwell Road

W.M. & L.J. HARRIS

P. WEBSE Pty. Ltd.

'Appila'

BADGEBUP TOWNSITE

Ranford Road

Hood Road

Katanning - Nyabing Road

'Grasmere'

BADGEBUP GOLD PROJECT

LOCATION MAP

Scale: 1:50000

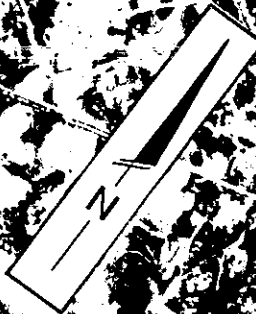
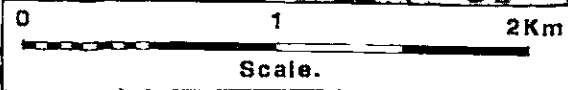
Date: April, '86.

0 1500m

Figure 2

Plate 1.

PROJECT AREA



reserves. The project is based on the mining of gold ore bodies which are exposed at the surface. The geologic resource which is based on approximately 280 drill holes has been calculated for each deposit as approximately:

<u>Deposit</u>	<u>Tonnes</u>	<u>Grade (g Au/tonne)</u>	<u>Classification</u>
Jinkas Hill	335,605	3.06	Probable
Dingo Hill	336,800	2.02	Possible
Cleggs	157,537	2.6	Possible
Lone Tree	300,000	1.7	Possible
White Dam	<u>72,050</u>	<u>2.6</u>	Possible
Total identified resource to max. 40m depth			
	<u>1,201,991</u>	<u>2.34</u>	Possible/Probable

Probable mining reserves have been calculated for two of these deposits as follows:

<u>Deposit</u>	<u>Tonnes</u>	<u>Grade (g Au/tonne)</u>	<u>Waste:Ore Ratio</u>
Jinkas Hill	230,600	3.39	4:1
)	167,100	2.46	5:1
Dingo Hill)	or		
)	74,100	4.13	5.1:1

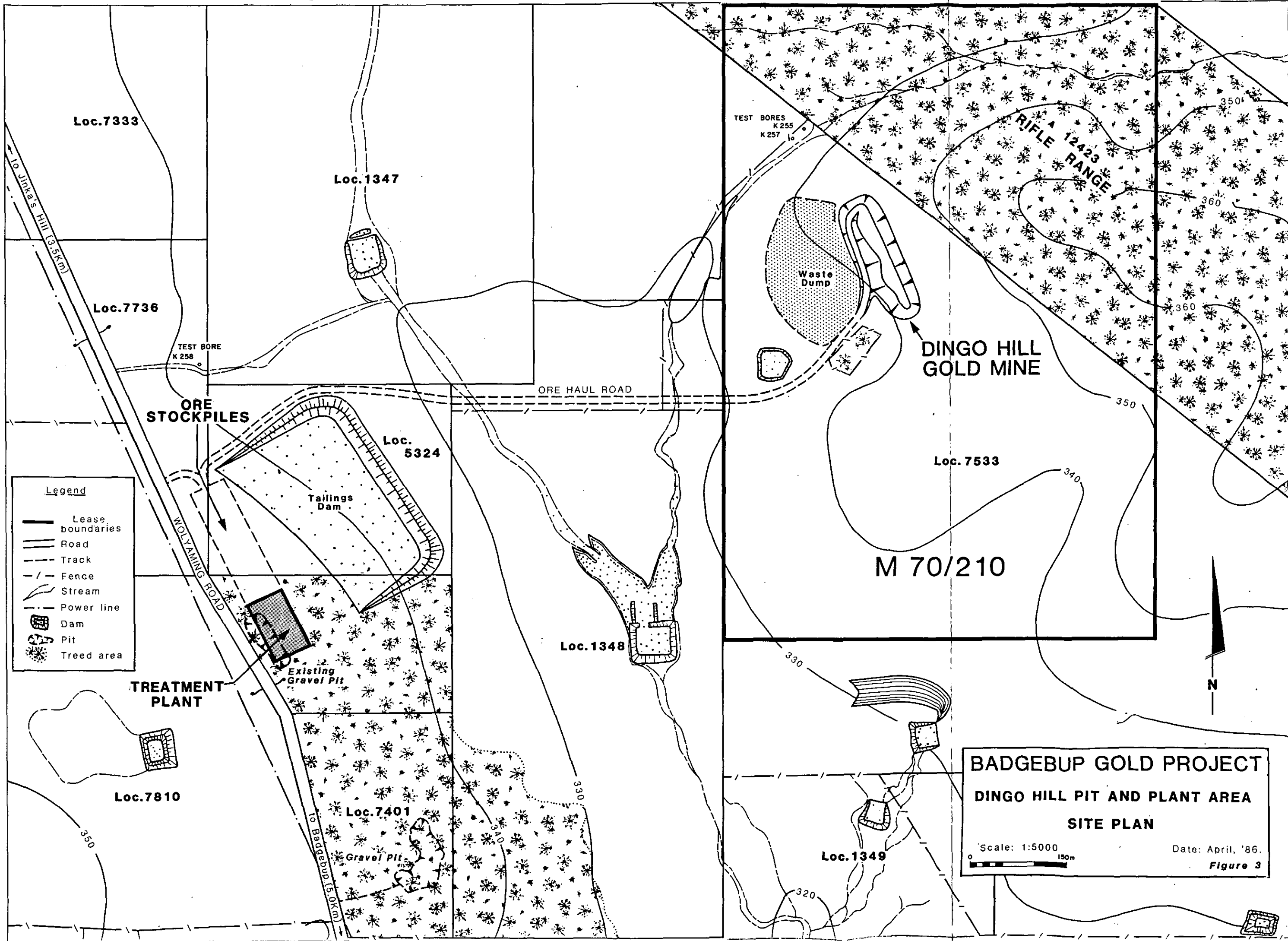
Further drilling is needed on some of the other areas for which a geologic resource has been calculated before a useable mining reserve can be determined.

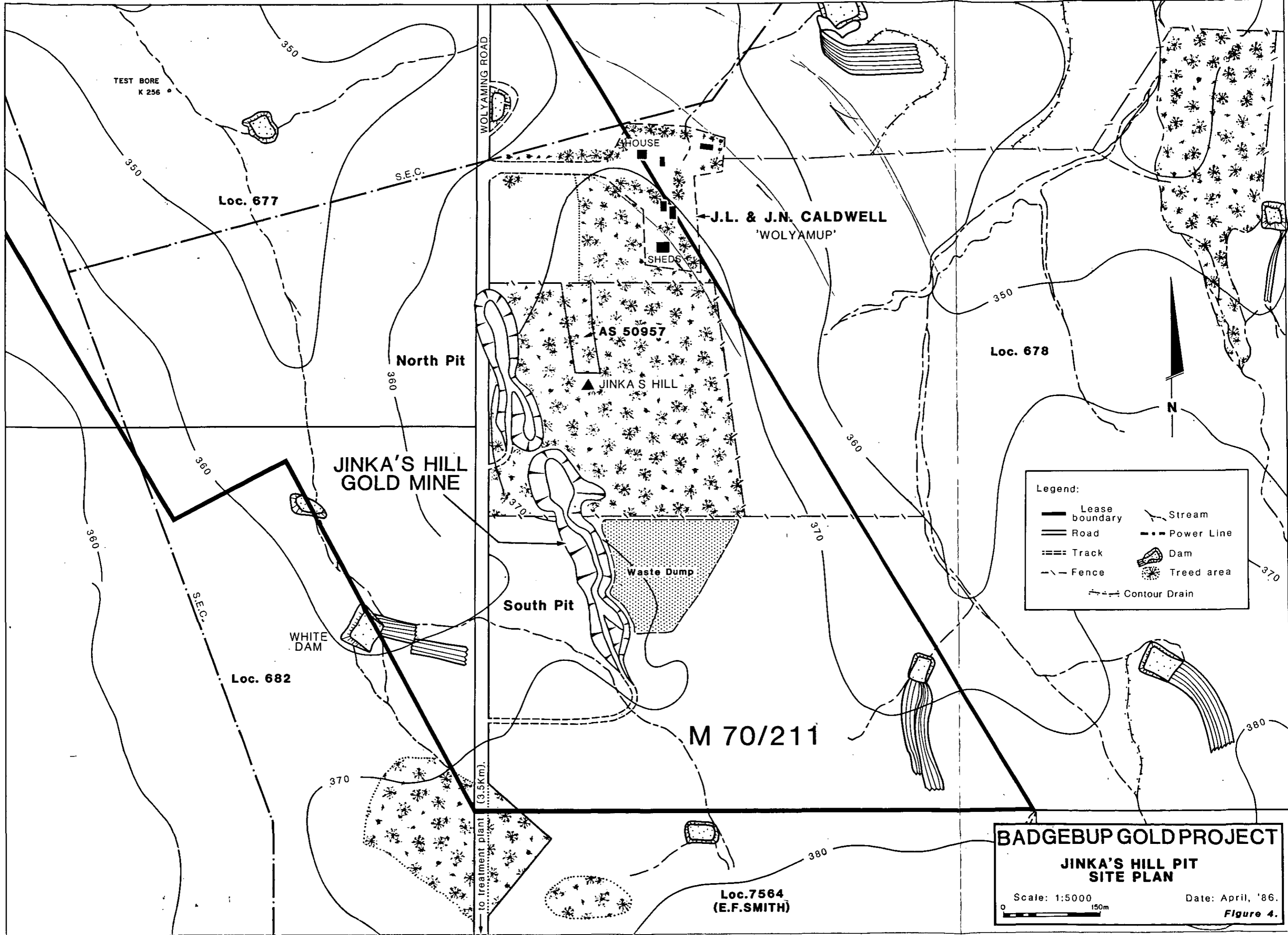
The ore will be mined by open cut methods to a depth of about 30 metres. It is proposed that the actual mining will be carried out by a mobile bucket excavator which will load directly into two conventional trucks for stockpiling at the primary crusher. Waste rock associated with the open cut design at this stage is expected to be about five times the tonnage of the actual ore mined. Mining will be done under contract.

The treatment plant and its associated facilities, including the tailings storage, is expected to occupy an area of less than 10 hectares. Associated Gold Fields N.L. will operate the mining and crushing sections during day shift only, and the rest of the operation will run continuously.

3.3 Power Supply

Electrical power will be drawn from the local S.E.C. grid and is expected to peak at 600 KVA.





BADGEBUP GOLD PROJECT

**JINKA'S HILL PIT
SITE PLAN**

Scale: 1:5000
0 150m

Date: April, '86.
Figure 4.

JINKA'S HILL

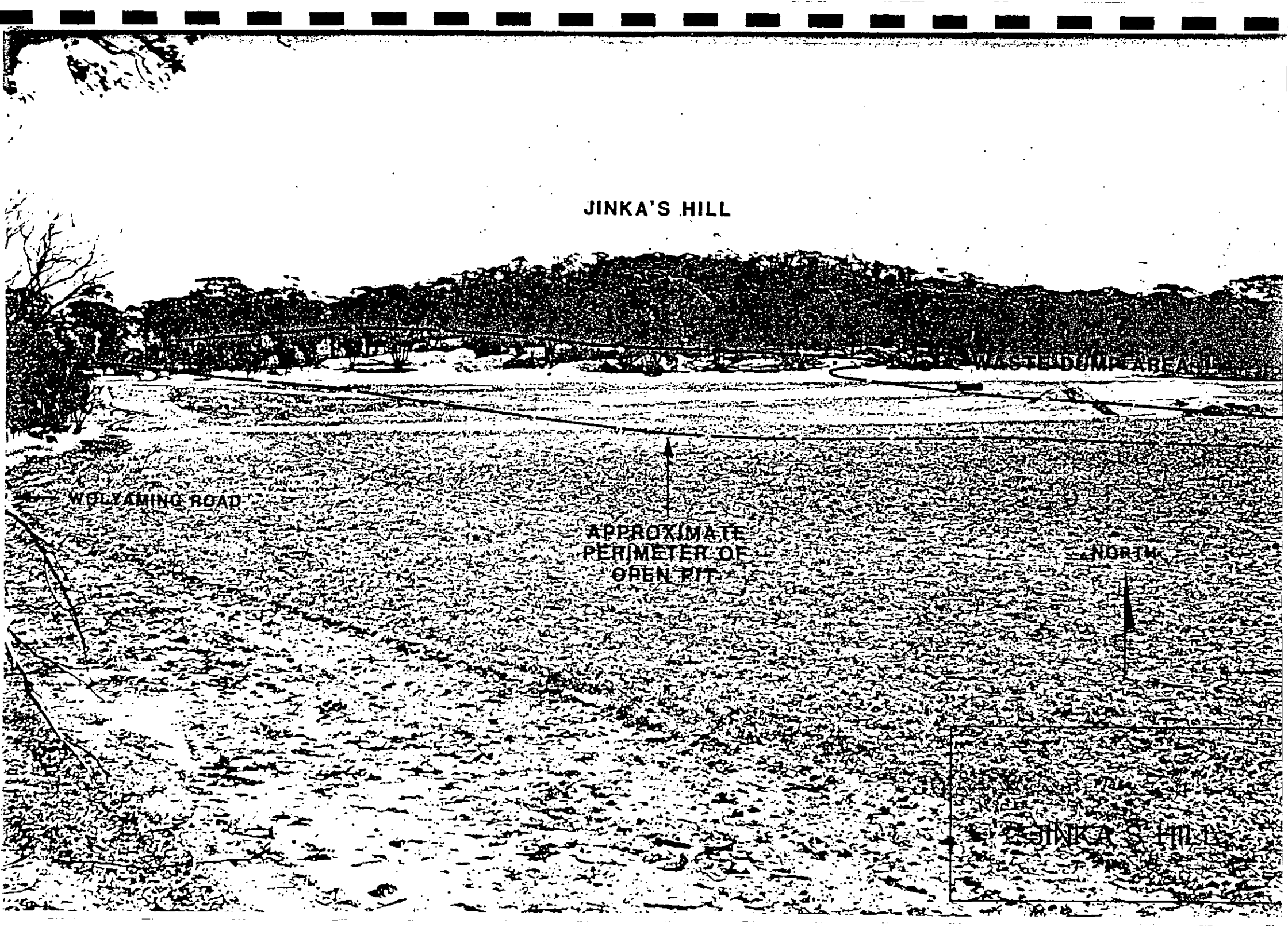
WASTE DUMP AREA

WOLYAMING ROAD

APPROXIMATE
PERIMETER OF
OPEN PIT

NORTH

JINKA'S HILL



DINGO HILL

TAILINGS DAM
SITE

TREATMENT
PLANT SITE

WOLYAMING
ROAD

DINGO HILL
AND
TREATMENT PLANT
SITE

3.4 Ore Treatment

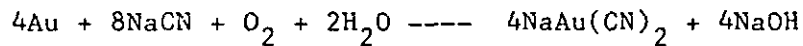
The gold extraction plant will be located on private land 1 kilometre from the Dingo Hill open cut. The plant will be of a standard carbon in pulp design incorporating:

- (a) Crushing, screening and milling circuits.
- (b) Cyanidation and gold adsorption.
- (c) Tailings disposal.

Refer to the Process Flowsheet (Figure 5) for a schematic of the carbon in pulp circuit.

3.4.1. Hydrometallurgical Circuit

The overall chemical equation, generally accepted, for the dissolution of gold in weak cyanide solutions is Elsner's equation.

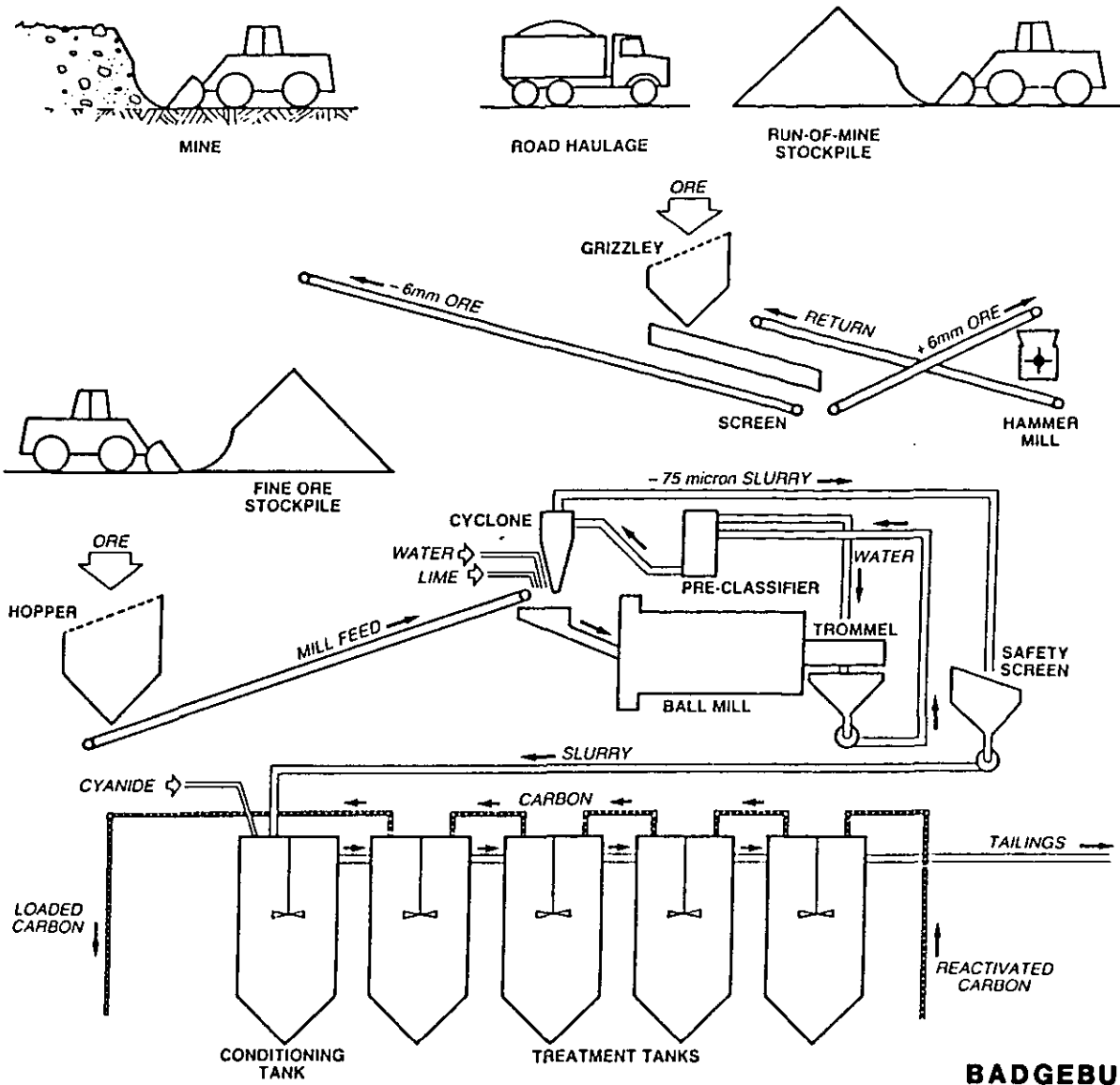


When the gold has dissolved, the pulp moves from the leach vessels to the adsorption tanks.

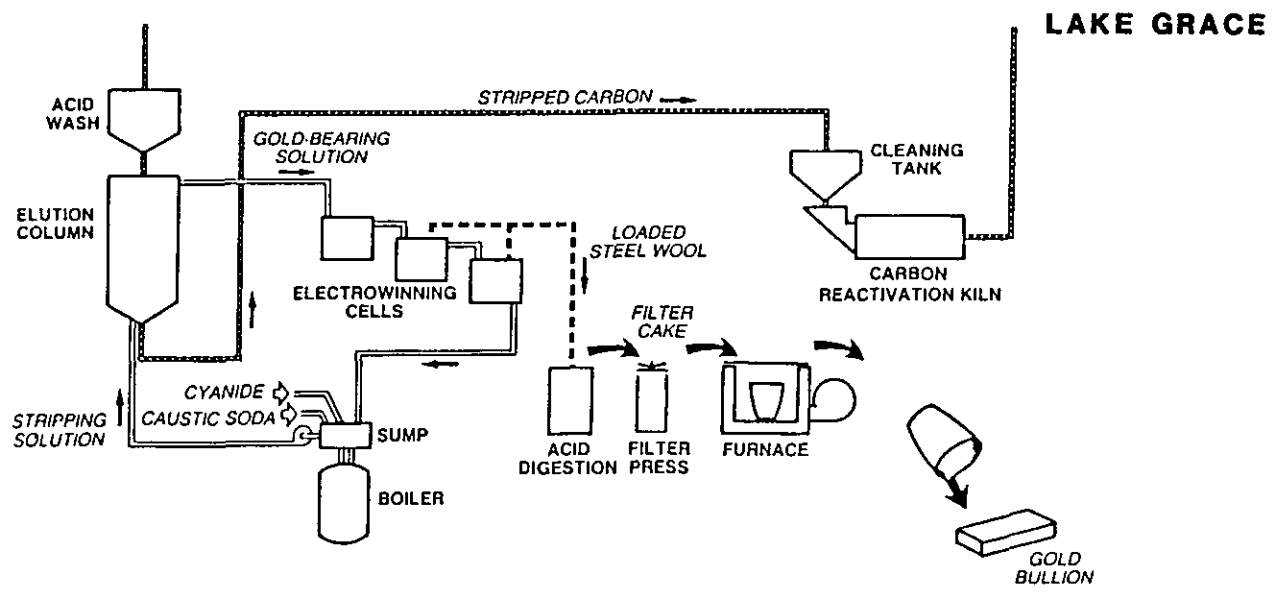
In these tanks the granular carbon (usually between 6 and 16 mesh) is moved counter-current to the cyanide pulp. Counter-current operation is used because the amount of gold that is adsorbed on the carbon is in equilibrium with the residual gold concentration in the solution, and therefore low gold tailings in the final stage can be obtained only if the pulp in this stage is contacted with fresh carbon. The gold is adsorbed onto the carbon as gold cyanide complex, $\text{Au}(\text{CN})_2$, either in the calcium auro-cyanide or hydrogen aurocyanide form, depending on the pH of the cyanide solution and the concentration and character of the "spectator" actions present.

Carbon removed from the adsorption tanks will be transferred to Otter Exploration N.L.'s existing Gold Treatment Plant at Lake Grace for desorption and recovery of gold.

Gold recovery from the activated carbon is accomplished by desorbing the gold values from the carbon and electro-winning the values from the resulting strip solutions. This permits repeated use of the carbon. The process, employs a 1.0 per cent NaOH, 0.5 per cent NaCN strip solution at near 100 degrees C to desorb the gold from the carbon. The precious metal values contained in the strip solution are electrowon from the solution, and the barren solution recycled for additional stripping. About 24 hours of desorbing is required to recover the gold from the carbon.



BADGEBUP



LAKE GRACE

BADGEBUP GOLD PROJECT
SCHEMATIC FLOWSHEET

Figure 5.

Barren tailings will be pumped to a tailings dam constructed adjacent to the plant site. Material in the tailings pulp will contain about equal quantities of solids and water. The water will be recovered and recirculated to the treatment plant. All waste water products from the plant, excluding sewage, will be disposed of through the tailings pipe.

3.5 Mine and Mill Water Supply

A localised saline ground water supply system comprised of a borefield (about six bores), pumping, piping and storage, will be installed as no surface water is available in the area. The exact layout of the borefield will be decided after completion of test drilling. Additional water will be drawn from the open pits.

The estimated requirements for ground water by the process plant will be approximately 500 tonnes per day.

Four test wells were drilled in the general area to test flow rates and chemical analysis of the ground water for the district.

The following analysis was obtained.

<u>Sample Number</u>	<u>Na (ppm)</u>	<u>Mg</u>	<u>Cl</u>	<u>Ca</u>	<u>Fe</u>	<u>TDS</u>	<u>pH</u>
K-255	3580	730	7270	210	1	15130	7.55
K-256	1460	475	3830	270	1	8780	7.7
K-257	3210	710	6740	48	1	14650	7.69
K-258	2420	320	4330	195	1	8600	7.4

Water for human consumption will be pumped and carted from the closest standpipe location.

4.0 BENEFITS EMANATING FROM PROPOSED PROJECT

The proposed Project will develop two open cut mines of modest size and reasonable gold grade within the near future. Production rates planned are on a scale satisfactory to financial considerations, while simultaneously creating a minimum of disruption in the area.

Transport of the work force, equipment and consumables can be managed by the existing road network.

People of the Katanning area will be offered employment both during construction and for day and shift work on the plant. The Companies believe that the establishment of a mining operation in the Katanning area will have a beneficial economic impact on the community.

Employment levels as indicated by the Metallurgical Feasibility Study are as follows:

- Operations General Foreman
- Maintenance General Foreman
- Clerk - Storeman
- Tradesmen (three)
- Operators (eight)

TOTAL of 14 people

The contract mining company that will be retained to excavate the open pit is expected to have a work force of six men.

Drilling results strongly suggest that deeper ore extensions exist, and these could be extracted using open stope techniques. Such extensions would prolong the total life of the Project.

Further exploration and development of these reserves will take place during the open cut mining period.

The Project is expected to generate profits for the Companies, and will provide a base for increased mineral exploration in the South West region. The State of Western Australia will benefit from the increased regional activity, payroll taxes and various other payments.

5.0 PREVAILING ENVIRONMENTAL CONDITIONS

5.1 The Environmental Consultant

A suitable Environmental Consultant will be retained by the Companies to study the existing environment. Copies of all such studies will be made available when received. This consultant will also be retained to supervise the environmental management of the Project when the mine is in production.

5.2 Location and Land Use

The Badgebup Project is located within the Great Southern Wheatbelt system. Refer to the aerial photograph (Plate No. 1) for a general view of the mine site location. Land in the Badgebup district has been extensively cleared and is used for wheat and sheep farming. Other land uses in the area include a reserve of some 126 hectares used as a rifle range by the Wurgabup Rifle Club and a Flora and Fauna Reserve of 49 hectares adjoining the Rifle Range.

5.3 Geographic Controls

The topography and vegetation of the district is typical of the Great Southern Wheatbelt region, see Plates 2 and 3 and Figure 6. Most of the natural vegetation has been replaced by farming paddocks, leaving natural bush only in reserves or areas unsuitable for agriculture.

Topography within the Badgebup area is gently undulating with maximum relief of about 70 metres over a distance of three kilometres.

The area consists of clay or sandy soils, cropped on a rotational basis. Drainage of the paddocks is generally not well defined, with excess runoff of rain water eventually draining into salt lake systems north and south of the Project area.

5.4 Flora

As already noted, the majority of land in the area has previously been cleared for farming. The proposed treatment site includes an area of partially cleared land adjoining Wolyaming Road which has previously been used as a source of gravel for road construction.

Reserve 24072 (48.5144 ha.) for the purpose of conservation of flora and fauna exists about midway between the Jinkas Hill and Dingo Hill mine sites and is two kilometres north of the proposed mill site. The reserve is surrounded on three sides by completely cleared farmland and adjoins Reserve 12423 (the Wurgabup Rifle Range) on the other. No operations are planned in or adjacent to the flora and fauna reserve, hence it is

considered unlikely that the proposed operations would have any effect on the flora or fauna within the reserve.

5.5 Fauna

In the immediate vicinity of the Badgebup Project area there are no physical features which are not common to a very large area of the surrounding farming lands. It therefore appears extremely unlikely that any specialised habitats peculiar to individual fauna species occur within the Project area.

5.6 Climate

The Great Southern Wheatbelt area of Western Australia has very dry, hot, summers and cold winters with moderate rainfall in the months of July to September.

The district has an annual rainfall of approximately 450mm (See Figure 7). The usual variations in inland Western Australian rainfall apply, with drought conditions a common occurrence. Evaporation has been calculated at 1300mm per year (See Figure 8) and greatly exceeds precipitation.

5.7 Water Resources

There is no permanent surface water in the area, due to the low rainfall, high evaporation and slight relief. Many farmers have small dams to water the sheep, but as they dry up quickly in the summer, they are not considered to be permanent surface water. Saline ground water is widespread through this wheat belt area, but it is not generally suitable for agricultural application due to high salinity levels.

5.8 Archaeological and Ethnological Aspects

Some months following the announcement of the discovery of a significant gold occurrence at Jinkas Hill an application for registration of an aboriginal site was made by a Ms Caroline Bird - Anthropology Student at University of W.A. The area was given Site Registration No. S0957.

Following representations by the company, Employees of the Western Australian Museum delineated the boundaries of the supposed site on the ground. This boundary is shown in Figure 4. The boundaries of the proposed open pit as currently planned will not encroach on to the site.

The Companies have the consent of the Minister for Cultural Affairs in the form of a letter dated April 14, 1981 written by the Minister to the effect that the site:

"..... may be disturbed or destroyed for the purposes of mining....."

A copy of the letter is appended. (Appendix A)

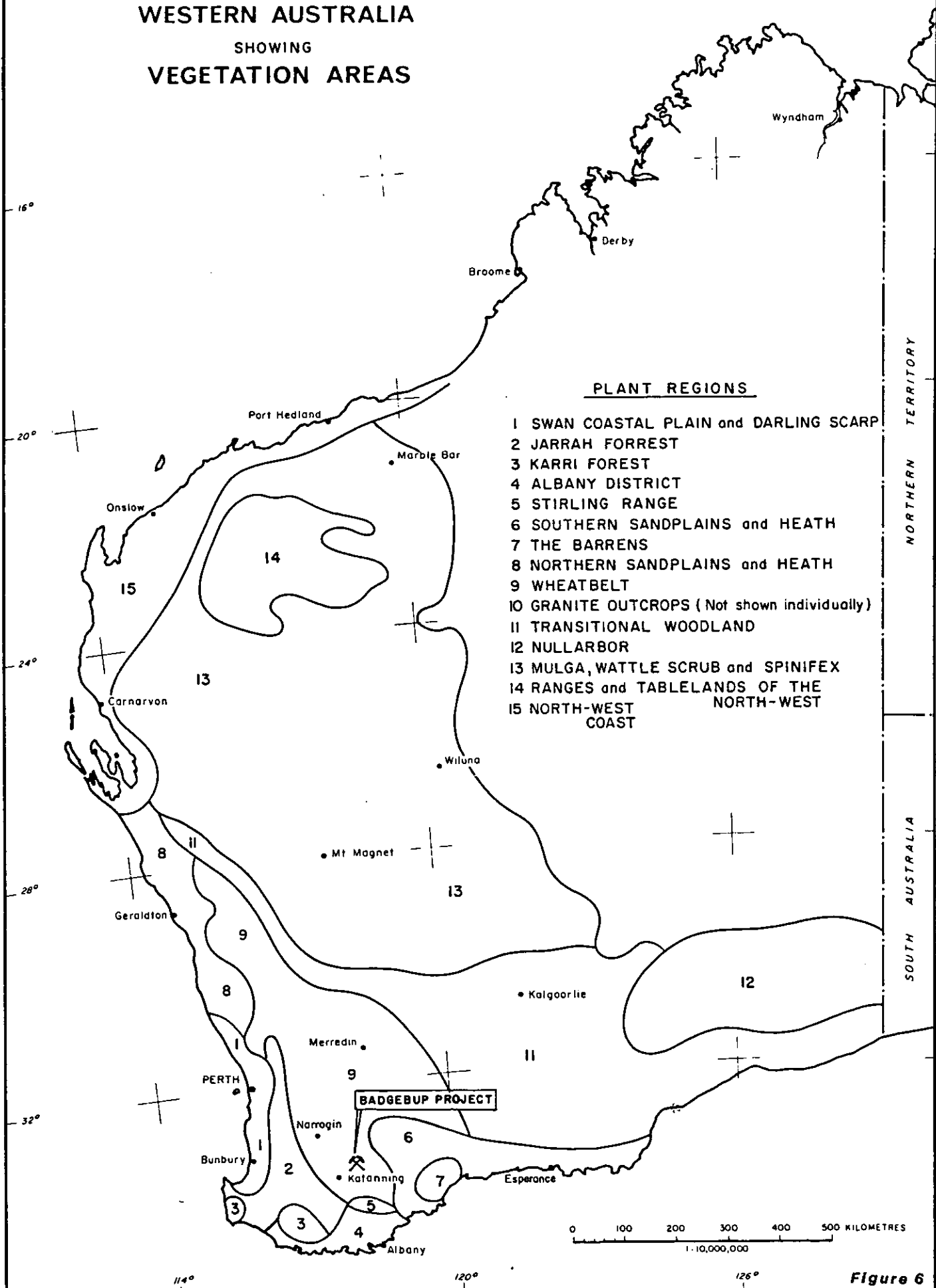
Should it become apparent that the mining operations will encroach over the site boundaries the Companies will approach the Museum with a view to arranging an appropriate archaeological survey and salvage operation. This encroachment is however unlikely to occur.

The Companies recognise their responsibilities under the Aboriginal heritage Act 1972, and will approach the W.A. Museum to conduct a survey of any of the project area where disturbance of Crown land or undisurbed private land is considered.

5.9 Seismic Activity

Government records since 1923, show the Badgebup area to be seismically quiet, with no earthquake epicentres with a magnitude greater than 3.0 on the Richter scale occurring within 100 kilometres of the Project site. (See Figure 9)

WESTERN AUSTRALIA SHOWING VEGETATION AREAS



PLANT REGIONS

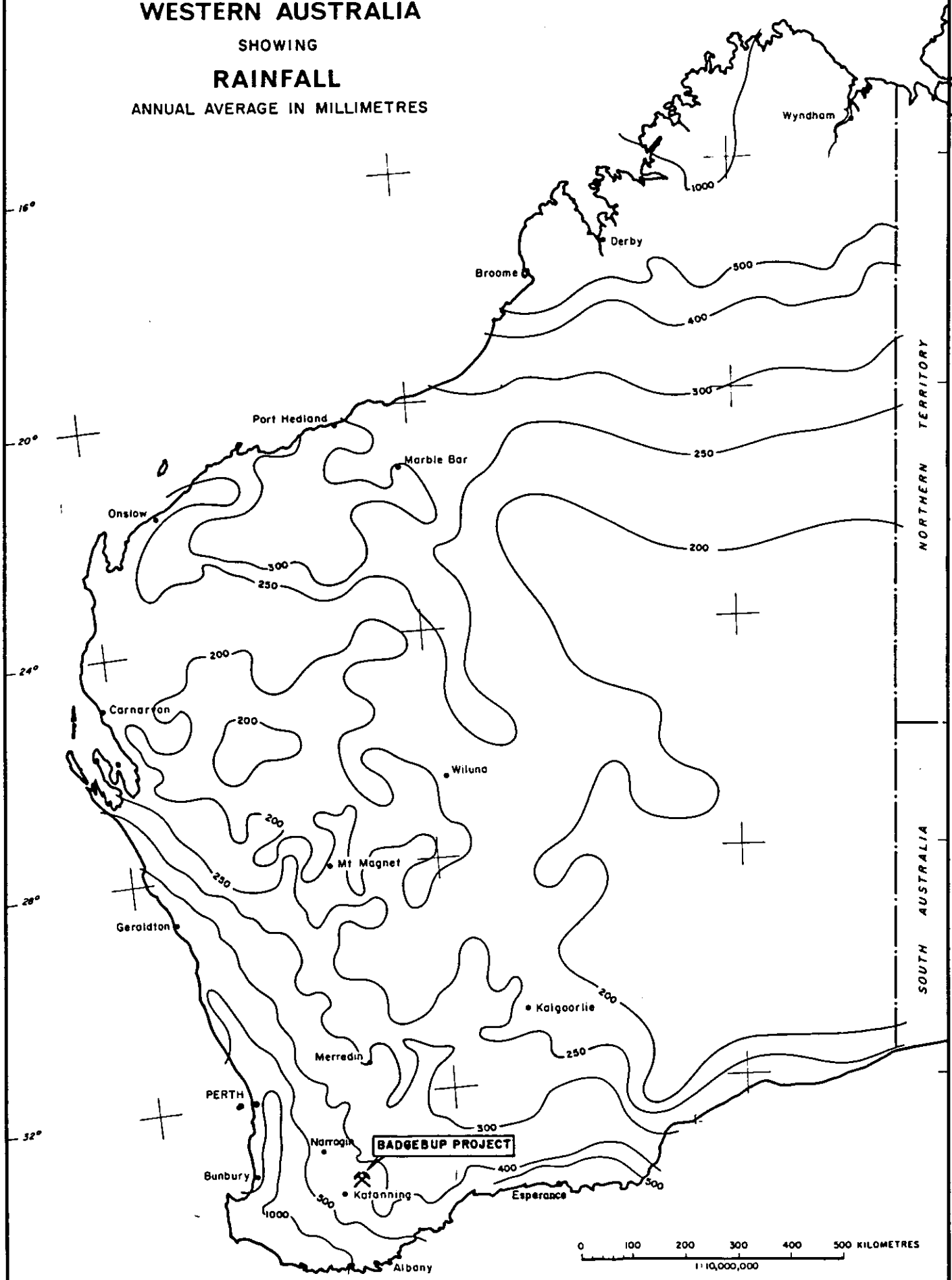
- 1 SWAN COASTAL PLAIN and DARLING SCARP
- 2 JARRAH FORREST
- 3 KARRI FOREST
- 4 ALBANY DISTRICT
- 5 STIRLING RANGE
- 6 SOUTHERN SANDPLAINS and HEATH
- 7 THE BARRENS
- 8 NORTHERN SANDPLAINS and HEATH
- 9 WHEATBELT
- 10 GRANITE OUTCROPS (Not shown individually)
- 11 TRANSITIONAL WOODLAND
- 12 NULLARBOR
- 13 MULGA, WATTLE SCRUB and SPINIFEX
- 14 RANGES and TABLELANDS OF THE NORTH-WEST
- 15 NORTH-WEST COAST

NORTHERN TERRITORY

SOUTH AUSTRALIA

Figure 6

WESTERN AUSTRALIA
SHOWING
RAINFALL
ANNUAL AVERAGE IN MILLIMETRES



BADGEBUP PROJECT

0 100 200 300 400 500 KILOMETRES
1:10,000,000

Figure 7

WESTERN AUSTRALIA
 SHOWING
 EVAPORATION
 ANNUAL AVERAGE IN MILLIMETRES

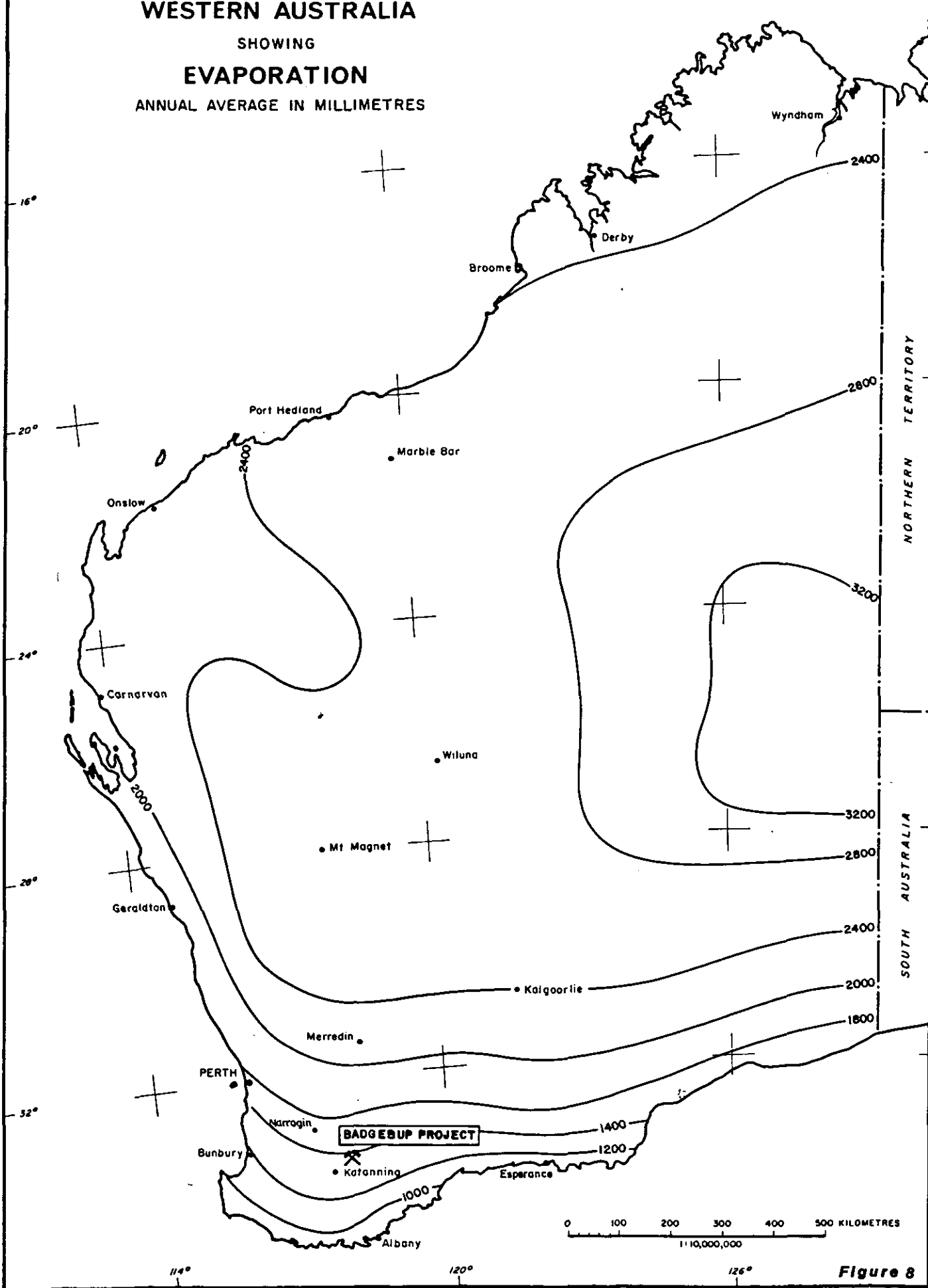


Figure 8

SEISMOGRAPH RECORDING STATIONS

- Three component
- Single component

EARTHQUAKES 1873-1977

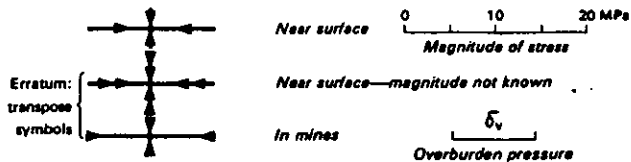
- Magnitude
- 3.5-4.9 5.0-5.9 >5.9
- <70 ● ● ●
- >70 ▲ ▲ ▲

FOCAL MECHANISMS

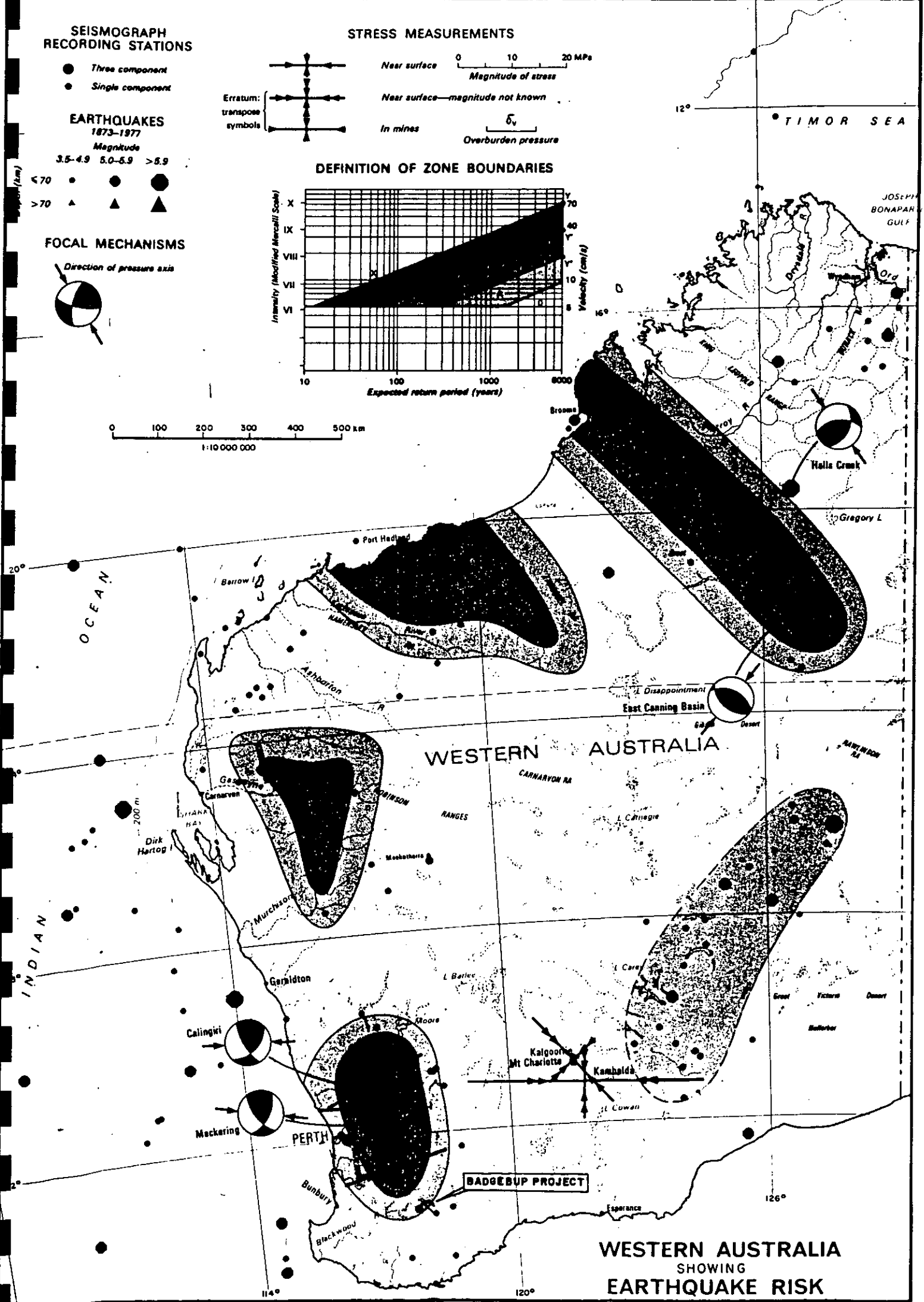
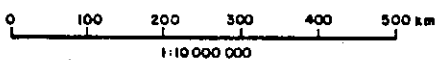
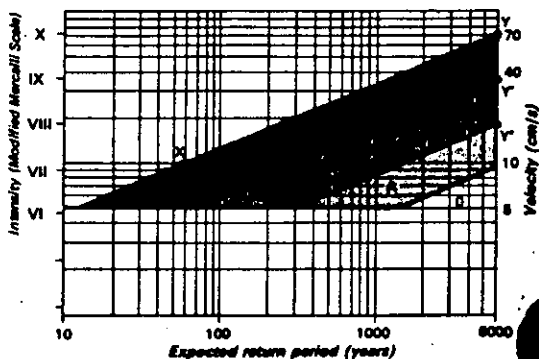
Direction of pressure axis



STRESS MEASUREMENTS



DEFINITION OF ZONE BOUNDARIES



WESTERN AUSTRALIA SHOWING EARTHQUAKE RISK

Figure 9

6.0 ENVIRONMENTAL IMPACT OF THE PROJECT AND PROPOSED CONTROL

6.1 Introduction

The total impact of the Project may be assessed by a consideration of the Project's effects on the following:

- (a) The permanent effects of the mining complex on the environment.
- (b) The effect of waste products during and after operation of the mine and mill.
- (c) The effect of the Project on present land usage and on the residents of the area and other communities.
- (d) The working environment within the proposed complex.

The precautions planned to avoid or minimise deleterious effects are discussed below.

6.2 Permanent Effects of the Mining Complex on the Natural Environment

The open pits and tailings dump constitute the principal permanent effects. Because of the limited life of the mine, buildings, plant and equipment will be removed when production ceases. The area around each of the pits will be rehabilitated, making it suitable for wheat and sheep farming activities. All ground water supply piping and reticulation and the tailings transport system will be removed from the area when the mining operation is completed.

The impact on the local flora and fauna will be minimal and temporary because of the limited size of the project and its limited life span. Any of the native animal population that are displaced by the project should return when the mine site is decommissioned.

6.2.1 Decommissioning of Mine and Plant

The Companies are aware of their responsibilities under the Mines Regulation Act for the abandonment of the mine and will act accordingly. The tailings dump in particular will be managed during and after the mining operation ceases. Rehabilitation of the tailings dump will continue until it is in a stable condition, particularly with regard to wind and water erosion.

The mine sites, except for the open pits, will be left in a suitable condition to permit farming to recommence.

Back filling of large portions of the open pits is proposed at this stage, unless further geological

investigations reveal economic ore extensions emanating from the existing workings.

6.3 Industrial Waste Products

A typical sample of the oxidised ore from the mine has the following analysis.

<u>Typical Assay</u>	<u>Weight %</u>
SiO ₂	58.5
Al ₂ O ₃	16.8
Fe ₂ O ₃	12.1
LOI	8.74
K ₂ O	1.88
MgO	0.196
Na ₂ O	0.46
CaO	0.031

<u>Typical Assay</u>	<u>ppm</u>
Mn	110
Pb	65
Cu	60
Zn	60
Ni	5
Co	5
As	5

About 2 kilograms of lime and 1.5 kilograms of sodium cyanide will be used in the treatment of each tonne of ore. No other reagents will be used at the Badgebup site.

The actual mining procedure will require very little blasting activity, so nitrates from ANFO blasting agents will be minimal.

6.3.1 Tailings Disposal

The tailings pulp will contain about equal quantities of saline ground water and ground ore.

A small on-site tailings dam is proposed by the Companies for tailings disposal (see Figure 3). Tailings at a later stage of the operation will be deposited inside the open cuts where suitable, to minimise land surface usage.

During the life of the mine the tailings dam will contain varying amounts of free surface saline water. The high salinity of water in the tailings dam due to evaporation will preclude its use by resident birds and

visiting waterfowl.

Access to the tailings dam by ground dwelling animals will be prevented by suitable fencing.

The Companies will segment the tailings down into several ponds so that disposal on a rotational basis is possible, and will minimise the risk of loss of tailings through a failed wall.

Figure 9 shows that the Badgebup Project is outside the areas of earthquake risk, and therefore this factor will not influence the tailings dam design.

6.3.2 Solid Waste

As the waste rock will be in a coarse broken form, the fugitive dust loss will be minimised.

Mine development waste rock will be stored close to the open pit site and contoured into the landscape and covered with 150mm of top soil. Where possible, waste rock may be back filled into the open cut mine. Scrap materials and refuse of a solid nature will be buried or incinerated in accordance with the requirements of the Katanning Shire Council.

Dust control around and within the treatment plant will conform to requirements of the W.A. Clean Air Act (1971) and the Mines Regulation Act. As the treatment plant is predominantly a wet leaching process only the crushing and screening plant will need attention.

6.3.3 Mill Tailings Effluent

The tailings pulp will be pumped to the tailings dump in a slurry containing about equal quantities of water and solids. The free cyanide in the tailings is at a concentration typical of gold leaching operations and is expected to quickly break down under the effect of natural degradation.

The height of the tailings walls will be sufficient to contain the run off from any rainfall. The tailings site selected will be assessed by the Companies as required by the Department of Conservation and the Environment, the Mines Department, and the Public Works Department.

The figures taken from Australia's Rainfall and Runoff Flood Analysis and Design (The Institution of Engineers, Australia) for the recurrence interval and rainfall intensity are as follows:

12 Hour duration, 2 year recurrence 36 mm.

12 Hour duration, 50 years recurrence 84 mm.
72 Hour duration, 2 year recurrence 58 mm.
72 Hour duration, 50 years recurrence 108 mm.

The above statistical data will be utilised when the tailings pond causeways are designed.

The tailings disposal system will require an effluent disposal licence under rights in Water and Irrigation Act, administered by the Public Work Department. At a suitable time during the Soil and Rock Engineering Study the Companies will approach the Public Works Department for a licence.

6.3.4 Gaseous Waste

All equipment at the plant will be electrically driven by power supplied by the S.E.C.

6.4 Natural Degradation of Cyanide (Ponding)

Existing practice is to direct the cyanide containing pulp to the tailings disposal area. Providing that the pond has a adequate retention time, the operation of natural environmental forces can effect some reduction in the concentration of a number of pollutants, including cyanide. These forces include photodecomposition by sunlight, acidification by the carbon dioxide in the air, oxidation by oxygen in the air, dilution and absorption on solids, and microbe action.

With the reduction in excess cyanide ion concentration, secondary metal precipitation reactions may be expected to occur. The effectiveness of natural degradation in a tailings pond has been impressively demonstrated by Dome Mines, in northern Ontario. (Scott J.S., Ingles J.C. "Removal of Cyanide from Gold Mill Effluents", 13th Annual Meeting, Canadian Mineral Processors, pp. 14-15 1981).

At that mine, waste barren solution containing about 100 mg/L total cyanide has dropped to a level of about 0.1mg/L during the summer months.

6.5 Human Wastes

Effluent and waste water from the ablution block will be run into a standard septic system of a suitable size to accommodate the predicted volume.

7.0 EFFECTS OF THE PROJECT ON LAND USE AND RESIDENTS

7.1 Land Use

The total area of land required for the project is 22 hectares. Of this approximately 16 hectares is currently used for wheat and sheep farming and the balance of 6 hectares is land which has remained uncleared due to its unsuitability for cultivation or grazing. The table below sets out the various land requirements for the project.

<u>Location</u>	<u>Land Requirement (hectares)</u>
Jinkas Hill, pit and waste dump	8
Dingo Hill, pit and waste dump	5
Dingo Hill, ore haul road	1
Treatment plant and stockpile area	2
Tailings dam	<u>6</u>
TOTAL:	22

The various features of the project will be laid out in such a way that they should cause minimal disruption to the day to day activities of the farmers concerned.

While production will be lost on the farmland listed above, in each case it represents less than one percent of the land held by the individual farmers and should have a negligible impact on the viability of their operations.

7.2 Permanent Residents

The Companies believe that the effect of the Badgebup Project will be beneficial to the general Katanning community. The obvious benefit will be:

- Increased employment.
- Increased income for local service industries.
- Increased expenditure in shops and stores.

Disadvantages to permanent residents will be minimised by the management and appear to be:

- Increased activity in the area and in the township of Katanning ;

Some localised noise emission from the mining operation requires consideration for the farm homesteads in the immediate area.

Homestead Distance from the Operation

J. & F. Caldwell	0.5 km north east of Jinkas Hill. Homestead not occupied, Caldwells reside in Katanning townsite.
B. & D. Clegg	3 km north west of Jinkas Hill
H. & N. Smith	2.5 km south east of Jinkas Hill
E.F. Smith	2.0 km south of Jinkas Hill
S. Longmire	2.5 km west of plant site
P. Keast	2.0 km south of plant site

The township of Katanning is 40 kilometres from the mine site, which is an adequate distance to eliminate the noise problem.

7.3 The Working Environment

The Companies' Management are aware of their responsibilities with regard to the following Government Acts:

- (a) The Mining Act (1978) and Mines Regulation Act (1974) as administrated by the Mines Department
- (b) Noise Abatement Act (1972) administrated by the Deptment of Health and Medical Services.
- (c) W.A. Clean Air Act (1971) administrated by the Department of Health and Medical Services.
- (d) Environmental Protection Act, administrated by the Department of Conservation and Environment.
- (e) Rights in Water and Irrigation Act, administrated by the Public Works Department.
- (f) Local Government Act. As directed by the Shire of Lake Grace.
- (g) And other regulatory requirements including:
 - Construction Safety Act
 - Inspection of Machinery Act
 - Assistance to Decentralised Industry Act
 - Main Roads Act
 - Soil Conservation Act

Any persons, whether employed by the Companies or various contractors which may be retained by them, will be made aware of these responsibilities to the Government, and the Management of the Project will ensure that these

requirements are adhered to.

The health of the employees will be maintained as required by the Mines Department and the Public Health Department, and all personnel will be made aware of safety precautions, and issued with modern protective safety clothing and equipment. Special care will be made to protect the staff from hazards associated with the use of sodium cyanide.

7.4 Dust Control

The Treatment Plant will be of a conventional carbon-in-leach design with crushing, grinding, screening, cyanidation, and carbon adsorption. Dust control will be applied to the crushing and screening circuits. Chemical preparation will be carried out in a correct and ventilated manner. The Companies' Management will discuss the various requirements with officers of the Clean Air Section of the Public Health Department and the Mines Department.

7.5 The Living Environment

As the work force will be living in the township of Katanning, they will conform to the council requirements as does any other citizen.

The township of Katanning offers excellent facilities and amenities, including:

- Sport Clubs
- Country Clubs
- Hotels
- Motels
- Restaurants
- All transport facilities
- Primary School and many Government Departments.

As the Project will have a total number of employees of less than 30, it is not expected that any overload of Katanning facilities will occur.

8.0 OTHER ENVIRONMENTAL SAFEGUARDS

The land area required by the Project will be strictly limited to the minimum required.

All work force involved in the various stages of the Project will be made aware of the local environmental requirements and possible damage they could do.

APPENDIX A

Letter from the Minister for Cultural Affairs,
April 14th, 1981



OFFICE OF THE MINISTER FOR EDUCATION
CULTURAL AFFAIRS AND RECREATION
PARLIAMENT PLACE
WEST PERTH. 6005

14th April, 1981.

Mr G.V. Blackburn,
Regional Geologist,
Otter Exploration N.L.,
125 Edward Street,
EAST PERTH. W.A. 6000.

Dear Mr Blackburn,

Aboriginal Site S0957 - Jinka's Hill

I refer to your application to the Trustees of the Western Australian Museum to disturb site S0957 in accordance with Section 18 of the Aboriginal Heritage Act, received at the Museum on 10th April.

I have received advice from the Trustees and wish to inform you, that in accordance with my powers under Section 18(3) of the Aboriginal Heritage Act as amended, I hereby give consent to your company's use of the land designated as Aboriginal Site S0957 in the following terms:

Given that the site is of historical significance under Section 39(2)(b) of the Aboriginal Heritage Act, the site should not be disturbed for exploration purposes but may be disturbed or destroyed for the purposes of mining, subject to the Western Australian Museum being given the opportunity, at your company's expense, to arrange for an adequate archaeological survey and salvage, where appropriate, of this and other sites within your lease.

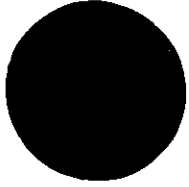
Yours sincerely,

BILL GRAYDEN, M.L.A.
MINISTER FOR CULTURAL AFFAIRS

NOI

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GLENGARRY MINING N.L.
WATTLE GULLY GOLD MINES N.L.
SOUTHWEST GOLD MINES N.L.

BADGEBUP GOLD PROJECT
WESTERN AUSTRALIA

WORKS APPROVAL DOCUMENT

AUGUST 1988

Prepared by Glengarry Mining N.L.

FILE:

838/88

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DRAWINGS

Figure 1	Badgebup Gold Project - Location Map	Scale: 1:50000
Figure 2	Badgebup Gold Project - Plant Area Site Plan	Scale: 1:5000
Figure 3	Plan No. G10-1003 - Proposed Tailings Dam Earthwork Details	Scale: 1:1000

1. INTRODUCTION

1.1 Introduction

This document has been prepared to support an application for E.P.A. Works Approval for a tailings dam to be constructed for the Badgebup Gold Project near Katanning. A Notice of Intent (NoI) for the project has previously been submitted by the former owners and an addendum to the NoI has been prepared by the current owners to update the description of the project as now proposed. Reference should be made to both of these documents for a description of the overall project and its environment.

1.2 Location

The Badgebup Gold Project is situated in the South West Mineral Field 300 kilometres south-east of Perth, Western Australia. The location is at latitude 30°31'20"S and longitude 117°55'00"E (Figure 1). The project is situated about 36 kilometres east-north-east of the township of Katanning.

There are no other operating or proposed mining projects in the district, the nearest operating mine being Otter Exploration's Griffins Find gold mine near Lake Grace, 70 kilometres to the north-east.

The project is based on proved ore reserves in Mining Leases 70/210 (Dingo Hill) and 70/211 (Jinka's Hill). The proprietors have also purchased the surrounding Exploration Licence 70/18.

1.3 Ownership and Management

The Badgebup Gold Project is a joint venture between Glengarry Mining N.L. (47.5%), Wattle Gully Gold Mines N.L. (47.5%) and Southwest Gold Mines N.L. (5%). Glengarry is manager of the joint venture.

Glengarry is a wholly-owned subsidiary of Folkestone Gold N.L. Folkestone Gold N.L. and the other two joint venture parties are all listed public companies with majority Australian ownership.

The head office location for each of the three parties is:

Glengarry Mining N.L.
12 Nairn Street
FREMANTLE, W.A. 6160

Wattle Gully Gold Mines N.L.
7th Floor, The Forrest Centre
221 St. George's Terrace
PERTH, W.A. 6000

Southwest Gold Mines N.L.
Ground Floor
524 Hay Street
PERTH, W.A. 6000

1.4 History

There has not been any previous mining activity in the area. Regional stream sediment sampling in 1979 led to the discovery of the Jinka's Hill deposit by the Otter Group of companies. Follow-up work in 1980 identified Dingo Hill. A number of other potential gold targets have been identified but have not been fully tested.

Exploration activity since 1979 has included surface sampling, magnetometer surveys, drilling and costeaning over the known ore positions.

Ownership of the various tenements passed from the Otter Group (Associated Gold Fields N.L.) to the current owners as the result of sale and purchase agreements made in 1987 and finalised in the current year.

1.5 Existing Facilities

As noted there has been no previous mining activities in the area and no mine-related facilities exist. The project site is well serviced by all transport systems. There is a good quality gravel airstrip located at the township of Katanning. Westrail's Badgebup siding on the Katanning to Nyabing line is located nine kilometres southerly from the project site.

The bitumen Katanning-Nyabing Road is situated next to the rail line and the gravel roads in the area of the project are of a good quality. In addition Warren Road, which passes 1.5 kilometres north of the Jinka's Hill deposit, is bitumenised from Katanning to within three kilometres of the proposed mill site. It is not intended to use public roads to transport ore in the early stages of the mining operation.

S.E.C. power lines servicing local farms cross the site.

A proposed extension to the Great Southern water supply network will pass close to the Badgebup siding.

2. GENERAL INFORMATION

Process Type: Recovery of Gold by Cyanidation Using Carbon-in-Pulp System

Throughput: 200,000 tonnes per annum

Ore Type: Gold mineralisation associated with quartz. The host rock is a granulite. The quartz is believed to represent a highly metamorphosed chert or quartzite. There can be minor sulphides and magnetite associated with some mineralisation.

Tailings: A production rate of 200,000 dry tonnes per annum.

3. TAILINGS PROPERTIES

3.1 Mineralogy/Composition

Base metal content - drill hole samples have not been assayed for base metals. However geological knowledge would indicate that they are at background levels only.

Residual gold - estimated to be 0.17 gpt.

Sulphide content - unknown, but very minor from geological observations of drill samples.

3.2 Residual Process Chemicals

Total cyanide ex-plant is 800 ppm.

Total cyanide in tailings return water is 800 ppm.

Free cyanide ex-plant is 100 ppm.

Free cyanide in tailings return water is 100 ppm.

Salinity of process water is 8,000 mg/litre.

Salinity of tailings return water is not known.

PH of slurry ex-plant is 9.8.

PH of tailings return water is 9.8.

Lime will be added at the rate of 4 Kg/tonne.

4. TAILINGS DISPOSAL STRUCTURE

4.1 Plan and Section

A detailed plan and section of the proposed tailings dam is appended (Plan No. G10-1003).

4.2 Construction Method

Plan No. G10-1003 has been prepared to show the proposed tailings area and the method of construction. In essence:

- (a) The site will be cleared of top soil and stockpiled for final covering of tailings.
- (b) A kee slot will be excavated to allow the impermeable core of the wall to bed on to the impermeable layers below the surface.
- (c) Initially, the walls will be constructed to RL374 and progressively raised using selected spoil from the mining operation which will be placed to maintain a freeboard of not less than one metre. The relationship between wall height and capacity (dry tonnes) is shown on G10-1003.

4.3 Area

The total area of the tailings site is 6.9 hectares.

4.4 Depth

The ultimate depth of tailings will vary from two metres at the northern end of the dam to 10 metres at the southern end. The walls will be lifted progressively.

4.5 Capacity

The storage capacity is shown at a wall height of RL385 and has the capacity to hold up to 583,000 dry tonnes (refer to Table on G10-1003).

4.6 Wall Angles

These are designed for outer wall slopes of 20° and inner walls at 35°.

4.7 Decant System

This is shown on Plan G10-1003 and uses a weir column with variable height weirs and a return water pump which remains primed at all times. This system eliminates the circumstances where free water is in contact with the outer walls.

4.8 Liners

The decant system proposed eliminates the need for an external lined dam which is external to the main structure.

5. TAILINGS DENSITY

Average slurry density ex-plant is 40% solids by weight (1.29 dt per cubic metre).

Estimated final tailings density is greater than 70% solids by weight (1.65 dt per cubic metre).

The estimated angle of internal friction is not known. However water management producing a final tailings density of 70% solids should result in a shear strength of the order of 150 kpa.

Particle size distribution is as follows:

<u>Size</u>	<u>WT %</u>
+ 106 mm	4.7
-106 + 90 mm	5.8
- 90 + 75 mm	12.6
- 75 + 45 mm	21.7
- 45 mm	55.2

	100.0

The hydraulic conductivity and/or permeability has not been determined.

6. TAILINGS DISPOSAL SITE DETAILS

6.1 Topography

Topography within the Badgebup area is gently undulating with maximum relief of about 70 metres over a distance of three kilometres. The site chosen for the tailings dam is at an elevation of 370 metres A.S.L. and has a uniform slope of 3% towards the south west.

6.2 Vegetation

The topography and vegetation of the district is typical of the Great Southern Wheatbelt Region . Most of the natural vegetation has been replaced by farming paddocks, leaving natural bush only in reserves or areas unsuitable for agriculture. The entire tailings dam site has been cleared and was offered to the project by the farmer, being an area of generally degraded soil.

6.3 Soils

The area consists of clay or sandy soils, cropped on a rotational basis. Drainage of the paddocks is not well defined, with excess run-off of rain water eventually draining into salt lake systems north and south of the project area.

6.4 Sub-soils

Sandy infertile soils up to 0.5 metres developed over the clay zone of a laterite profile. Weathered granulite and adamellite occur at a depth of about 10 metres.

6.5 Geology

The area is underlain by a sequence of gently east dipping, northwest trending, mafic to felsic granulites which have been intruded by discordant sheets of Archaean adamellite. Easterly trending dolerite dykes of proterozoic age intrude this sequence. The granulites are metamorphic derivatives of rocks that were probably of sedimentary and volcanogenic origin.

Gold mineralisation is confined to two or more shallow east dipping felsic granulite units containing quartzite intercalations and minor chert bands. There is a close spatial relationship between the auriferous granulites and an adamellite sill.

The regional fracture system has two main components. An east-west trend and a north-east south-west trend.

6.6 Groundwater

A series of drill holes were drilled in February 1986 by Associated Gold Fields to investigate the groundwater potential at Badgebup and equip the holes for test pumping at some future date. The sites were chosen based on geological criteria by AGF.

Details of the holes are set out below:

K255 Northern end of Dingo Hill, 40580N, 50167E
adjacent to inferred dolerite dyke

TD 26m, water at 25m (poor), hole abandoned for geological reasons, not cased.

Water analysis (ppm)

Na	Mg	Cl	Ca	Fe	TDS	pH
3580	730	7270	210	1	15130	7.55

K256 Edge of creek east of Lone Tree, 19200N, 20027E
near angle drill hole which has flowed at collar periodically

TD 45m, water at 35m, cased to ± 40m, slotted last 12m, reasonable flow.

Water analysis (ppm)

Na	Mg	Cl	Ca	Fe	TDS	pH
1460	475	3830	270	1	8780	7.70

K257 24 metres west of K255, 40680N, 50143E
offset from K255 to test same concept

TD 22m, water at 15m, cased to 21m, slotted last 8.5m, flow not as good as K256.

Water analysis (ppm)

Na	Mg	Cl	Ca	Fe	TDS	pH
3210	710	6740	48	1	14650	7.69

K258 Drainage channel north west of proposed tailings dam not on grid

TD 40m, water at 31m, cased to 38m, slotted last 10m, best flow of holes drilled.

Water analysis (ppm)

Na	Mg	Cl	Ca	Fe	TDS	pH
2420	320	4330	195	1	8600	7.40

K259 Jinka's Hill South, 1800N, 20226E
sited near previous wet holes?

TD 26.5m, no water - hole abandoned.

6.7 Water Resources

There are no licenced water bores in the Badgebup district.

6.7 Catchment Area

The tailings dam is located near the head of a catchment area totalling a maximum four hectares.

6.9 Run-off Diversion

It is intended to put drains just up-slope from the eastern and western sides of the tailings dam to divert any rainwater run-off into the sump at the southern end.

7. TAILINGS EMPLACEMENT METHOD

Method of Deposition:

- (i) Sub-aerial discharge from tailings pipe around the dam perimeter.
- (ii) Maximum lift thickness of 0.5 metres.
- (iii) Annual growth rate of 4.0 metres.

Emplacement will be such that tailings are fully dried between each cycle.

8. CLIMATIC CONDITIONS

The Great Southern Wheatbelt area of Western Australia has very dry hot summers and cold winters with moderate rainfall in the months of July to September.

The district has an annual rainfall of approximately 450 mm. The usual variations in inland Western Australian rainfall apply, with drought conditions a common occurrence. Evaporation has been calculated at 1300mm per year and greatly exceeds precipitation.

The design of the tailings dam is based on these data and on the need to catch any run-off water and recycle as much water as possible through the plant.

9. MONITORING

Two bores will be located downstream from the tailings dam and these will be monitored to test the groundwater (refer to Figure 2).

Groundwater samples will be collected and analysed monthly whereas samples of surface water will be collected after rain sufficient to cause run-off has occurred, but not more frequently than once per month.

The tailings pipe running from the plant to the tailings dam will be located on a gently sloping surface that runs into a drain. The drain will act as a collector in case of a burst or leaking pipeline. Similarly the track alongside the safety drain will also slope gently towards the drain to contain any possible leakage until it is repaired (refer to inset on Figure 2).

Inspections of the tailings pipeline will be made every four hours.

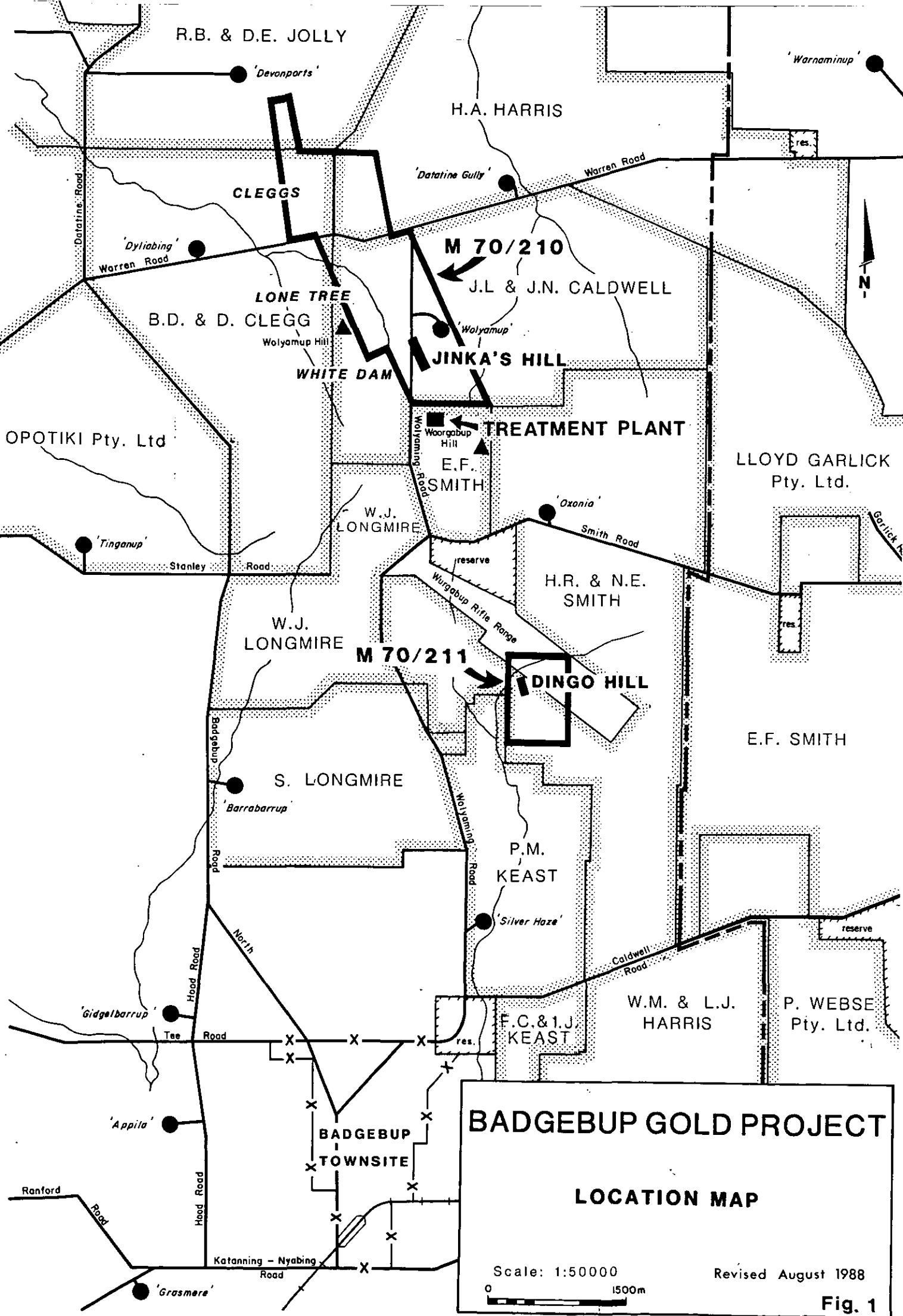
The return water dam will be fitted with a warning system that will alert plant operators to any possible overflow situation

10. REHABILITATION

The infertile sandy soil that is displaced in the construction of the dam walls will be used to cover the top surface of the completed tailings dump to a depth of at least 500mm.

The tailings walls will be constructed of waste mine rock and suitably placed ditches to divert any rain run-off from eroding the walls will have been in use since the formation of the dam.

The collector sump will be refilled and drainage will occupy its normal route down stream.



BADGEBUP GOLD PROJECT

LOCATION MAP

Scale: 1:50000

Revised August 1988

0 1500m

Fig. 1

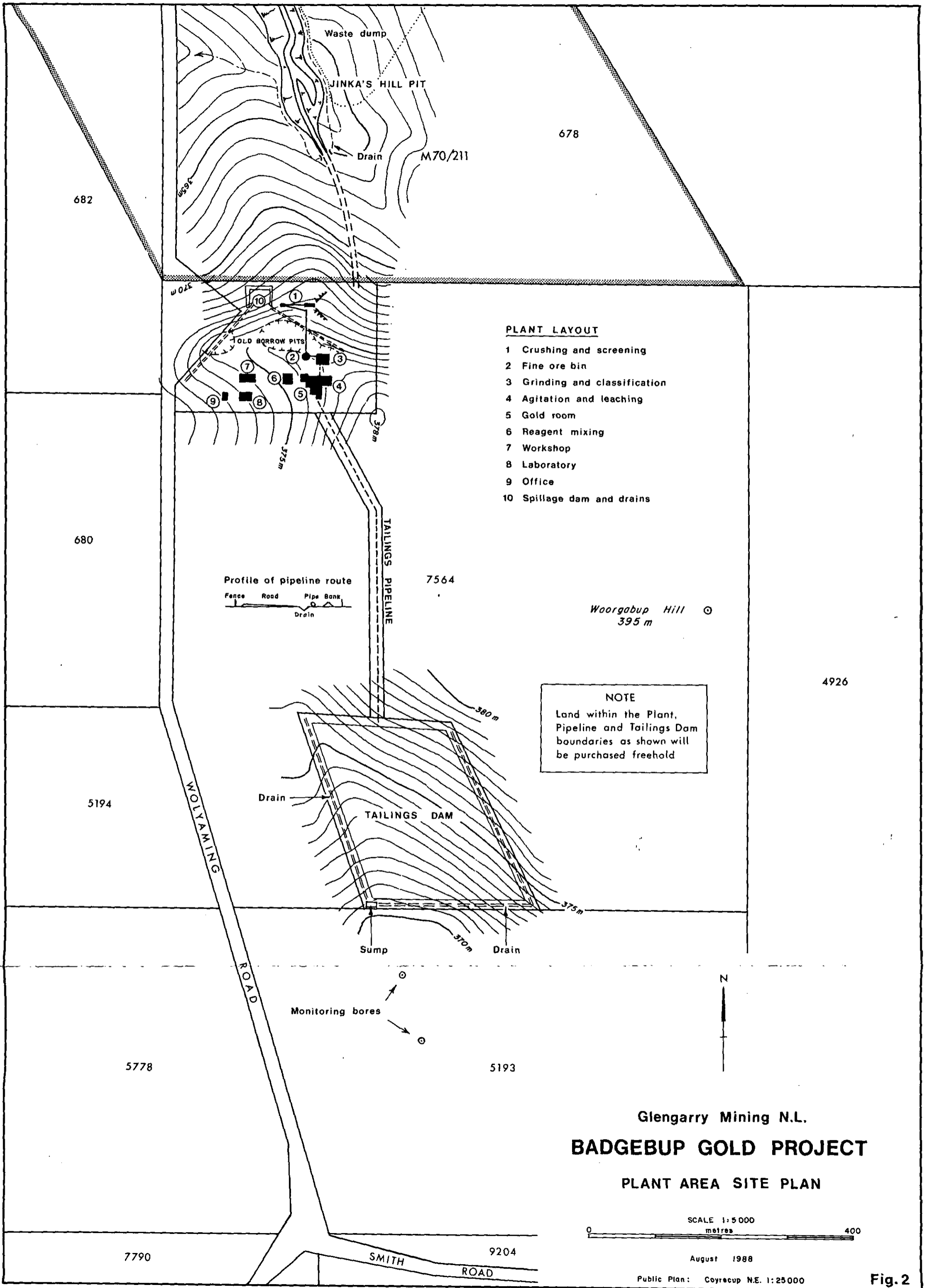


Fig.2