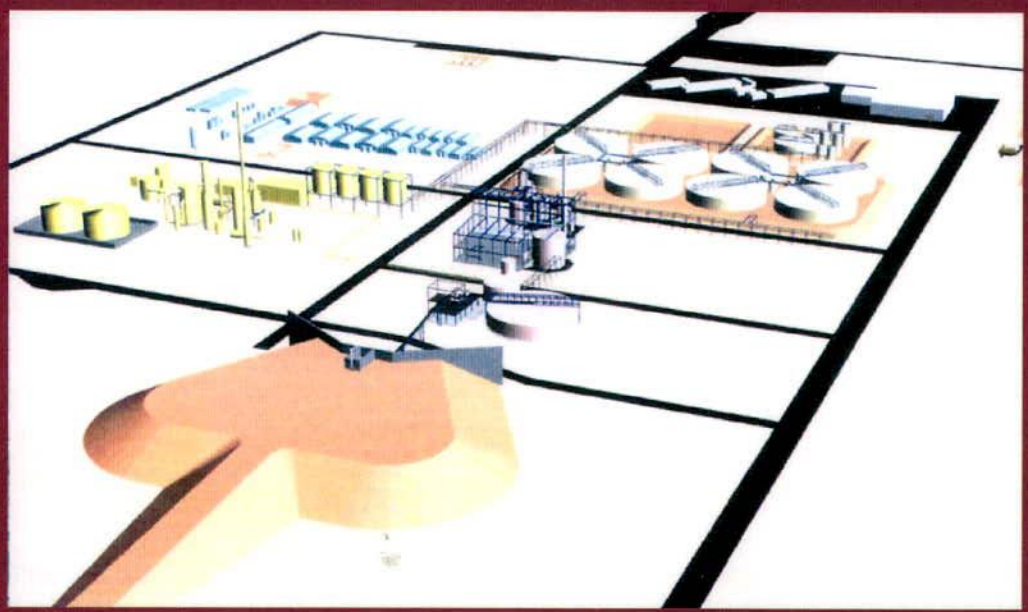
THE BULONG NICKEL COBALT LATERITE PROJECT

CONSULTATIVE ENVIRONMENTAL REVIEW



VOLUME 2 - APPENDICES

RESOLUTE RESOURCES LIMITED

INCORPORATED IN WESTERN AUSTRALIA

RESOLUTE RESOURCES LIMITED

BULONG NICKEL LATERITE PROJECT

CONSULTATIVE ENVIRONMENTAL REVIEW

VOLUME II – APPENDICES

Prepared for:

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BA5007-01-001 Rev 1

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VOLUME II

APPENDICES

Appendix A

CONDITIONS APPLYING TO MINING LEASES HELD BY THE PROPONENT

Appendix A

CONDITIONS APPLYING TO MINING LEASES HELD BY THE PROPONENT

Lease	Size (ha)	General conditions	Specific conditions	Date
M25/111	119.3	1 Survey.	NA	15.10.93
		2 Compliance with the provisions of the *Aboriginal Heritage Act* 1972 to ensure that no action is taken which would interfere with or damage any Aboriginal site.		
		3 All surface holes drilled for the purpose of exploration are to be capped, filled or otherwise made safe after completion.		
		4 All costeans and other disturbances to the surface of the land made as a result of exploration, including drill pads, grid lines and access tracks, are to be backfilled and rehabilitated to the satisfaction of the District Mining Engineer. Backfilling and rehabilitation are required no later than six months after excavation unless otherwise approved in writing by the District Mining Engineer.		
		5 All waste materials, rubbish, plastic sample bags, abandoned equipment and temporary buildings are to be removed from the mining tenement prior to or at the termination of exploration programme.		

Lease	Size (ha)	General conditions	Specific conditions	Date
		6 Unless the written approval of the District Mining Engineer is first obtained, the uses of scrapers, graders, bulldozers, backhoes or other mechanised equipment for surface disturbance or the excavation of costeans is prohibited. Following approval, all topsoil is to be removed ahead of mining operations and separately stockpiled for replacement after backfilling and/or completion of operations.		
		7 No developmental or productive mining or construction activity is to be commenced until the tenement holder has submitted a plan of the proposed operations and measures to safeguard the environment to the State Mining Engineer for assessment; and until his written approval has been obtained.		
M25/75	641.5	As above	8 The complete excision of any portion encroaching on that portion of Prospecting Licence 25/906 that was contained within former Gold Mining Lease 25/1408.	
			9 The complete excision of Gold Mining Leases 25/1338, 25/1379, 25/1380, 25/1410, 25/1413, 25/1414 with rights of ingress to and egress from the ground comprised therein being at all times preserved to the lessee thereof.	
			10 Mining on any road or road reserve being confined to below a depth of 15 m from the natural surface.	
			11 No mining on Camping Reserve 3751, Bulong Townsite and Nightsoil Depot Reserve 2841 without the prior written consent of the Minister of Mines.	

Lease	Size (ha)	General conditions	Specific conditions	Date
			12 In the event of Explosive Reserve 3752 being utilised for storage and/or manufacture of explosives; mining on the reserve being confined to below a depth of 15 m; no mining whatsoever being conducted within such distance of the explosives storage area within the reserve as may be determined by the Chief Inspector of Explosives; all excavations and other disturbances to the surface of the land within the reserve made in the course of prospecting being filled in to the satisfaction of the Regional Mining Engineer.	
			13 No mining on Cemetery Reserve No. 3978 and mining within a distance of 140 m laterally from the Reserve being confined to below a depth of 50 m from the lowest part of the surface of the land with rights of ingress and egress from the said Reserve being at all times preserved to the public.	
			14 No interference with the telegraph line or the installations in connection therewith.	
			15 Rights of ingress to and egress from the telegraph line being at all times preserved to employees of the Australian Telecommunications Commission.	
M25/76	977	As above	8 The complete excision of any portion encroaching on Mining Lease 25/67 to a depth of 50 m.	
			9 The complete excision of any portion encroaching on Gold Mining Lease 25/1342 and Mining Lease 25/21.	
			10 Mining on any road or road reserve being confined to below a depth of 15 m from the natural surface.	

Lease	Size (ha)	General conditions	Specific conditions	Date
			11 No mining on camping reserve 3794 and Bulong townsite without the prior written consent of the Minister for Mines.	
			12 No interference with the telegraph line or the installations in connection therewith.	
			13 Rights of ingress to and egress from the telegraph line being at all times preserved to employees of the Australian Telecommunications Commission.	
			14 The construction and operation of the project and measures to protect the environment being carried out generally in accordance with the documents titled 'Notice of Intent, Bulong Nickel Project, Research Mining Proposal' (March 1992), and 'Revision to Notice of Intent, Bulong Nickel Project' (April 1992), both retained on Mines Department File No.566/89. Where a difference exists between the above document and the following conditions, then the following conditions shall prevail.	
			15 The development and operation of the project being carried out in a manner which creates the minimum practicable disturbance to the existing vegetation and natural landform.	
			16 All topsoil is to be removed ahead of all mining operations from sites such as pit areas, waste disposal areas, ore stockpile areas, pipeline, haul roads and new access roads and stockpiled for later respreading or immediately respread as rehabilitation progresses.	

Lease	Size (ha)	General conditions	Specific conditions	Date
			17 At the completion of operations, all buildings and structures are to be removed from site or demolished and buried to the satisfaction of the State Mining Engineer.	
			18 All rubbish and scrap is to be progressively disposed of in a suitable manner.	
			19 At the completion of operations, or progressively where possible, all access roads and other disturbed areas are to be covered with topsoil, deep ripped and revegetated with local native grasses, shrubs and trees to the satisfaction of the State Mining Engineer.	
			20 Any alteration or expansion of operations within the lease boundaries beyond that outlined in the above document not to commence until a plan of operations and a programme to safeguard the environment are submitted to the State Mining Engineer for his assessment and until his written approval to proceed has been obtained.	
			21 The lessee to submit to the State Mining Engineer, in June of each year, a brief annual report outlining the operations and rehabilitation work undertaken in the previous twelve months and the proposed operations and rehabilitation programmes for the next twelve months.	
M25/77	981	As above	8 Mining on any road or road reserve is to be confined to below a depth of 15 m from the natural surface.	28.3.90
			9 No interference with the telegraph line or the installations in connection therewith.	
			10 Rights of ingress to and egress from the telegraph line is to be at all times preserved to employees of the Australian Telecommunications Commission.	

Lease	Size (ha)	General conditions	Specific conditions	Date
M25/78	981	As above	8 The complete excision of any portion encroaching on Gold Mining Lease 27/1709.	28.03.90
M25/127	582.8	As above	The lessee's attention is drawn to the provisions of the *Aboriginal Heritage Act* 1972.	11.05.94
M25/128	561.4	As above	As above	11.05.94
M25/160	540	Under application		
M25/161	640	Under application		
M25/162	366	Under application		
M27/189	785.5	As above (1-5) plus: 6 The lessee or transferee, as the case may be, shall within thirty (30) days of receiving written notification of (i) the grant of the lease or (ii) registration of a transfer introducing a new lessee advise, by certified mail, the holder of any underlying pastoral lease of details of the grant or transfer. 7 No developmental or productive mining or construction activity is to be commenced until the tenement holder has submitted a plan of the proposed operations and measures to safeguard the environment to the State Mining Engineer for assessment; and until his written approval has been obtained.	The lessee's attention is drawn to the provisions of the *Aboriginal Heritage Act* 1972. The grant of this lease does not include land that is the subject of Prospecting Licence 27/1312. 8 No interference with Geodetic Survey Station G27-1 and mining within 15 m thereof being confined to below a depth of 15 m from the natural surface.	16.12.94

Lease	Size (ha)	General conditions	Specific conditions	Date
M27/190	937.3	As above	The lessee's attention is drawn to the provisions of the *Aboriginal Heritage Act* 1972. Mining on any road, road verge or road reserve is to be confined to below a depth of 15 m from the natural surface.	9.12.94

Appendix B

AGREEMENT BETWEEN RESOLUTE RESOURCES LTD AND HAMPTON HILL STATION

Appendix B

AGREEMENT BETWEEN RESOLUTE RESOURCES LTD AND HAMPTON HILL STATION

THIS AGREEMENT is made the 12th day of December 1995.

BETWEEN:

CHARLES BARTON CECIL JONES, BARTON CECIL JONES, JOHN LOAD CECIL JONES and BURCHELL FRANCIS CECIL JONES all of care of JONES PARTNERS PTY. LTD. of Suite 1, 82 Brookman Street, Kalgoorlie in the State of Western Australia (hereinafter called "Joneses" which expression includes all and any one or more of them and their respective personal representatives heirs successors and assigns) of the one part and

RESOLUTE RESOURCES LIMITED (A.C.N. 009 121 662) and ENERGY OIL & GAS NL (A.C.N. 008 930 881) both of 4th Floor, Griffin Centre, 28 The Esplanade, Perth (hereinafter called "the Licence Holders" which expression includes their successors and assigns) of the other part.
WHEREAS:

A. Joneses are the registered holders of Pastoral Lease 3114/1214 known as Hampton Hill Station ("the Pastoral Lease");

B. The Licence Holders are, or are entitled to be, the registered holders of Mining Leases 25/75 to 25/78 (inclusive) in the East Coolgardie Mineral Field over certain ground within the Pastoral Lease ("Mining Leases");

C. The Licence Holders have agreed that they shall conduct mining operations on the Mining Leases subject to the terms and conditions contained in this Agreement.

IT IS HEREBY AGREED between the parties as follows:

1.0 ACCESS TO MINING LEASES

1.1 The Licence Holders shall only use existing roads developed by Joneses for purposes of gaining access to the Mining Leases. At all times the Licence Holders shall maintain the roads in a condition equal to or better than that in which they are at

the date of this Agreement. In order to prevent damage to pasture on either side of the roads, the Licence Holders shall use only fresh water in maintaining the roads.

1.2 Where the Licence Holders require roads, grid lines, costeans or trenches, drill holes, power lines, water lines or other access across the Mining Leases in connection with their mining operations the routes of the same shall be kept to a maximum width no greater than 10 metres to reduce surface erosion and protect the environment. The Licence Holders shall ensure that no costean or trench is left open for more than 24 hours unless protected by a fence to prevent stock injuries. The routes of roads, grid lines, power lines and water lines shall be decided in consultation between the Licence Holders and Joneses but these shall not cross good grazing land unless no alternative route is available.

2.0 SIGNPOSTS AND FENCES

The Licence Holders shall be responsible at their own expense for the erection and maintenance of signposts, fences, gates and grids which Joneses, after consultation with the Licence Holders, reasonably consider are necessary in order to minimise interference by the Licence Holders and their employees, agents, contractors and invitees with Joneses' activities on the Pastoral Lease.

3.0 PRIOR CONSULTATION

The Licence Holders shall give Joneses reasonable advance notice from time to time before commencement of any mining excavation or construction work on the Mining Leases so as to afford the parties sufficient time to consult and co-ordinate their activities, and, in particular, to minimise any disruption to Joneses' activities on the Pastoral Lease.

4.0 HAMPTON HILL STATION OPERATIONS

4.1 The Licence Holders shall at all times use their best endeavours to minimise interference with Joneses' pastoral and grazing activities on the Pastoral Lease.

4.2 The Licence Holders shall employ exploration, engineering and mining practices such that the actual area of the Pastoral Lease which is disturbed by the Licence Holders' activities is limited to that reasonably required in connection with exploration and mining and treatment of ore on the Mining Leases.

4.3 The Licence Holders covenant and undertake with Joneses:

(a) to ensure as far as practicable that any applications for mining tenements or miscellaneous licences in connection with the Licence Holders' operations are over an area or areas which does not comprise good grazing land or form part of a water drainage system;

(b) not to pollute or cause pollution to any soak, dam, bore or watercourse on the Pastoral Lease and to ensure that any dams constructed for water or tailings are constructed such that salt water and/or chemicals cannot escape from such dams into the surrounding country and that such dams are filled after evaporation of water such that any salt or chemical contaminated spoil is at the bottom of the dam. Surface soil stockpiled prior to excavating any dam is to be replaced as topsoil after refilling the dam;

(c) not to damage or otherwise interfere with any buildings, dams, fences, roads or other improvements on the Pastoral Lease nor to camp near any well, dam or water trough without the prior written consent of Joneses and, if such consent is given from time to time, to make good to the satisfaction of Joneses and at the cost of the Licence Holders any damage caused to the same;

(d) to minimise the effects of any ground disturbance caused by their activities and to take all reasonable precautions against causing soil erosion on the Pastoral Lease;

(e) to comply with any reasonable precautions which Joneses may adopt against the spread of any disease or noxious weed or vermin and not to allow any dogs to be taken onto the Pastoral Lease without the prior consent of Joneses;

(f) to ensure that all gates are left open or closed after use as found and that cattle, sheep and other livestock on the Pastoral Lease are not maimed injured or lost or unduly disturbed;

(g) to pay to Joneses the replacement value of any cattle, sheep or other livestock maimed, injured or lost as a result of the activities of the Licence Holders or their officers, employees, agents, contractors or invitees on the Pastoral Lease;

(h) not to make any break in any fences on the Pastoral Lease without prior consultation with Joneses and ensure that gates effective to keep stock in or out as the case may be are installed at the Licence Holders' cost at any such breaks;

(i) to seal and progressively restore and rehabilitate those parts of the Pastoral Lease as are affected by the Licence Holders' activities (other than any mine, waste dumps and tailings dumps) including filling or sealing off any trenching or other excavations, replacing topsoil and repasturing so as to leave the surface of any part of the Pastoral Lease so affected in a similar condition and contour to that in which it was prior to the Licence Holders commencing their activities on the Pastoral Lease;

(j) on cessation of their operations on the Mining Leases to recontour and revegetate all bore sites, roads, mine sites, waste dumps and tailings dams and other disturbances in accordance with the requirements of the Department of Minerals and Energy, the Department of Conservation and Land Management and other relevant authorities;

(k) comply with all Acts, regulations, by-laws and requirements of government and other competent authorities for the time being relating to the Pastoral Lease, the

Mining Leases and any other mining tenements held by the Licence Holders and other activities of the Licence Holders on the Pastoral Lease including taking all proper precautions under the *Bushfires Act, 1954* and comply with the requirements of the senior officer of any local bushfire authority;

(l) unless otherwise agreed by Joneses in respect of any particular item or items (which shall thereby become the property of Joneses) remove all their plant, equipment and chattels including power lines and other electrical installations from the Pastoral Lease within six (6) months after the earlier of the expiration of the relevant Mining Lease or other mining tenement or the determination of this Agreement and, if requested by Joneses, remove any road constructed by the Licence Holders and restore the surface occupied by any such road to a condition complying with the requirements of the Department of Minerals and Energy, the Department of Conservation and Land Management and other relevant authorities;

(m) to maintain during the term of this Agreement public liability insurance in respect of death or injury to persons and loss, damage or destruction of property with a reputable insurance company for an amount of not less than $5,000,000.00 in respect of any one claim or series of claims and unlimited as to number of claims;

(n) upon the expiration or other determination of this Agreement to withdraw immediately any caveat lodged by the Licence Holders over the Pastoral Lease.

5.0 INDEMNITY

The Licence Holders hereby indemnify and undertakes to hold harmless Joneses from and in respect of any and all claims demands accounts debts costs and expenses incurred as a result of any death or personal injury or any damage to or destruction or loss of property of any person whatsoever (including Joneses, the Licence Holders and their respective officers, employees, agents, contractors and invitees) to the extent caused by the Licence Holders or their presence or that of their officers, employees, agents, contractors or invitees on any part of the Pastoral Lease whether or not the subject of a mining tenement held from time to time by the Licence Holders.

6.0 NOTICES

6.1 Any notice given by a party under this Agreement (including an advice given by the Licence Holders to Joneses pursuant to clause 3.0), shall be in writing and either served personally on an officer or representative of the party to whom it is given or mailed airmail postage prepaid addressed to its address hereinbefore written or sent by facsimile transmission.

6.2 Notices shall be deemed given or made:

(a) if served personally, at the time of service;
(b) if mailed, on the third business day after the date of mailing; or
(c) if sent by facsimile, on the date following the day of transmission.

Any notice given or made hereunder may be signed by a duly authorised representative on behalf of the party giving the notice. A party may change its address by giving notice in that behalf to the other party.

7.0 DETERMINATION OF DISPUTES

If any dispute or disagreement arises between the parties on any matter arising out of this Agreement then, unless otherwise provided in this Agreement, the dispute or disagreement may be referred by either party to the Mining Warden for decision if he has jurisdiction. If the Warden does not have jurisdiction the matter may be referred by either party to arbitration in accordance with the provisions of the *Commercial Arbitration Act, 1985* by an arbitrator acceptable to both parties or, if they are unable to agree upon a suitable arbitrator, an arbitrator nominated by the President for the time being of the Australasian Institute of Mining & Metallurgy. For the purposes of any arbitration conducted under the Commercial Arbitration Act the parties consent to each party being legally represented.

8.0 WAIVER

In its absolute discretion either party may waive in writing compliance by the other party with any obligation of that other party under this Agreement, any such waiver being without prejudice to such other party's obligations to comply with all other provisions of this Agreement.

9.0 COSTS

The Licence Holders shall bear their own costs associated with the preparation, stamping and registration of this Agreement and shall bear the reasonable legal expenses and costs incurred by Joneses in relation to the preparation, negotiation and execution of this Agreement in an amount not to exceed $3,000.00.

10.0 REGISTRATION OF AGREEMENT AND CAVEATS

Joneses may lodge this Agreement for Ministerial consent and registration in respect of each of the Mining Leases. Each of the parties shall do everything necessary on its respective part to be done in order to obtain such Ministerial consent to registration.

Joneses may from time to time lodge caveats against the Mining Leases to protect their respective interests under this Agreement.

IN WITNESS WHEREOF this Agreement has been executed as a Deed by the parties on the day and year first before written.

SIGNED by the said CHARLES BARTON CECIL JONES in the presence of:

Witness:

Address:

Occupation:

SIGNED by the said BARTON CECIL JONES in the presence of:

Witness:

Address:

Occupation:

SIGNED by the said JOHN LOAD CECIL JONES in the presence of:

Witness:

Address:

Occupation:

SIGNED by the said BURCHELL FRANCIS CECIL JONES in the presence of:

Witness:

Address:

Occupation:

THE COMMON SEAL of RESOLUTE RESOURCES LIMITED (A.C.N. 009 121 662). was hereunto affixed in the presence of:

Director:

Secretary:

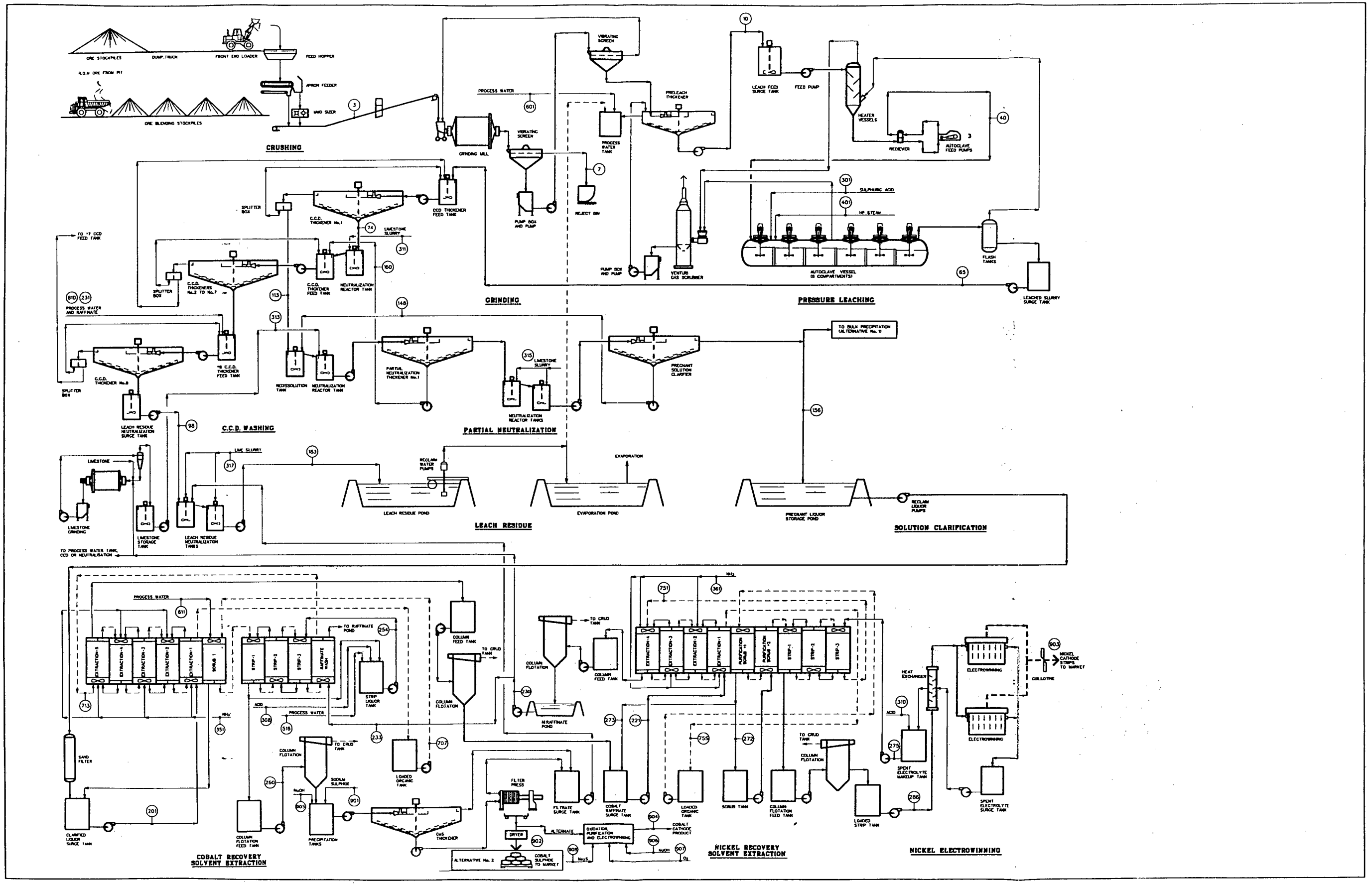
THE COMMON SEAL of ENERGY OIL & GAS N.L. (A.C.N. 008 930 881). was hereunto affixed in the presence of:

Director:

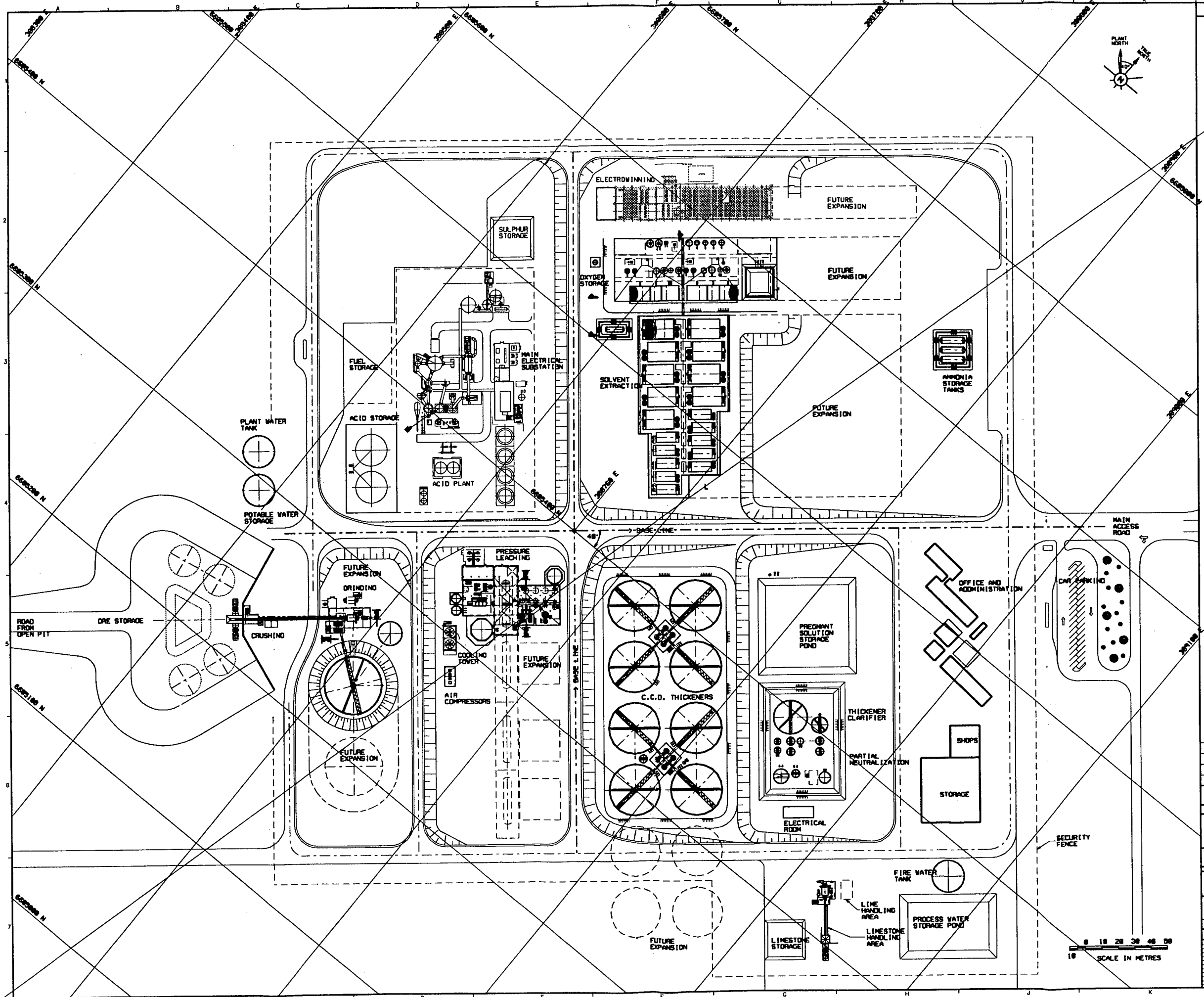
Secretary:

Appendix C

PLANT INFRASTRUCTURE



SIMPLIFIED PROCESS FLOW CHART



NOTES

PREVAILING WIND FREQUENCY DISTRIBUTION

STUDY DRAWING

NO.	DESCRIPTION	DATE	BY	CHKD	APPD
D	RELEASED FOR FEASIBILITY STUDY REPORT		D.W		
C	DRAWING NUMBER REVISED WAS 110-M-DJ-4 RELEASED FOR INFORMATION	SEP.23 1992	D.W		
B	RELEASED FOR NOTICE OF INTENT REPORT	AUG.3 1992	D.W		
A	RELEASED FOR CLIENT APPROVAL	JUL.24 1992	D.W		

REVISIONS

110-C-DJ-001	OVERALL LAYOUT PLAN
100-M-DF-11	SIMPLIFIED FLOWSHEET - OVERALL PROCESS

REFERENCE DRAWINGS

KILBORN — KILBORN INTERNATIONAL ENGINEERING CONSULTANTS

RESOLUTE RESOURCES LIMITED — PERTH WESTERN AUSTRALIA

BATEMAN KINHILL

DRG NO	GENERAL LAYOUT
SCALE	1:750
DESIGNED	D.WALDEN
DRAWN	D.WALDEN
CHECKED	
APPROVED	
CAD FILE No.	110IDF04.DGN
BATEMAN KINHILL PROJECT NUMBER	PRP307
DRAWING NUMBER	110-M-DJ-00
REV	D

TITLE

BULONG NICKEL LATERITE PROJECT
1993 FEASIBILITY STUDY
YARD PLAN AND BUILDING LOCATION

NOTES

PREVAILING WIND FREQUENCY DISTRIBUTION

PLANT NORTH

TRUE NORTH

AREA-290

SULPHUR STORAGE

FUEL STORAGE

MAIN ELECTRICAL SUBSTATION

ACID STORAGE

ACID PLANT

WATER STORAGE

AREA-260

ELECTROWINNING

FUTURE EXPANSION

OXYGEN STORAGE

SOLVENT EXTRACTION

AREA-240

AREA-280

AMMONIA STORAGE TANKS

BASE LINE

MAIN ACCESS ROAD

ROAD FROM OPEN PIT

ORE STORAGE

AREA-200

CRUSHING

FUTURE EXPANSION

GRINDING

PRESSURE LEACHING

AREA-210

COOLING TOWER

AIR COMPRESSORS

AREA-290

C.C.D. THICKENERS

AREA-220

PREGNANT SOLUTION STORAGE POND

THICKENER CLARIFIER

PARTIAL NEUTRALIZATION

ELECTRICAL ROOM

OFFICE AND ADMINISTRATION

AREA-350

SHOPS

STORAGE

CAR PARKING

SECURITY FENCE

AREA-280

LIME HANDLING AREA

LIMESTONE STORAGE

LIMESTONE HANDLING AREA

PROCESS WATER STORAGE POND

0 10 20 30 40 50

10 SCALE IN METRES

STUDY DRAWING

NO	DESCRIPTION	DATE	BY	CHKD	CLIENT	ENG MGR
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A	RELEASED FOR INFORMATION	SEP 25 1995	D.W			

REVISIONS

DRG NO.	DESCRIPTION
110-C-DJ-001	OVERALL LAYOUT PLAN
100-M-DF-1	SIMPLIFIED FLOWSHEET - OVERALL PROCESS

REFERENCE DRAWINGS

KILBORN

RESOLUTE RESOURCES LIMITED
PERTH WESTERN AUSTRALIA

SECTION: GENERAL LAYOUT

SCALE: 1:750

DES SHED: D.WALDEN

DRAWN: D.WALDEN

CHECKED:

APPROVED:

BATEMAN KINHILL

TITLE

BULONG NICKEL LATERITE PROJECT
1995 FEASIBILITY STUDY
SITE DEVELOPMENT
DRAWING AREA INDEX

CAD FILE No. 11010F05.DGN

PROJECT NUMBER: P8K507

DRAWING NUMBER: 110-M-DJ-002 REV: B

NOTES

PLAN

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SECTION (C)
1:200

SECTION (A)
1:200

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B	RELEASED FOR INFORMATION	SEP.22 1995.	D.W			
A	RELEASED FOR NOTICE OF INTENT REPORT	AUG.3 1995.	D.W			

REVISIONS

REFERENCE DRAWINGS	
200-M-DJ-3	GENERAL ARRANGEMENT GRINDING
200-M-DJ-2	GENERAL ARRANGEMENT CRUSHING
110-M-DJ-1	YARD PLAN
200-B-DF-001	CRUSHING AND GRINDING PROCESS FLOWSHEET
DWG NO.	DESCRIPTION

KILBURN — ENGINEERING

RESOLUTE RESOURCES LIMITED
PERTH WESTERN AUSTRALIA

BATEMAN KINHILL
A Partnership between Bateman Project Engineering Pty Ltd ACN 008 744 099 and Kinhill Pacific Pty Ltd ACN 145 340 020

ENGINEERING DATA CONTAINED HEREIN ARE RESTRICTED IN USE FOR THE GENERAL PURPOSES FOR WHICH THEY ARE PREPARED.

SECTION: GENERAL LAYOUT
SCALE: 1:200
DRAWN: D.WALDEN
CHECKED:
APPROVED:
DATE: APR '95
DWG NO:

TITLE

BULONG NICKEL LATERITE PROJECT
1995 FEASIBILITY STUDY
CRUSHING & GRINDING
GENERAL ARRANGEMENT
CONVEYOR GEOMETRY PLAN & SECTIONS

CAD FILE No. 20010F01.DGN
BATEMAN KINHILL PROJECT NUMBER P8K307
DRAWING NUMBER 200-M-DJ-001 REV C

SCALE IN METRES

NOTES

TRUE NORTH
PLANT NORTH

A B C D
12000
4000 4000 4000
4000
32000

RING BEAM FOOTING

PROCESS WATER STORAGE TANK 15000 DIA. X 6000

50 TONNE MOBILE CRANE

SUMP AND PUMP

PUMP BOX

THICKENER U/F PUMPS (TYP)

FUTURE EXPANSION

2400 I.D PIPE TUNNEL

CONCRETE TUNNEL (TYP)

5000

1000 I.D ESCAPE TUNNEL

SUB STATION

15500 1500 4800 4800 4800 3000

A B C D E

1 2 3 4 5 6 7

50 TONNE MOBILE CRANE

STUDY DRAWING

NO.	DESCRIPTION	DATE	BY	CHKD	CLIENT	PROJ. MGR.
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A	RELEASED FOR INFORMATION	SEP 22 1995	D.W			

REVISIONS

200-M-DJ-1 CRUSHING AND GRINDING GENERAL ARRANGEMENT

DWG. NO. DESCRIPTION

REFERENCE DRAWINGS

KILBORN

RESOLUTE RESOURCES LIMITED
PERTH WESTERN AUSTRALIA

BATEMAN KINHILL

SECTION GENERAL LAYOUT
SCALE 1:100
DESIGNED D.WALDEN
DRAWN D.WALDEN
CHECKED
APPROVED

TITLE

BULONG NICKEL LATERITE PROJECT
1995 FEASIBILITY STUDY
GRINDING AREA
GENERAL ARRANGEMENT
GROUND FLOOR PLAN

CAD FILE No. 20010F03.DGN
BATEMAN PROJECT NUMBER P8K507
DRAWING NUMBER 200-M-DJ-003 REV. B

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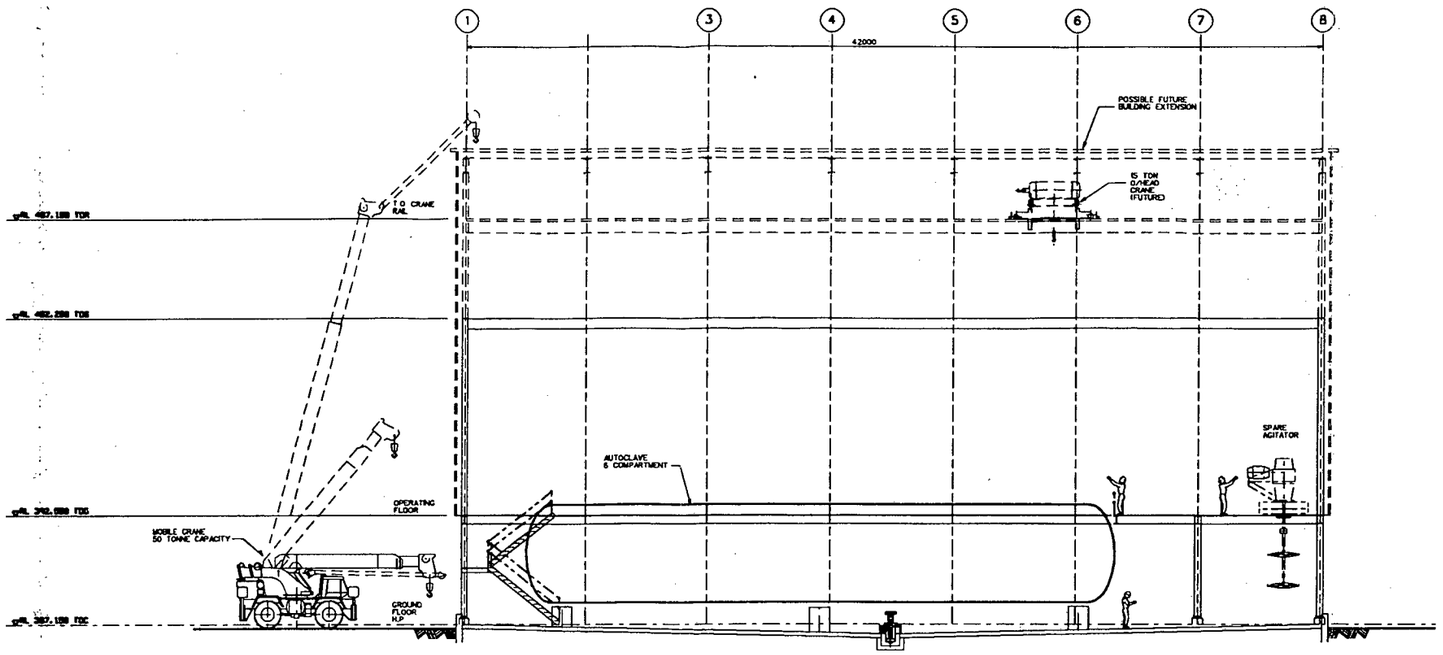
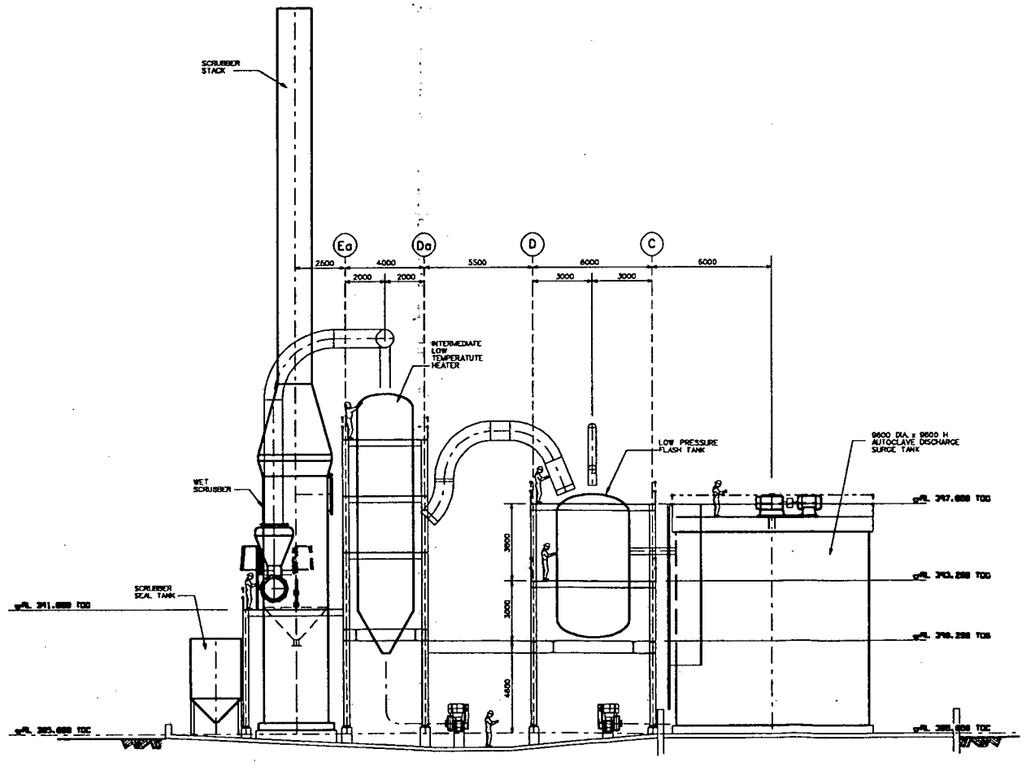
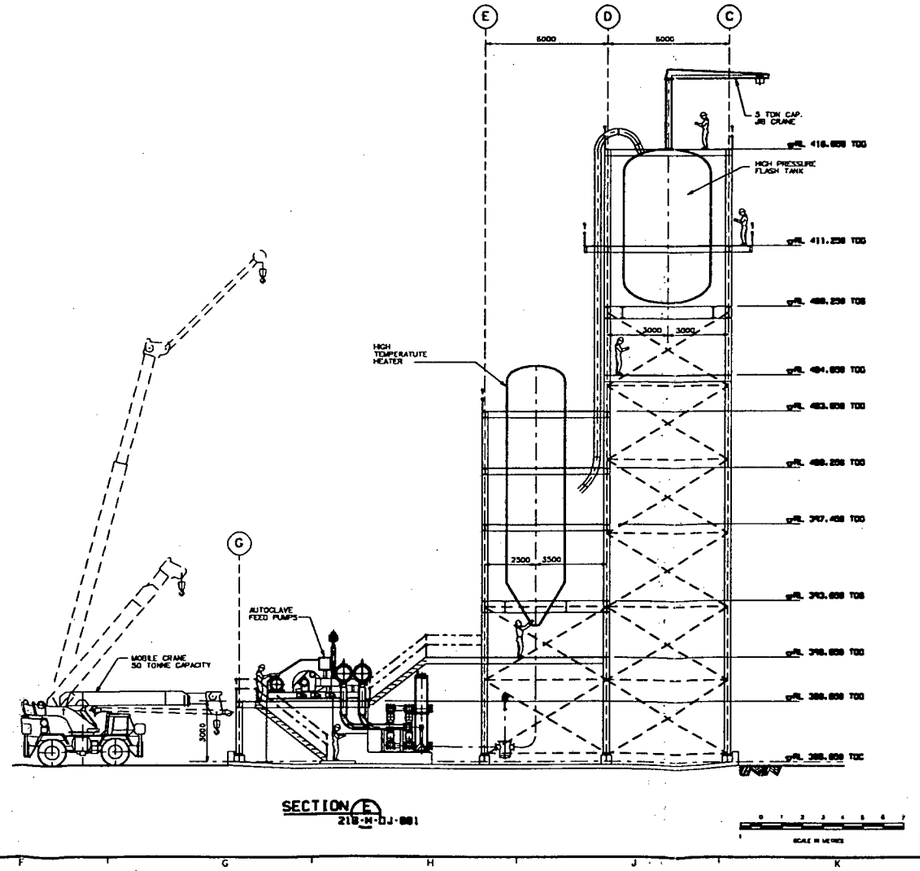


SECTION D
210-M-DJ-881



SECTION F
210-M-DJ-881



SECTION E
210-M-DJ-881

NOTES

STUDY DRAWING

NO.	DESCRIPTION	DATE	BY	CHKD	CLIENT	PROJ. ENG.
B	RELEASED FOR FEASIBILITY STUDY REPORT		D.W.			
A	RELEASED FOR INFORMATION	SEP 23 1985	D.W.			

REVISIONS

210-M-DJ-1	PRESSURE LEACHING G.A. GROUND FLOOR PLAN

REFERENCE DRAWINGS

KILBORN
ENGINEERS MANAGERS CONSULTANTS

RESOLUTE RESOURCES LIMITED
PERTH WESTERN AUSTRALIA

BATEMAN KINHILL
A Partnership between Bateman Project Pty Ltd ACN 008 741 996 and Kinhill Pty Ltd ACN 078 341 426

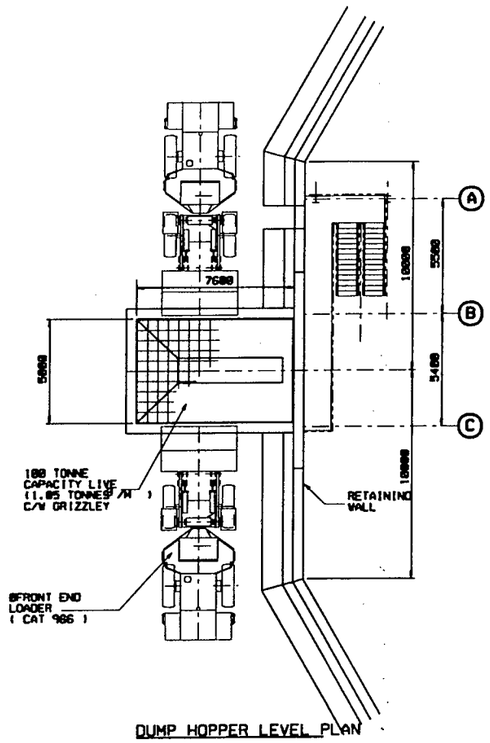
ENGINEERING DATA CONTAINED HEREON ARE RESTRICTED IN USE FOR THE ORIGINAL PURPOSE FOR WHICH THEY ARE PREPARED.

DESCRIPTION	GENERAL LAYOUT
SCALE	1 : 100
DES. ENGR.	D.WALDEN
DRAWN	D.WALDEN
CHECKED	
APPROVED	

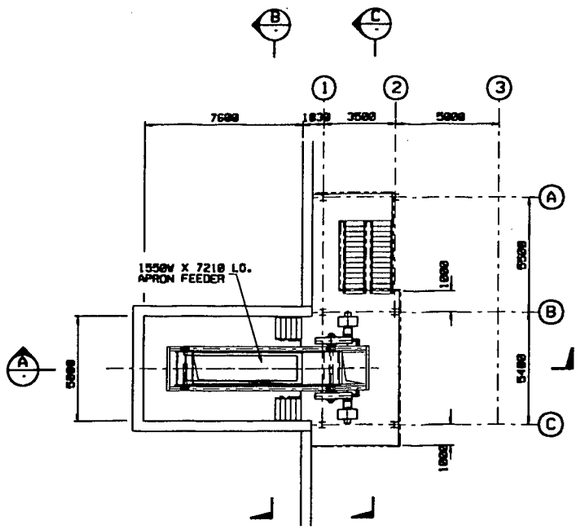
TITLE

BULONG NICKEL LATERITE PROJECT
1985 FEASIBILITY STUDY
PRESSURE LEACHING
GENERAL ARRANGEMENT
SECTION D-D, E-E, F-F

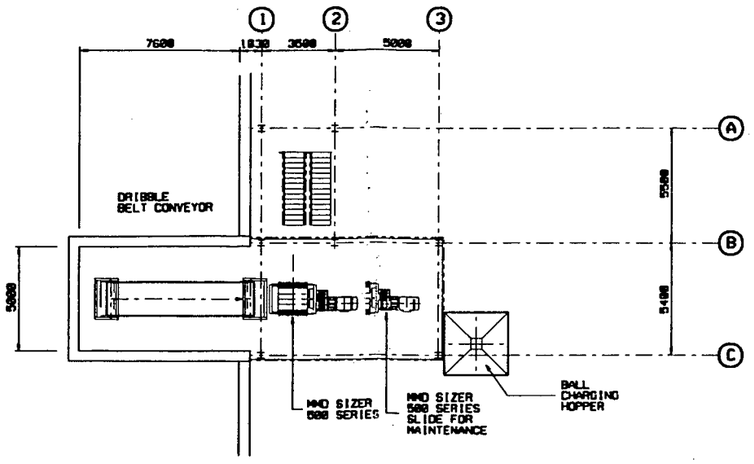
CAD FILE No.	21010P04.DGN
BATEMAN KINHILL PROJECT NUMBER	P8K507
DRAWING NUMBER	210-M-DJ-4
REV.	



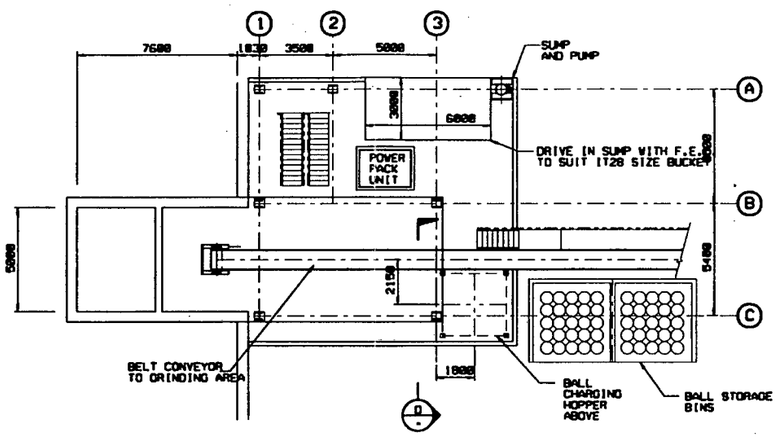
DUMP HOPPER LEVEL PLAN



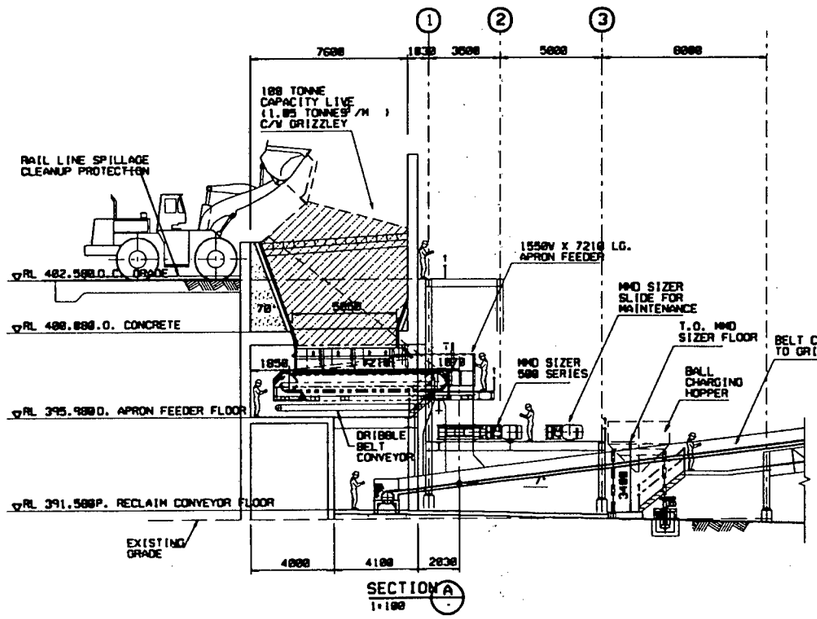
APRON FEEDER FLOOR PLAN



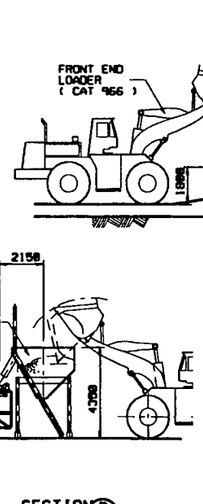
MMD SIZER FLOOR PLAN



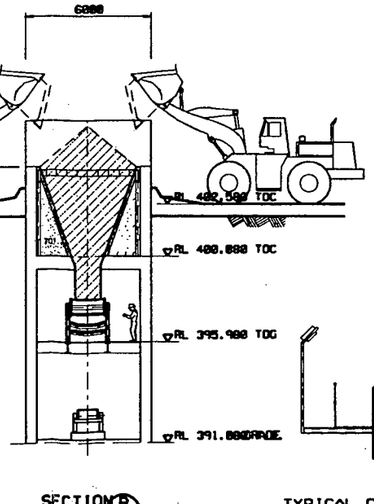
RECLAIM CONVEYOR FLOOR PLAN



SECTION A
1:100

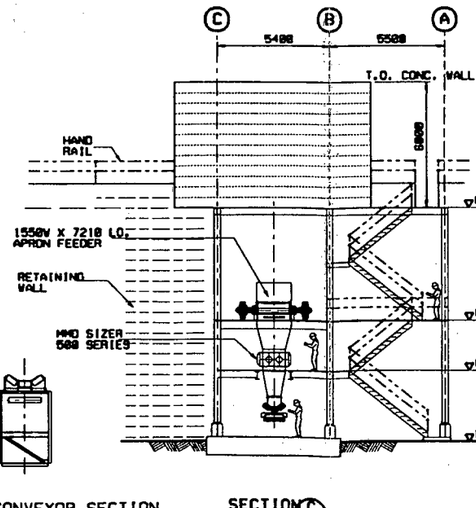


SECTION D
1:100



SECTION B
1:100

TYPICAL CONVEYOR SECTION
1:50



SECTION C
1:100

SCALE IN METRES

STUDY DRAWING

NO.	DESCRIPTION	DATE	BY	CHKD	ENGR	APPD
B	RELEASED FOR FEASIBILITY STUDY REPORT		D.W			
A	RELEASED FOR INFORMATION	SEP.22 1995	D.W			

REVISIONS

KILBORN — 200-M-DJ-1 — CRUSHING AND GRINDING GENERAL ARRANGEMENT

REFERENCE DRAWINGS

RESOLUTE RESOURCES LIMITED
PERTH WESTERN AUSTRALIA

BATEMAN KINHILL

SECTION	GENERAL LAYOUT
SCALE:	1:100
DESIGNED	D.WALDEN
DRAWN	D.WALDEN
CHECKED	
APPROVED	
DATE	6 JULY 1995
B.O.M. NO.	
CAD FILE No.	2001DF02.DGN
BATEMAN KINHILL PROJECT NUMBER	P8K507
DRAWING NUMBER	200-M-DJ-002
REV.	

TITLE

BULONG NICKEL LATERITE PROJECT
1995 FEASIBILITY STUDY
CRUSHING & GRINDING - TRUCK DUMP
GENERAL ARRANGEMENT
PLANS AND SECTIONS

NOTES

TRUE NORTH
PLANT NORTH

PROCESS WATER STORAGE TANK 15000 DIA. X 6000

LOW HEAD HORIZONTAL VIBRATING SCREEN 1200 W X 3000 LG

GRINDING MILL 3960 DIA. X 5486 LG

2-LOW HEAD HORIZONTAL VIBRATING SCREENS 2400 W X 4800 LG

FUTURE EXPANSION

ELECTRICAL ROOM

PRE LEACH THICKENER 32000 DIA.

BELT CONVEYOR FROM CRUSHING AREA

200-M-DJ-005

STUDY DRAWING

B	RELEASED FOR FEASIBILITY STUDY REPORT		D.W						
A	RELEASED FOR INFORMATION	SEP.22 1995	D.W						
NO.	DESCRIPTION	DATE	BY	DRGN	CLIENT	REAL ENG.			

REVISIONS

200-M-DJ-1 CRUSHING AND GRINDING GENERAL ARRANGEMENT

KILBORN — DRWG NO. — DESCRIPTION

REFERENCE DRAWINGS

RESOLUTE RESOURCES LIMITED
PERTH WESTERN AUSTRALIA

BATEMAN KINHILL

DES'N ON: GENERAL LAYOUT
SCALE: 1:100
DES SHEET: D.WALDEN
DRAWN: D.WALDEN
CHECKED:
APPROVED:
B.O.M. NO.

ENGINEERING DATA CONTAINED HEREIN ARE RESTRICTED IN USE FOR THE ORIGINAL PURPOSES FOR WHICH THEY ARE PREPARED.

TITLE

BULONG NICKEL LATERITE PROJECT
1995 FEASIBILITY STUDY
GRINDING AREA
GENERAL ARRANGEMENT
UPPER FLOOR PLAN @ RL 403.180

CAD FILE No. 20010F04.DGN
BATEMAN KINHILL PROJECT NUMBER P&K507
DRAWING NUMBER 200-M-DJ-004 REV B

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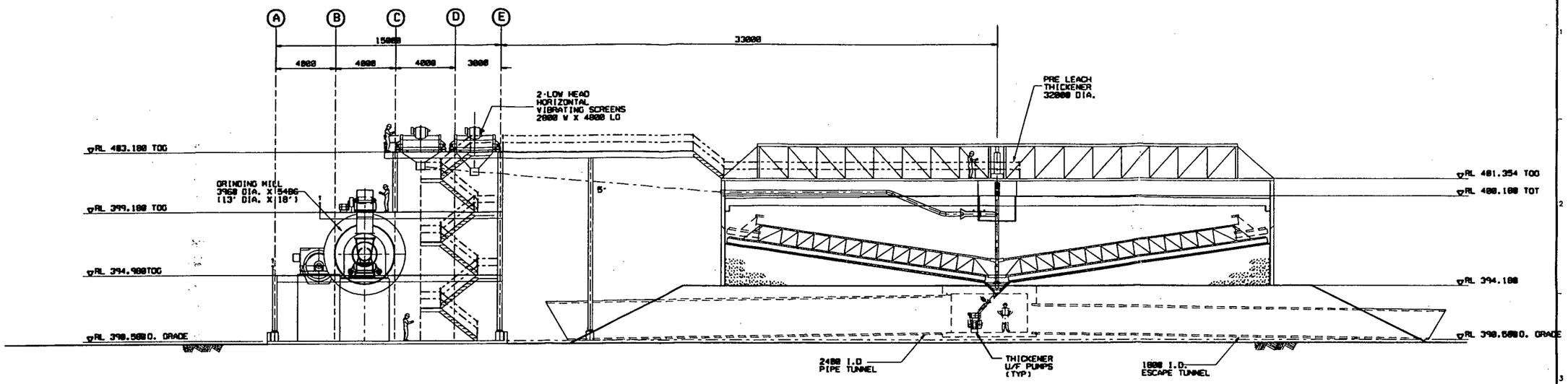
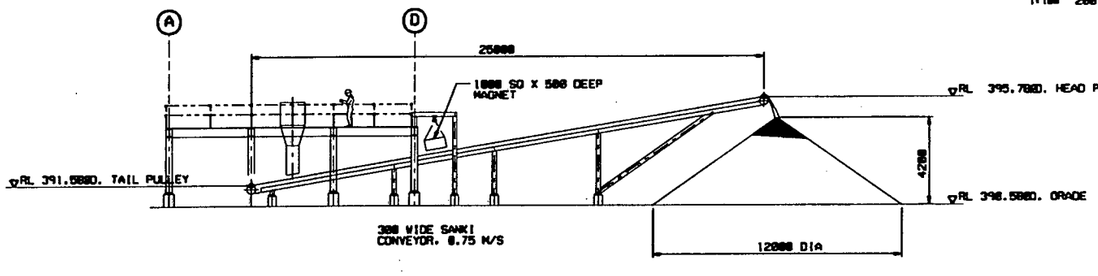
SCALE IN METRES

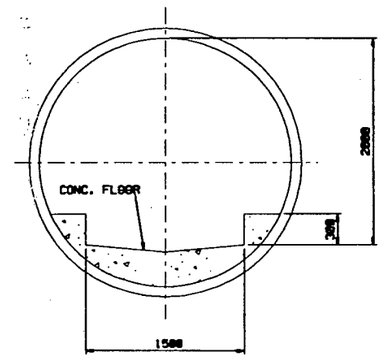
NOTES



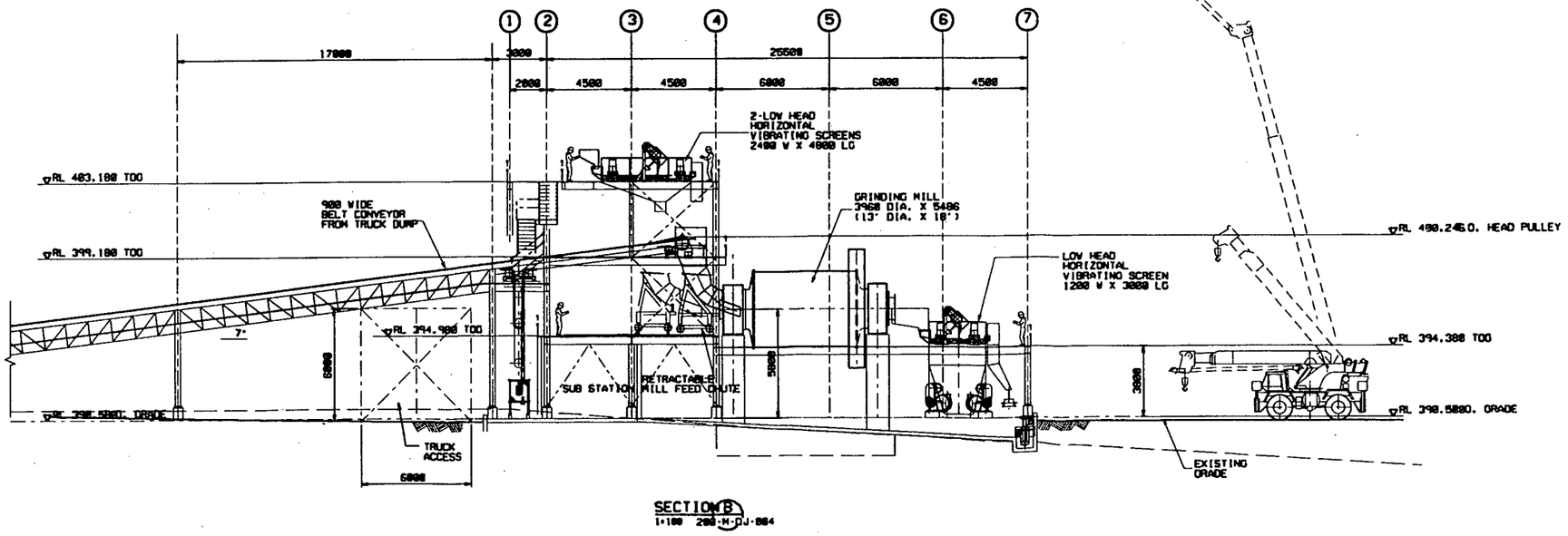
SECTION A
1:100 200-M-DJ-004



SECTION D
1:100 200-M-DJ-004



SECTION C TYP. THRU TUNNEL
1:5 200-M-DJ-004



SECTION B
1:100 200-M-DJ-004

STUDY DRAWING

NO.	DESCRIPTION	DATE	BY	CHKD	DJ/DF	PROJ MGR
B	RELEASED FOR FEASIBILITY STUDY REPORT		D.W			
A	RELEASED FOR INFORMATION	SEP.22 1995	D.W			

REVISIONS

KILBORN — 200-M-DJ-1 — CRUSHING AND GRINDING GENERAL ARRANGEMENT

DWG NO. — DESCRIPTION

REFERENCE DRAWINGS

RESOLUTE RESOURCES LIMITED
PERTH WESTERN AUSTRALIA

RATFMAN KINIIII
A Partnership between
Ratfman Pty Ltd ACN 000 000 000 and
Kinifish Pty Ltd ACN 000 000 000

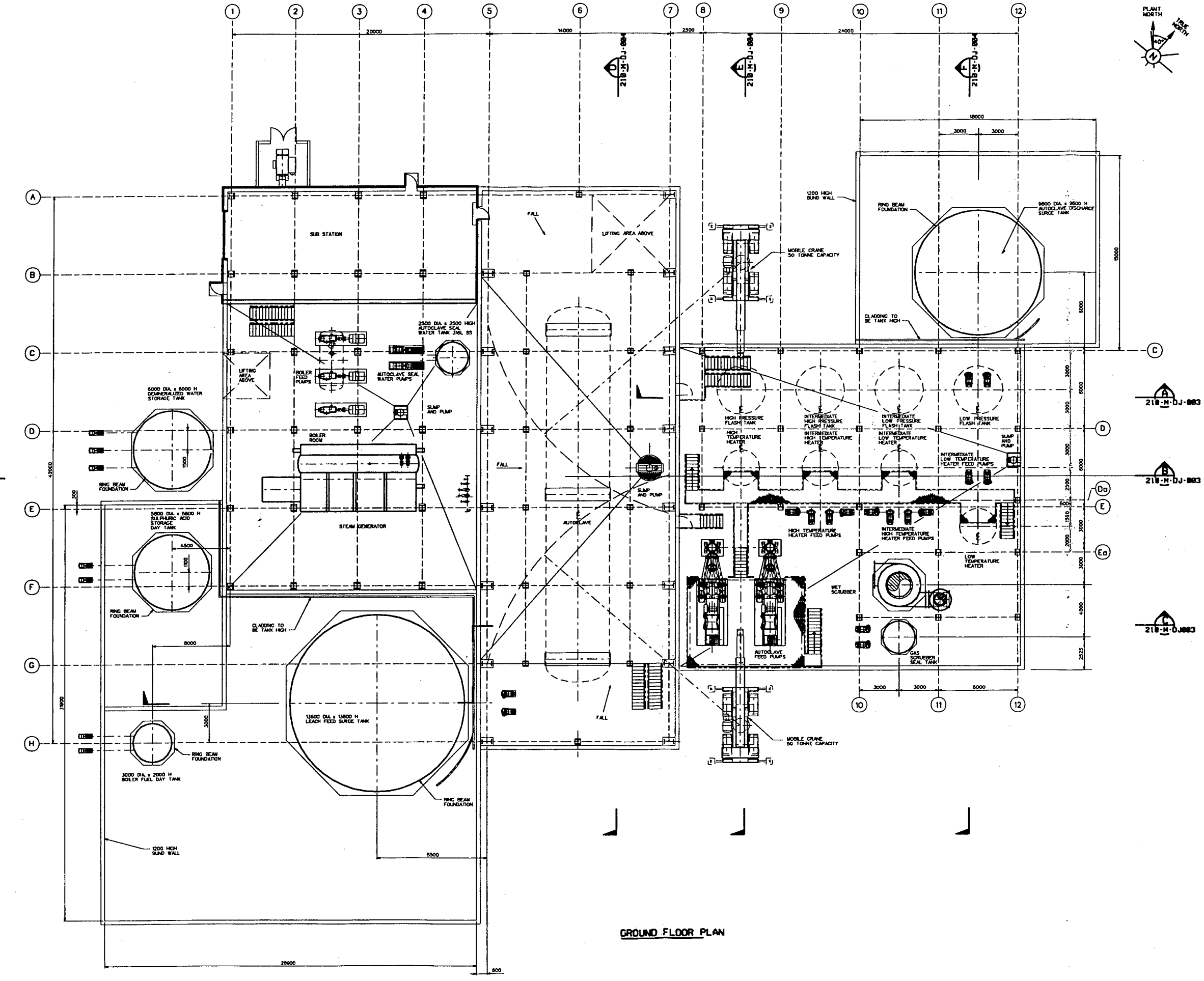
ENGINEERING DATA CONTAINED HEREIN ARE RESTRICTED IN USE FOR THE SPECIAL PURPOSES FOR WHICH THEY ARE PREPARED

TITLE

BULONG NICKEL LATERITE PROJECT
1995 FEASIBILITY STUDY
GRINDING AREA
GENERAL ARRANGEMENT
SECTIONS

SECTION: GENERAL LAYOUT
SCALE: 1:100 — DATE
DESIGNED: D.WALDEN — 22.9.95
DRAWN: D.WALDEN — 22.9.95
CHECKED:
APPROVED:
DWG NO.
CAD FILE No. 20010F05.DGN
DATABASE MODEL PROJECT NUMBER: PBK507
DRAWING NUMBER: 200-M-DJ-005 — REV: B

0 1 2 3 4 5 6 7
SCALE IN METRES



GROUND FLOOR PLAN

SCALE IN METRES 0 1 2 3 4 5 6 7

NOTES

STUDY DRAWING

NO.	DESCRIPTION	DATE	BY	CHECK	SUPV	APPR
B	RELEASED FOR FEASIBILITY STUDY REPORT		D.W			
A	RELEASED FOR INFORMATION	SEP 22 1995	D.W			

REVISIONS

210-M-DJ-2	PRESSURE LEACHING G.A. SECTIONS
210-M-DJ-2	PRESSURE LEACHING G.A. SECTIONS
210-M-DJ-2	PRESSURE LEACHING G.A. UPPER PLAN
110-M-DJ-1	YARD PLAN
210-B-DF-001	PRESSURE LEACHING PROCESS FLOWSHEET

KILBURN ENGINEERING TECHNOLOGY DIVISION — DWG. NO. — DESCRIPTION

REFERENCE DRAWINGS

RESOLUTE RESOURCES LIMITED
PERTH WESTERN AUSTRALIA

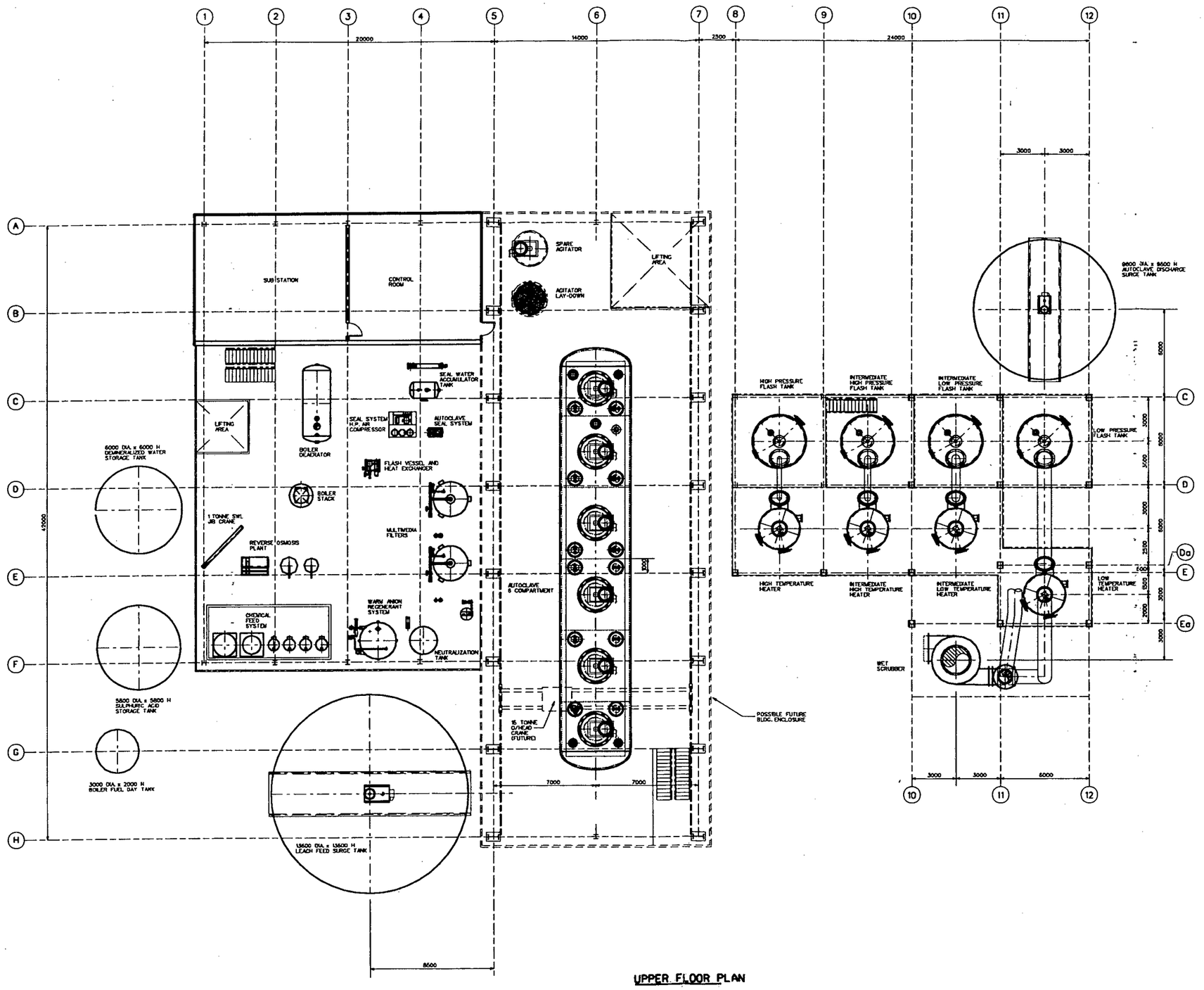
BATEMAN KINHILL
A Partnership between Bateman Project Engineering Pty Ltd ACN 008 345 886 and Kinhill Pacific Pty Ltd ACN 010 241 630

SECTION: GENERAL LAYOUT
SCALE: 1 : 100 — DATE
WDB CHKD: D.W.ALDEN — 22.09.1995
DRAWN: D.W.ALDEN — 22.09.1995
CHECKED
APPROVED
W.O.N. NO.

TITLE

BULONG NICKEL LATERITE PROJECT
1995 FEASIBILITY STUDY
PRESSURE LEACHING
GENERAL ARRANGEMENT
GROUND FLOOR PLAN

CAD FILE No. 21010P01.DGN
BATEMAN MINING PROJECT NUMBER P9K507
DRAWING NUMBER 210-M-DJ-1 — REV. B



UPPER FLOOR PLAN

NOTES

STUDY DRAWING

NO.	DESCRIPTION	DATE	BY	CHKD	CLIENT	Other
B	RELEASED FOR FEASIBILITY STUDY REPORT		D.W			
A	RELEASED FOR INFORMATION	SEP.27 1995	D.W			

REVISIONS

REFERENCE DRAWINGS	
210-M-DJ-1	PRESSURE LEACHING G.A. GROUND FLOOR PLAN

KILBORN — DWG. NO. — DESCRIPTION

RESOLUTE RESOURCES LIMITED
PERTH WESTERN AUSTRALIA

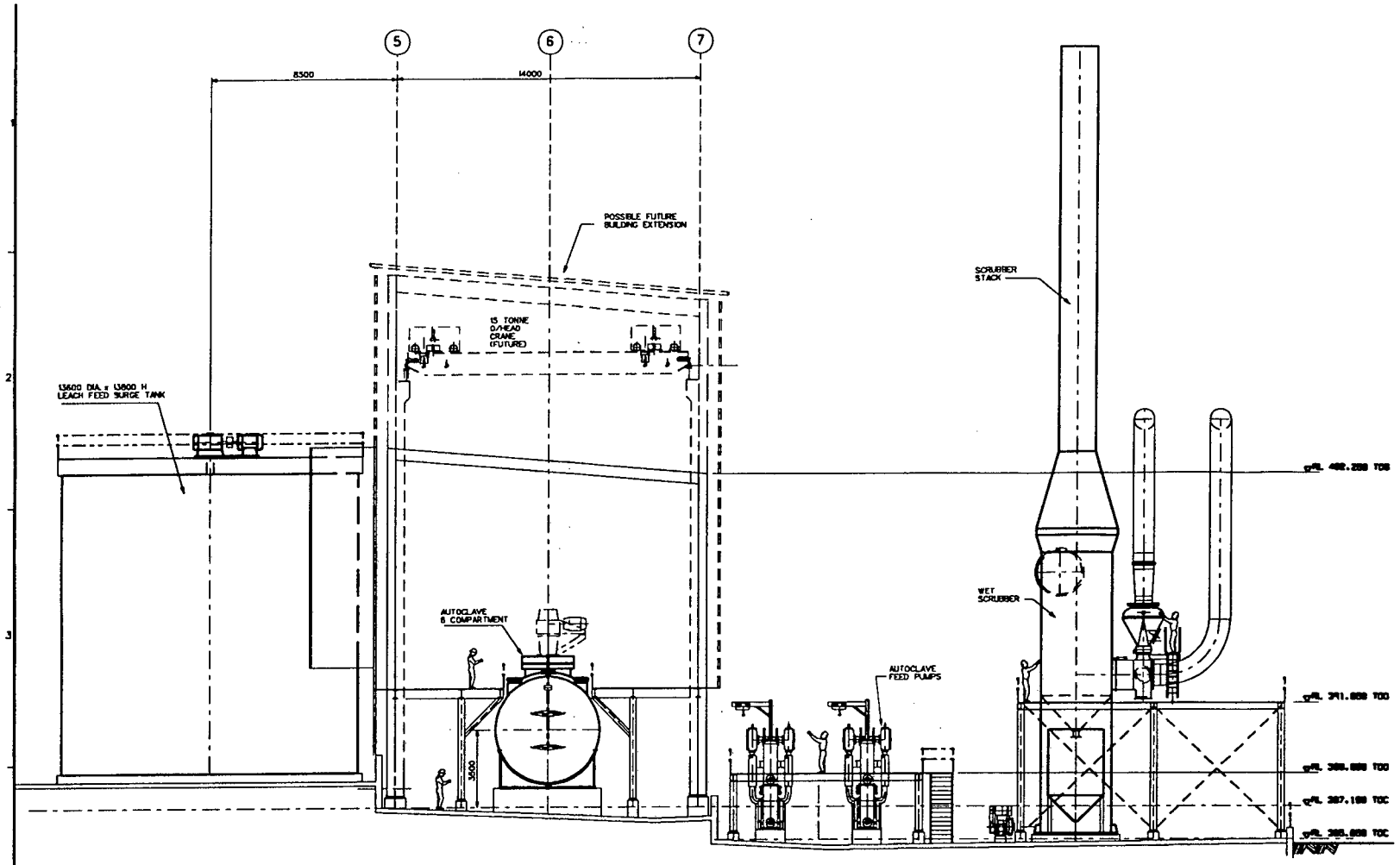
BATEMAN KINHILL

SECTION GENERAL LAYOUT
SCALE 1:100 DATE
DESIGNED D.W.ALDEN 21.10 1995
DRAWN D.W.ALDEN 21.10 1995
CHECKED
APPROVED
P.O.R. NO.

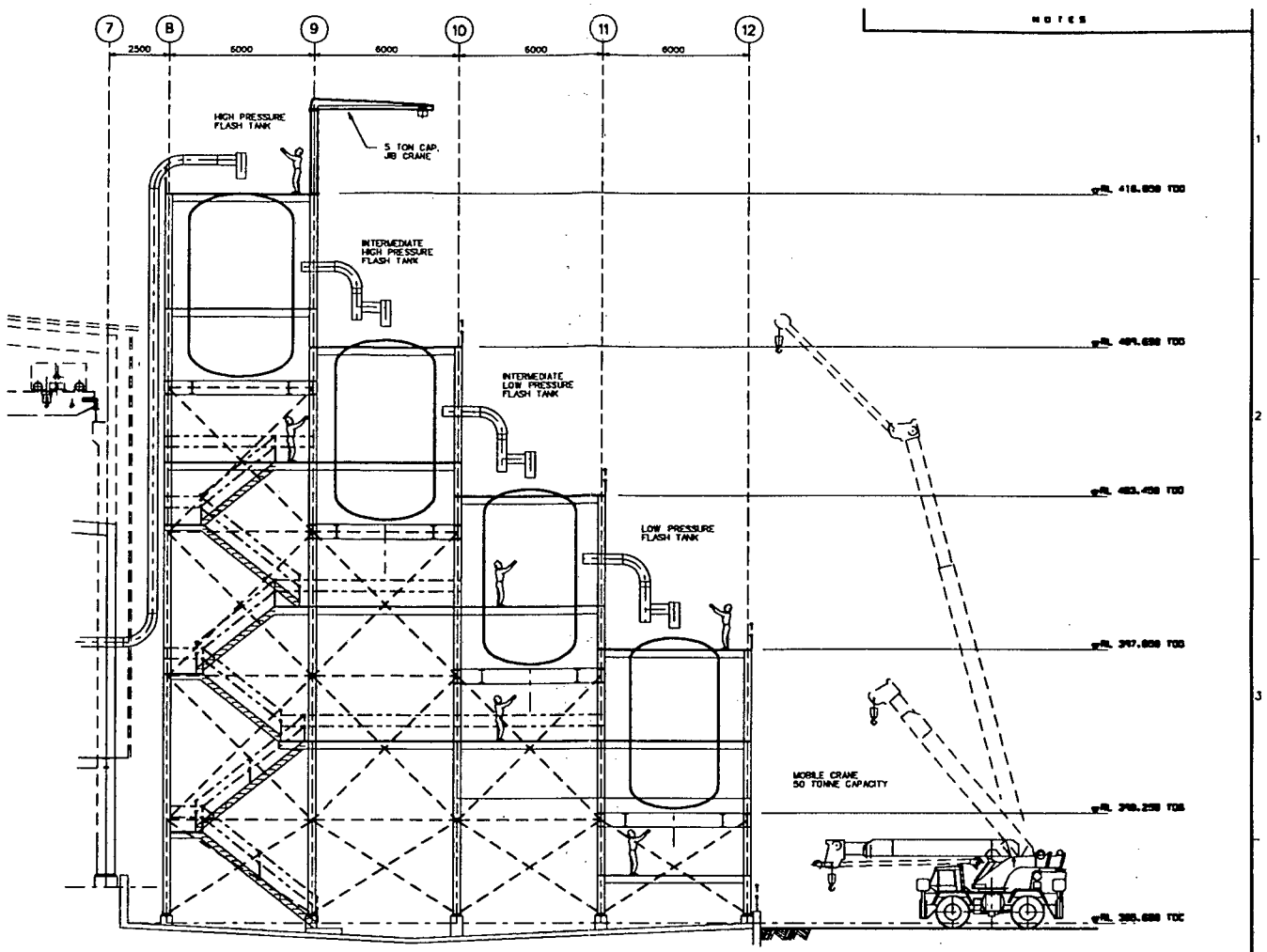
TITLE

BULONG NICKEL LATERITE PROJECT
1995 FEASIBILITY STUDY
PRESSURE LEACHING
GENERAL ARRANGEMENT
UPPER FLOOR PLAN

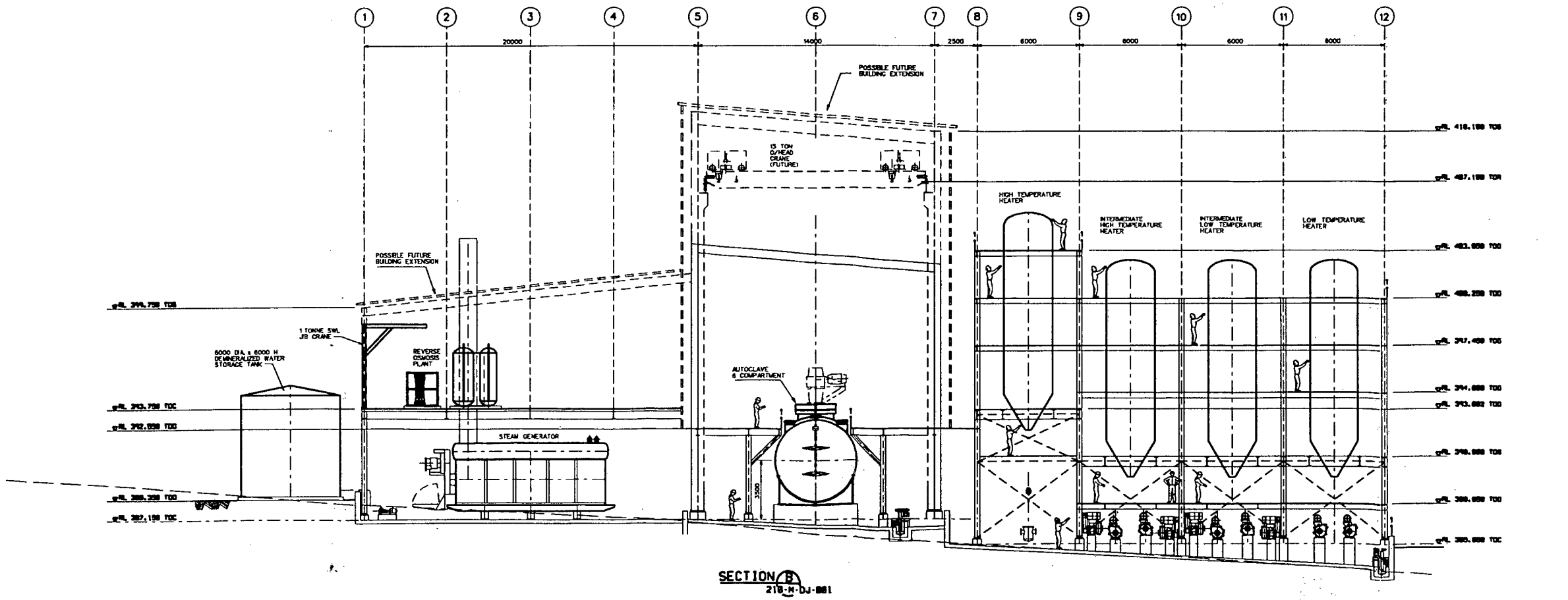
CAD FILE No. 21010P02.DGN
BATEMAN KINHILL PROJECT NUMBER P8K307
DRAWING NUMBER 210-M-DJ-2 REV.



SECTION C
218-M-DJ-881



SECTION A
218-M-DJ-881



SECTION B
218-M-DJ-881

NOTES

STUDY DRAWING

NO.	DESCRIPTION	DATE	BY	ENGR	CLIENT	PROJ. MGR.
B	RELEASED FOR FEASIBILITY STUDY REPORT		D.W			
A	RELEASED FOR INFORMATION	SEP.22 1995	D.W			

REVISIONS

210-M-DJ-1	PRESSURE LEACHING G.A. GROUND FLOOR PLAN

REFERENCE DRAWINGS

KILBURN — DRG. NO. — DESCRIPTION

RESOLUTE RESOURCES LIMITED
PERTH WESTERN AUSTRALIA

BATEMAN KINHILL

DRAWING DATA CONTAINED HEREIN ARE RESTRICTED IN USE FOR THE ORIGINAL PURPOSES FOR WHICH THEY ARE PREPARED.

SECTION	GENERAL LAYOUT
SCALE:	1:100
DESIGNED	D.WALDEN
DRAWN	D.WALDEN
CHECKED	
APPROVED	
B.G.A. NO.	
DATE	23.10.1995
DATE	23.10.1995

TITLE

BULONG NICKEL LATERITE PROJECT
1995 FEASIBILITY STUDY
PRESSURE LEACHING
GENERAL ARRANGEMENT
SECTIONS A - A . B - B . C - C

CAD FILE No. 21010P03.DGN
BATEMAN PROJECT NUMBER P89K3907
DRAWING NUMBER 210-M-DJ-3
REV.

SCALE IN METRES 0 1 2 3 4 5 6 7

FORM NE-34 REV. 5 1-ACP

PREGNANT SOLUTION STORAGE POND

10000 DIA. CLARIFIER THICKENR

1000 DIA. X 3000 H CLARIFIER THICKENR O/FLOW TANK

SUMP AND PUMP

21000 DIA. PARTIAL NEUTRALIZATION THICKENR NO.1

5000 DIA. X 12000 H NEUTRALIZATION TANKS

5000 DIA. X 7000 H FLOCCULENT #1 HOLDING TANK

FLOCCULENT #1 MIXING

4000 DIA. X 3000 H THICKENER O/FLOW TANK

1300 DIA. X 1300 FLOCCULENT #2 HOLDING TANK

SUMP AND PUMP

5000 DIA. X 12000 H NEUTRALIZATION TANKS

4000 DIA. X 7000 H NEUTRALIZATION TANKS

68000 | 11000 | 73000

539000

139000

259000

390000

190000

32000 DIA. C.C.D. THICKENR NO.7

32000 DIA. C.C.D. THICKENR NO.6

32000 DIA. C.C.D. THICKENR NO.8

32000 DIA. C.C.D. THICKENR NO.5

32000 DIA. C.C.D. THICKENR NO.4

32000 DIA. C.C.D. THICKENR NO.1

32000 DIA. C.C.D. THICKENR NO.3

32000 DIA. C.C.D. THICKENR NO.2

5000 DIA X 12000 NEUTRALISATION REACTOR TANK

4-3000 DIA X 3000 THICKENER MIXING FEED TANKS

2600 I.D PIPE TUNNEL (TYP)

THICKENER U/F PUMPS (TYP)

CONCRETE TUNNEL 4500 DIA. (INSIDE TYP)

3000 I.D PIPE TUNNEL (TYP)

24000 | 38000 | 38000 | 38000 | 24000

0 2 4 6 8 10 12 14

SCALE IN METRES

TRUE NORTH

PLANT NORTH

NOTES

STUDY DRAWING

NO.	DESCRIPTION	DATE	BY	CHKD	CLIENT	BKH/PM
B	RELEASED FOR FEASIBILITY STUDY REPORT		D.W			
A	RELEASED FOR INFORMATION	SEPT 1995	D.W			

REVISIONS

DWG NO.	DESCRIPTION
220-M-DJ-3	C.C.D. WASHING G.A. SECTIONS
220-M-DJ-2	C.C.D. WASHING G.A. UPPER PLAN
110-M-DJ-1	YARD PLAN
220-B-DF-001	C.C.D. WASHING PROCESS FLOWSHEET

REFERENCE DRAWINGS

KILBORN

RESOLUTE RESOURCES LIMITED
PERTH WESTERN AUSTRALIA

BATEMAN KINHILL

ENGINEERING DATA CONTAINED HEREIN ARE RESTRICTED IN USE FOR THE ORIGINAL PURPOSES FOR WHICH THEY ARE PREPARED.

TITLE

BULONG NICKEL LATERITE PROJECT
1995 FEASIBILITY STUDY
C.C.D. WASHING & PARTIAL NEUTRALISATION
GENERAL ARRANGEMENT
LOWER PLAN

SECTION GENERAL LAYOUT
SCALE 1:200 @ A1
DESIGNED D.WALDEN SEPT 1995
DRAWN D.WALDEN SEPT 1995
CHECKED
APPROVED
B.O.M. NO.
CAD FILE No. 2201DF01.DGN
BATEMAN KINHILL PROJECT NUMBER PB1307
DRAWING NUMBER 220-M-DJ-001
REV.

PREGNANT SOLUTION
STORAGE POND

68000

5000

73000

16000 DIA.
CLARIFIER
THICKENR

1800 DIA. X 3000 H
CLARIFIER THICKENER
O/FLOW TANK

21000 DIA.
PARTIAL
NEUTRALIZATION
THICKENR NO.1

5000 DIA. X 12000 H NEUTRALIZATION HOLDING TANKS

7000 DIA. X 7000 H FLOCCULENT #1 MIXING

4000 DIA. X 3000 H
THICKENER
O/FLOW TANK

1300 DIA. X 1300 H
FLOCCULENT #2
HOLDING TANK

5000 DIA. X 12000 H
NEUTRALIZATION
TANKS

4000 DIA. X 7000 H
NEUTRALIZATION
TANKS

TRUE NORTH
PLANT NORTH
30°

SUB STATION

53000

13500

32000 DIA.
C.C.D. THICKENR NO.1

32000 DIA.
C.C.D. THICKENR NO.2

32000 DIA.
C.C.D. THICKENR NO.3

32000 DIA.
C.C.D. THICKENR NO.4

25000

38000

19000

A 220-M-DJ-003

B 220-M-DJ-003

C 220-M-DJ-003

D 220-M-DJ-003

24000

30000

30000

30000

24000

0 2 4 6 8 10 12 14
SCALE IN METRES

NOTES

STUDY DRAWING

NO.	DESCRIPTION	DATE	BY	CHKD	DWG	FINAL APPD
B	RELEASED FOR FEASIBILITY STUDY REPORT		D.W			
A	RELEASED FOR INFORMATION	27.11.95	D.W			

REVISIONS

220-M-DJ-1 C.C.D. WASHING G.A. LOWER PLAN

DWG NO. DESCRIPTION

REFERENCE DRAWINGS

KILBORN
ATHOLINE TECHNOLOGY DIVISION
PERTH 6000
SUNNY FRIDAY PLAZA

RESOLUTE RESOURCES LIMITED
PERTH WESTERN AUSTRALIA

BATEMAN KINHILL
In Partnership with
Bateman Project Engineering Pty Ltd ACN 009 241 966
Kinhill Pacific Pty Ltd ACN 010 241 626

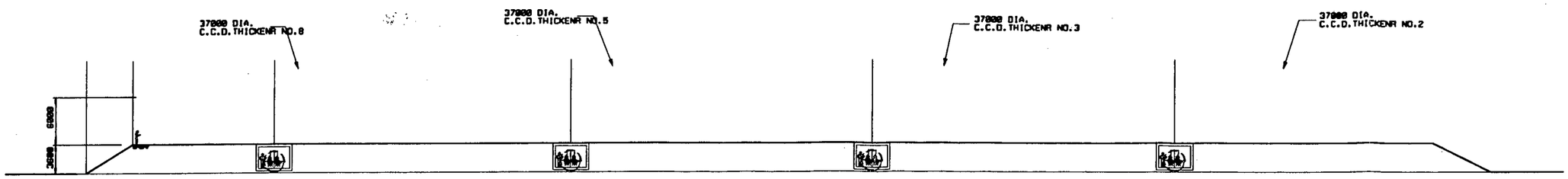
ENGINEERING DATA CONTAINED HEREIN ARE RESTRICTED IN USE FOR THE ORIGINAL PURPOSES FOR WHICH THEY ARE PREPARED.

SECTION GENERAL LAYOUT
SCALE 1:200 DATE
DESIGNED D.WALDEN 6.6.95
DRAWN D.WALDEN 6.6.95
CHECKED
APPROVED
D.B.M. NO.
CAD FILE No. 22010F02.DGN
BATCHMIX WHEEL PROJECT NUMBER PBK307
DRAWING NUMBER 220-M-DJ-002 REV. B

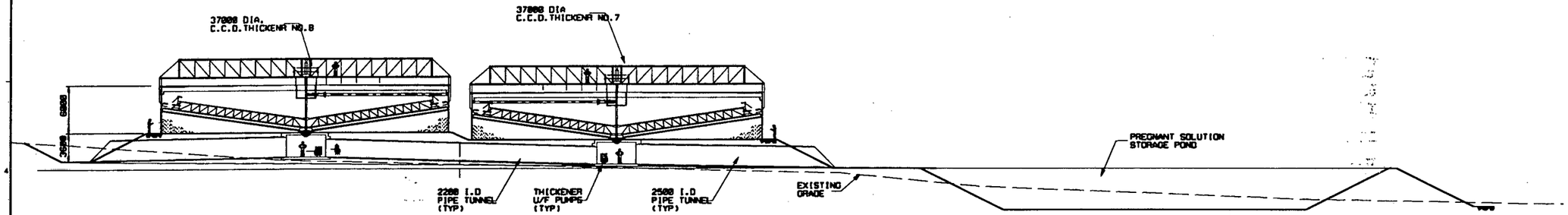
TITLE

BULONG NICKEL LATERITE PROJECT
1995 FEASIBILITY STUDY
C.C.D. WASHING & PARTIAL NEUTRALISZATION
GENERAL ARRANGEMENT
UPPER PLAN

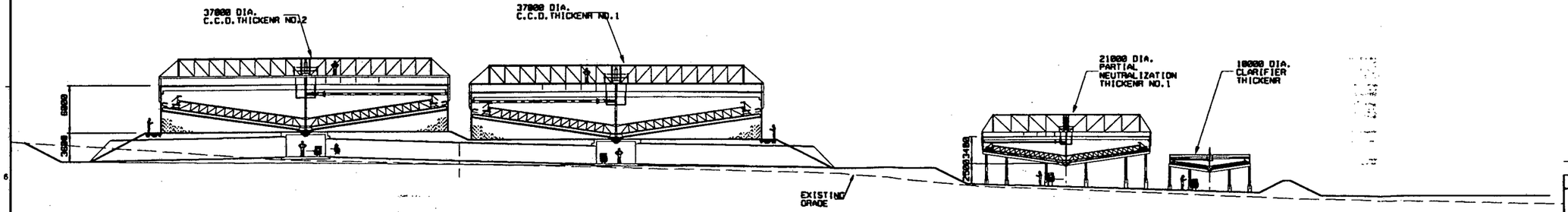
NOTES



SECTION A
220-M-DJ-002



SECTION B
220-M-DJ-002



SECTION C
220-M-DJ-002

STUDY DRAWING

NO.	DESCRIPTION	DATE	BY	DESIGN	CHECK	APPR'D
B	RELEASED FOR FEASIBILITY STUDY REPORT		D.W			
A	RELEASED FOR INFORMATION	97.22 WK	D.W			

REVISIONS

220-M-DJ-1 C.C.D. WASHING G.A. LOWER PLAN

DWG. NO. DESCRIPTION

REFERENCE DRAWINGS

KILBORN
ENGLAND TECHNOLOGY SERVICES
KILBORN PROJECT NUMBER

RESOLUTE RESOURCES LIMITED
PERTH WESTERN AUSTRALIA

BATEMAN KINHILL

SECTION GENERAL LAYOUT
SCALE 1:200
DESIGNED D.WALDEN
DRAWN D.WALDEN
CHECKED
APPROVED
S.O.R. NO.

TITLE

BULONG NICKEL LATERITE PROJECT
1995 FEASIBILITY STUDY
C.C.D. WASHING & PARTIAL NEUTRALISATION
GENERAL ARRANGEMENT
SECTIONS

CAD FILE No. 220I0F03.DGN
BATEMAN KINHILL PROJECT NUMBER P8K507
DRAWING NUMBER 220-M-DJ-003 REV.

0 2 4 6 8 10 12 14
2 SCALE IN METRES

A B C D E F G H J K

NOTES

NICKEL SOLVENT EXTRACTION

NICKEL RAFFINATE STORAGE POND 16.5.0X17.5X3.5

SPACE RESERVED FOR NICKEL ELECTROWINNING TANK FARM

ACCESS WAY (TYP)

BORIC ACID TANK 3.4 DIA.X3.6

NAHS HOLDING TANK 3.8 DIA.X3.6

NAHS MIXING TANK 3.8 DIA.X3.6

NICKEL EXTRACTANT STORAGE TANK 3.8 DIA.X3.6

DILUENT STORAGE TANK 4.8 DIA.X4.6

COL.FEED PUMP BOX

RAFFINATE COLUMN CELL

STRIP COLUMN CELL

NICKEL SX COLLECTION SUMP

NICKEL STRIP LIQUOR TRANSFER TANK 4.0 DIA.X4.0

NICKEL SCRUB FEED TANK 3.3 DIA.X3.0

NICKEL CRUD TANK 2.4 DIA.X3.0

NICKEL SEPARATION TANK 2.9 DIA.X3.3

FUTURE FILTER PRESS

NICKEL LOADED ORGANIC TANK 9.0X18.5X3.5

NICKEL STRIP COLUMN FEED TANK STORAGE TANK 9.0X7.0X3.5

NICKEL SX FEED TANK 9.0X12.0X3.5

NICKEL EXTRACTION MIXER SETTLER NO.1

NICKEL EXTRACTION MIXER SETTLER NO.2

NICKEL EXTRACTION MIXER SETTLER NO.3

NICKEL EXTRACTION MIXER SETTLER NO.4

NICKEL STRIPPING MIXER SETTLER NO.3

NICKEL STRIPPING MIXER SETTLER NO.2

NICKEL STRIPPING MIXER SETTLER NO.1

NICKEL SCRUB MIXER SETTLER NO.2

NICKEL SCRUB MIXER SETTLER NO.1

COBALT EXTRACTION MIXER SETTLER NO.1

COBALT EXTRACTION MIXER SETTLER NO.2

COBALT EXTRACTION MIXER SETTLER NO.3

COBALT EXTRACTION MIXER SETTLER NO.4

COBALT EXTRACTION MIXER SETTLER NO.5

COBALT WASH MIXER SETTLER

COBALT STRIPPING MIXER SETTLER NO.3

COBALT STRIPPING MIXER SETTLER NO.2

COBALT STRIPPING MIXER SETTLER NO.1

COBALT SCRUB MIXER SETTLER

COVER (TYP)

WALKWAY (TYP)

STUDY DRAWING

COBALT SOLVENT EXTRACTION

240-M-DJ-003

COBALT SULPHIDE FILTER PRESS

COBALT SULPHIDE THICKENER 2.8 DIA

COBALT SULPHIDE PRECIPITATION TANK NO.2 4.4 DIA.X5.8

COBALT SULPHIDE PRECIPITATION TANK NO.1 4.4 DIA.X5.8

COBALT STRIP LIQUOR TANK 4.8 DIA.X4.6

STRIP COLUMN CELL

RAFFINATE COLUMN CELL

COBALT RAFFINATE COLUMN FEED TANK 4.8 DIA.X4.6

COBALT SX COLLECTION SUMP

COBALT CRUD TANK 2.9 DIA.X3.3

COBALT SEPARATION TANK 2.9 DIA.X5.3

FUTURE FILTER PRESS

COBALT LOADED ORGANIC TANK 9.0X18.5X3.5

COBALT SX STRIP COLUMN FEED TANK STORAGE TANK 9.0X18.5X3.5

COBALT SX FEED TANK 9.0X12.0X3.5

SPACE RESERVED FOR COBALT ELECTROWINNING TANK FARM

TANK FARM

OXYGEN TANK

BOLLARD (TYP)

CAUSTIC SODA STORAGE TANK 3.8 DIA. X 10.0

LEGEND

CHECKER PLATE

GRATING

CONCRETE

0 2 4 6 8

1 SCALE IN METRES

NO	DESCRIPTION	DATE	BY	CHKD	APPD
B	RELEASED FOR FEASIBILITY STUDY REPORT		D.W		
A	RELEASED FOR INFORMATION	SEP.93	D.W		

REVISIONS

240-M-DJ-1 SX AND EW GEN ARRGT - COMBINED PLAN

REFERENCE DRAWINGS

KILBORN

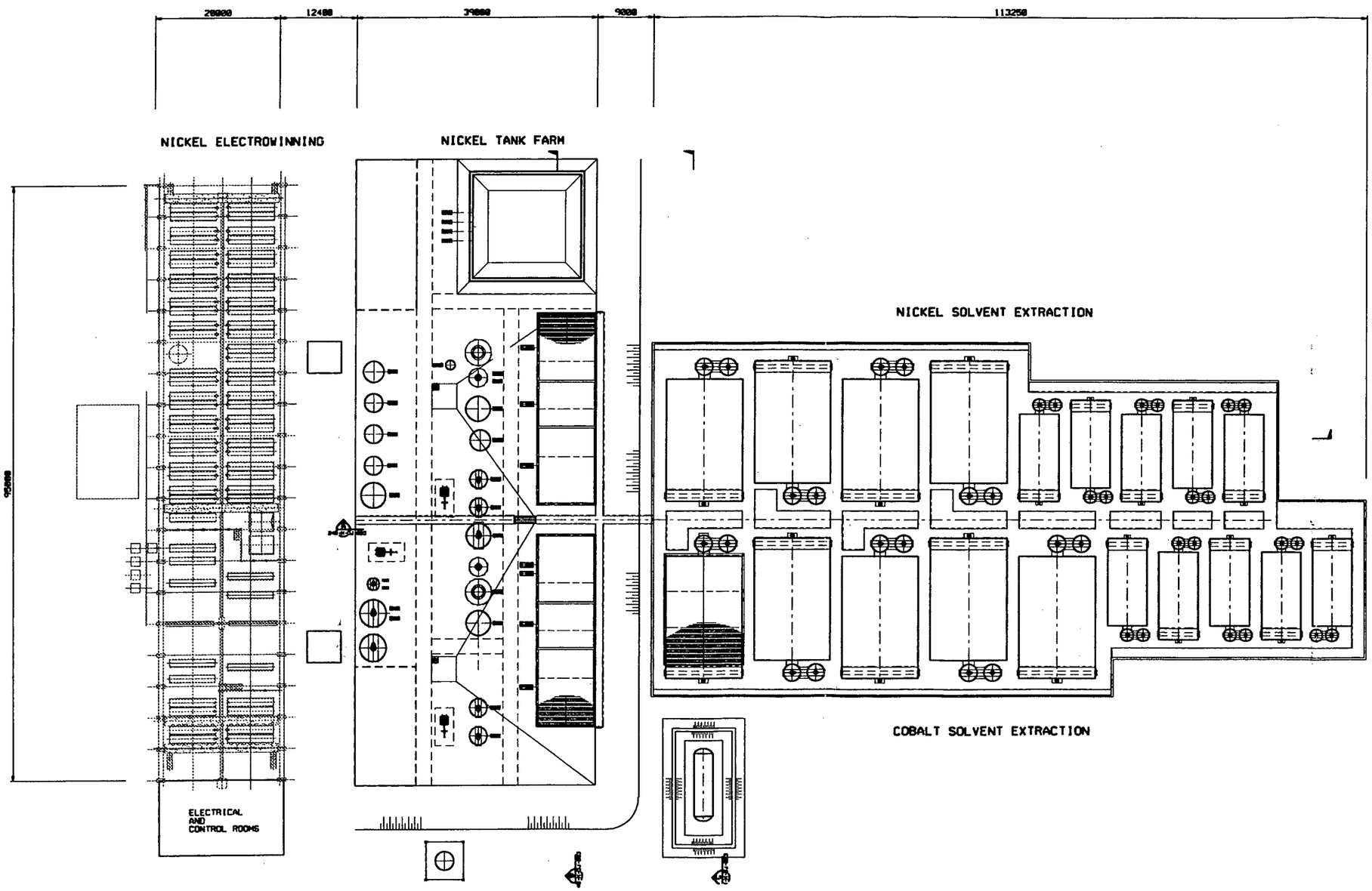
RESOLUTE RESOURCES LIMITED
PERTH WESTERN AUSTRALIA

BATEMAN KINHILL

TITLE

BULONG NICKEL LATERITE PROJECT
1993 FEASIBILITY STUDY
SOLVENT EXTRACTION
GENERAL ARRANGEMENT
PLAN

DESIGN	GENERAL LAYOUT
SCALE	1:150
DESIGNED	D.WALDEN
DRAWN	D.WALDEN
CHECKED	
APPROVED	
CAD FILE No.	240I0F02.DGN
DRAWING NUMBER	PBK507
	240-M-DJ-002B



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A	RELEASED FOR INFORMATION	SEP.22 1995	D.W			

REVISIONS

DWG NO.	DESCRIPTION
240-M-DJ-3	S.X. GENERAL ARRANGEMENT - SECTIONS
240-M-DJ-2	S.X. GENERAL ARRANGEMENT - PLAN
110-M-DJ-1	YARD PLAN
250-B-DF-001	NICKEL SX PROCESS FLOWSHEET
240-B-DF-002	COBALT SX PROCESS FLOWSHEET

REFERENCE DRAWINGS

KILBORN — SYDNEY

RESOLUTE RESOURCES LIMITED
PERTH WESTERN AUSTRALIA

BATEMAN KINHILL

SECTION: GENERAL LAYOUT
SCALE: 1:250 DATE
DESIGNED: D.WALDEN SEP.95
DRAWN: D.WALDEN SEP.95
CHECKED:
APPROVED:
B.K.H. NO.

TITLE

BULONG NICKEL LATERITE PROJECT
1995 FEASIBILITY STUDY
SOLVENT EXTRACTION & ELECTROWINNING
GENERAL ARRANGEMENT
COMBINED PLAN

CAD FILE NO. 2401DF01.DGN
BATEMAN KINHILL PROJECT NUMBER P89507
DRAWING NUMBER 240-M-DJ-001 REV. B

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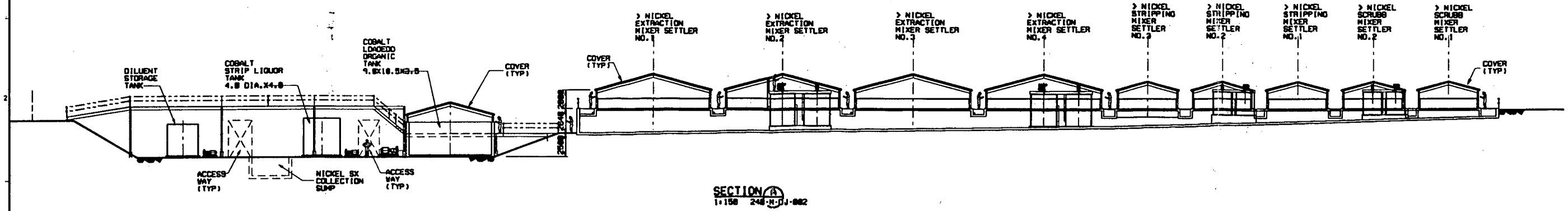

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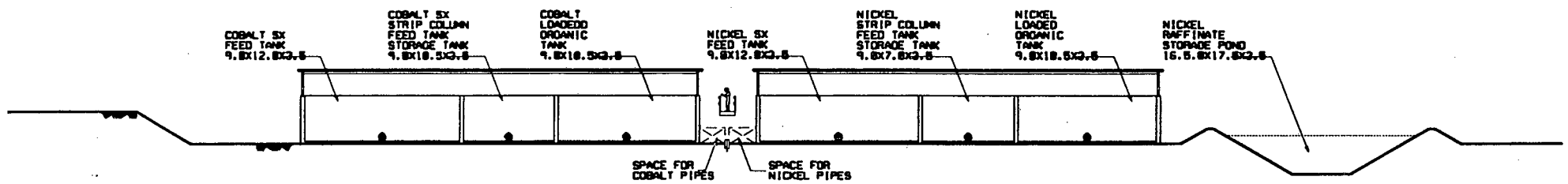

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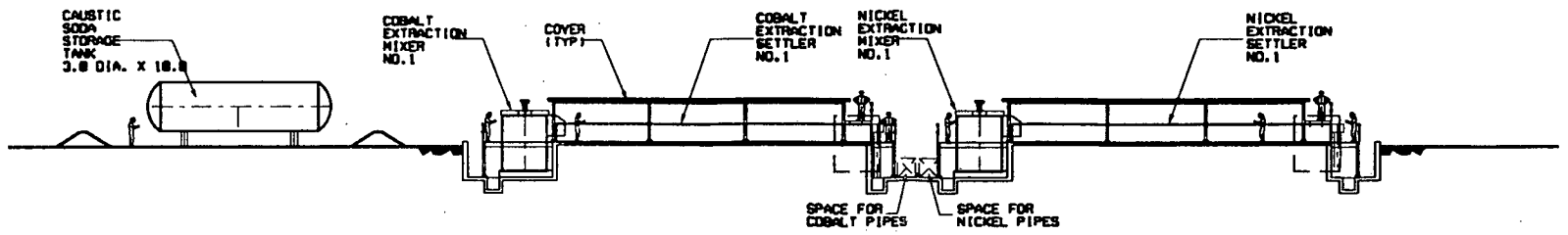

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STUDY DRAWING

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A	RELEASED FOR INFORMATION	SEP 23 1995	D.W			

REVISIONS

240-M-DJ-1 SX AND EW GEN.ARRGT - COMBINED PLAN

DWG NO. DESCRIPTION

REFERENCE DRAWINGS

KILBORN

RESOLUTE RESOURCES LIMITED
PERTH WESTERN AUSTRALIA

BATEMAN KINHILL

SECTION GENERAL LAYOUT
SCALE 1:150
DES/CHKD D.WALDEN
DRAWN D.WALDEN
CHECKED
APPROVED
W.B.S. NO.

TITLE

BULONG NICKEL LATERITE PROJECT
1995 FEASIBILITY STUDY
SOLVENT EXTRACTION
GENERAL ARRANGEMENT
SECTIONS

CAD FILE No. 2401DF03.DGN
BATEMAN KINHILL PROJECT NUMBER PBK507
DRAWING NUMBER 240-M-DJ-0038 REV. B

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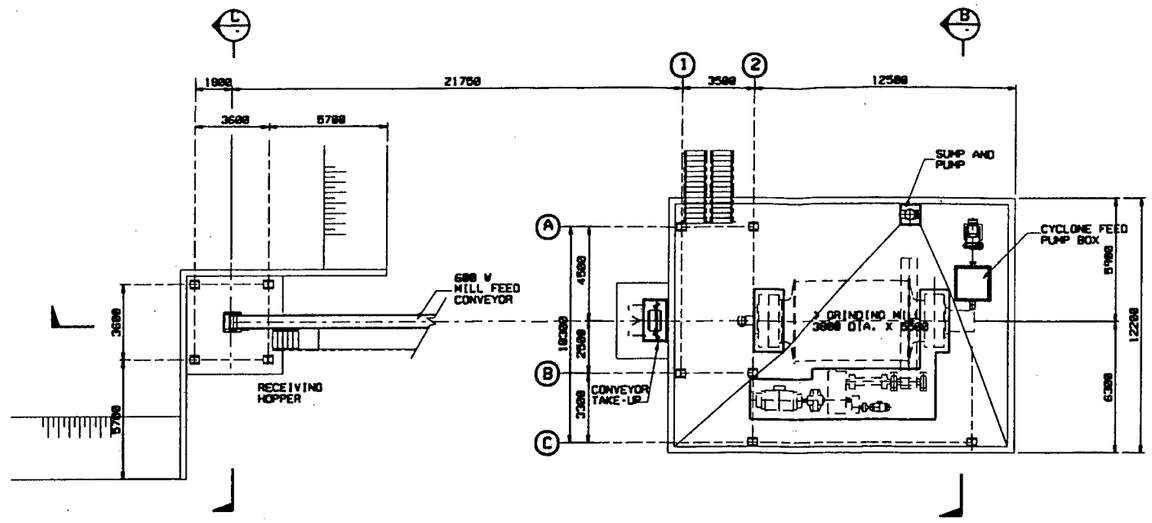

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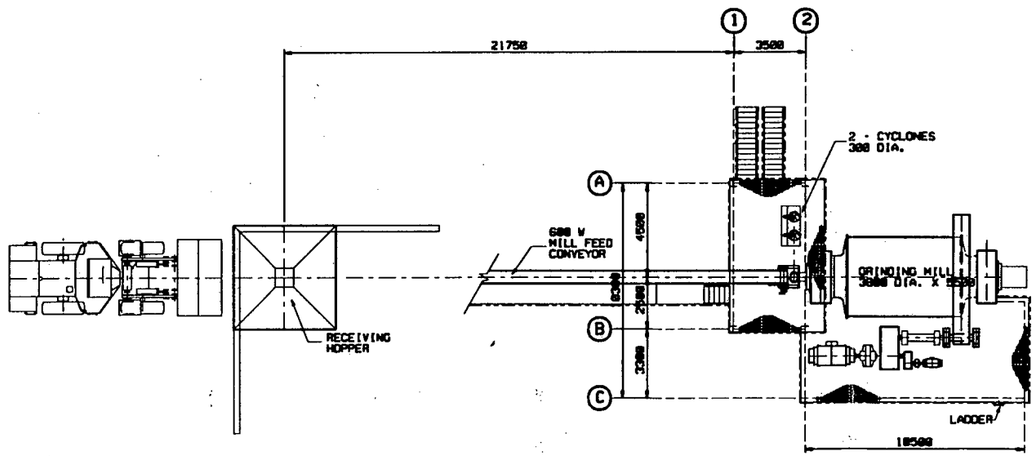

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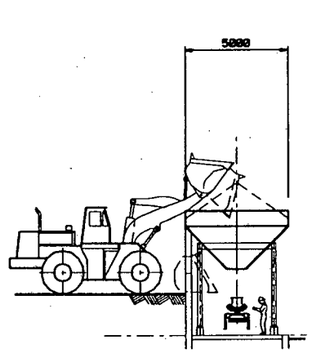

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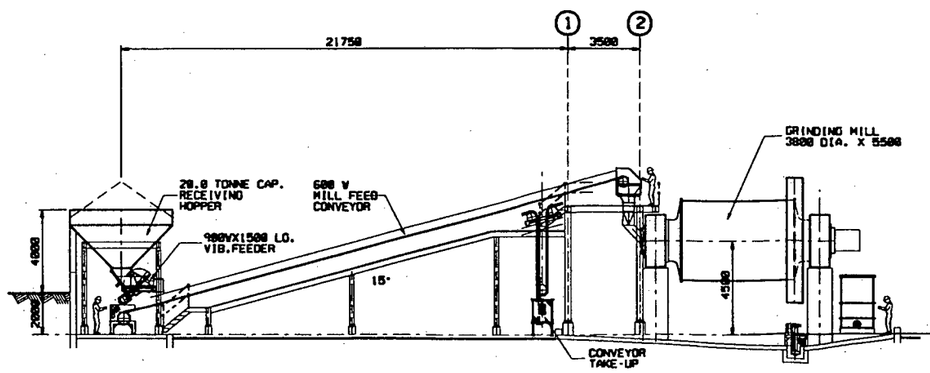

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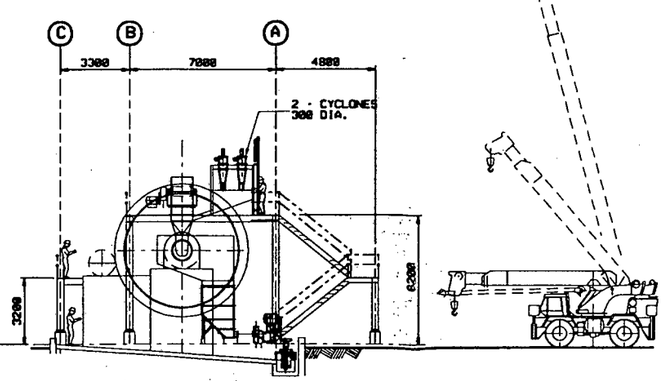

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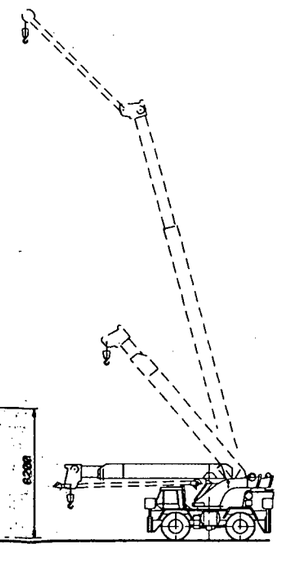

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1 SCALE IN METRES

PLANT NORTH
+10°
TRUE NORTH

STUDY DRAWING

NO.	DESCRIPTION	DATE	BY	CHECK	QUAL CHK	PROJ MGR
B	RELEASED FOR FEASIBILITY STUDY REPORT		D.W			
A	RELEASED FOR INFORMATION	SEP.23 1995	D.W			

REVISIONS

YD-M-DJ-1 YARD PLAN

KILBORN — DWG. NO. — DESCRIPTION

REFERENCE DRAWINGS

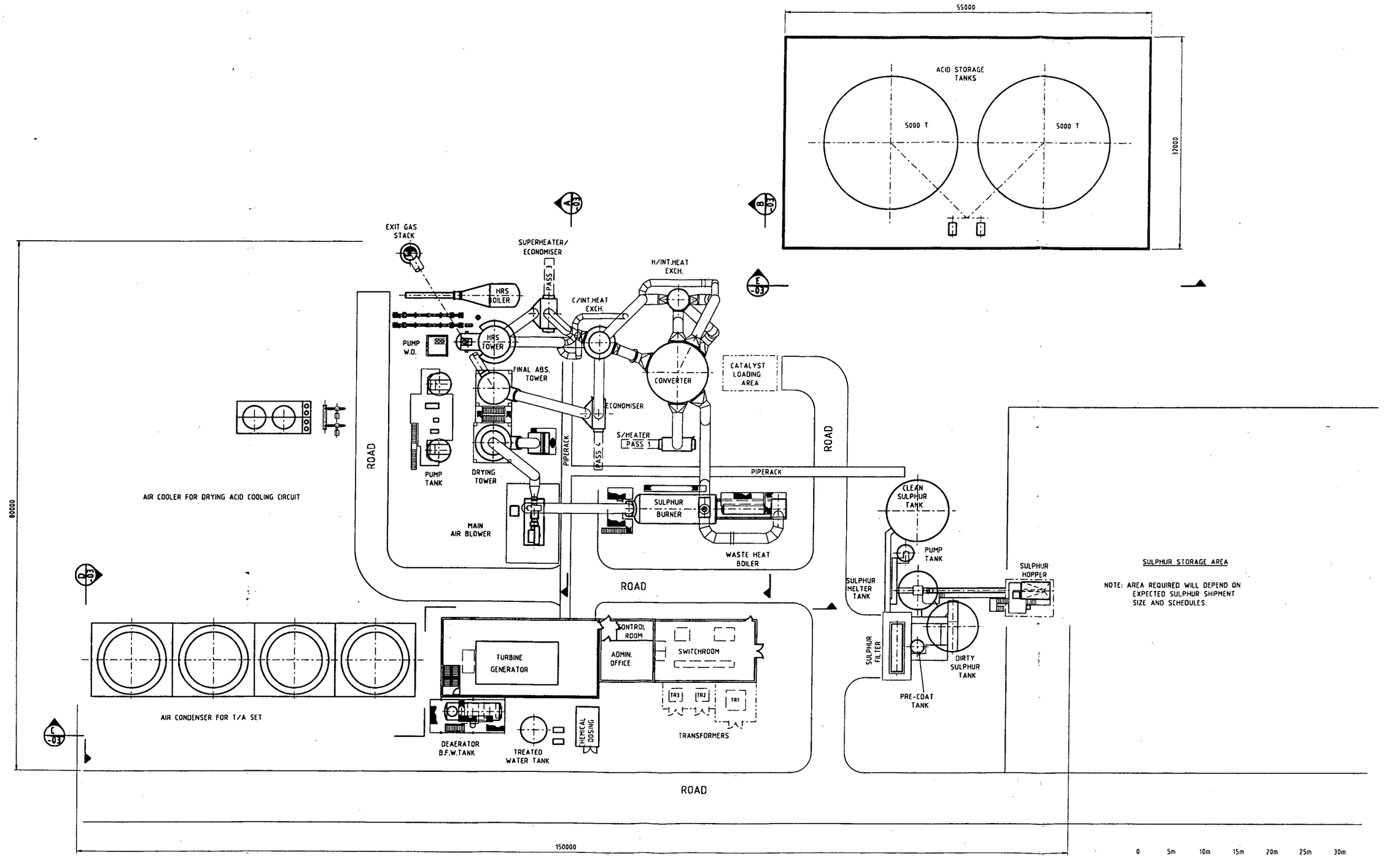
RESOLUTE RESOURCES LIMITED
PERTH WESTERN AUSTRALIA

BATEMAN KINHILL

SECTION	GENERAL LAYOUT
SCALE	1:100
DESIGNED	D.WALDEN
DRAWN	D.WALDEN
CHECKED	
APPROVED	
BUILD NO.	
CAD FILE No.	28010FDLDGN
BATEMAN KINHILL PROJECT NUMBER	PBK507
DRAWING NUMBER	280-M-DJ-001
REV.	B

TITLE

BULONG NICKEL LATERITE PROJECT
1995 FEASIBILITY STUDY
REAGENTS HANDLING - LIMESTONE
GENERAL ARRANGEMENT
PLAN AND SECTIONS



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C	8-8-95	ISSUED TO B.K.K.	W.R.		
B	28-7-95	ISSUED WITH REPORT TO B.K.K.	W.R.		
A	17-7-95	PRELIMINARY ISSUE TO B.K.K.	W.R.		

REFERENCE

DRAWING NUMBER

TITLE

BULONG NICKEL PROJECT

7451

900 T.P.D. SULPHURIC ACID PLANT WITH HEAT RECOVERY SYSTEM PLAN LAYOUT

W.R. 6-7-95

SCALE 1:200

simon-CARVES AUSTRALIA

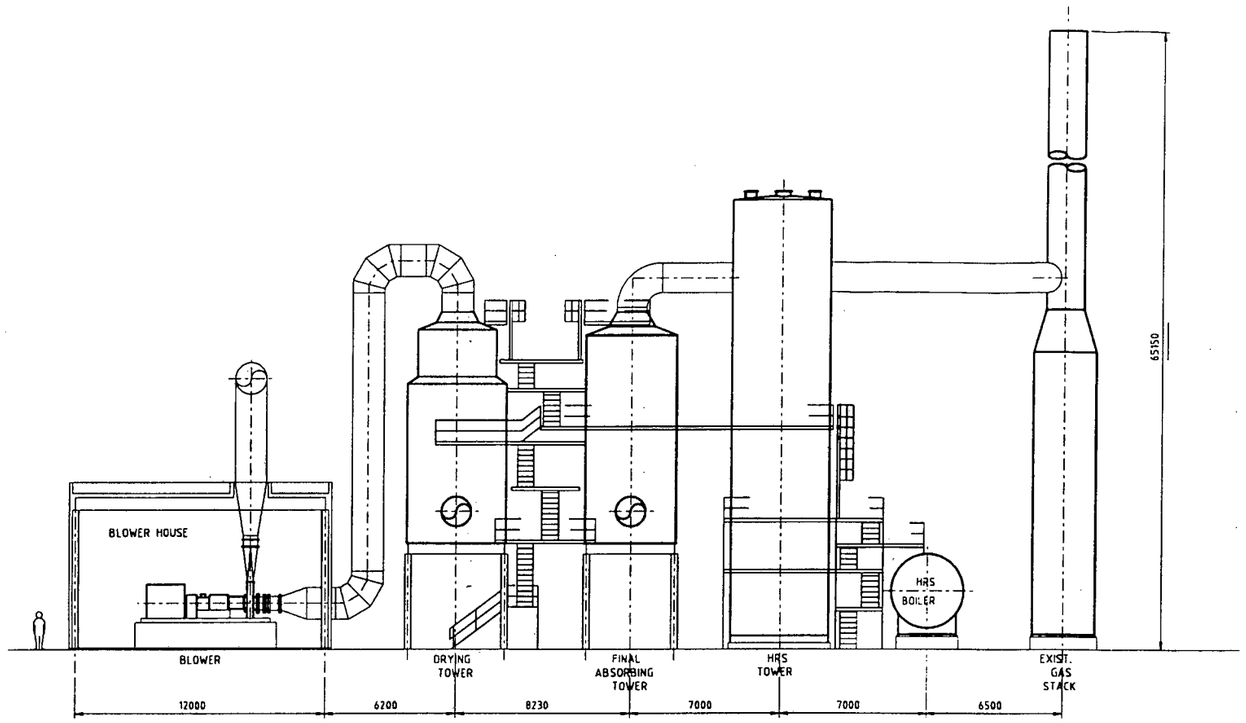
Division of Simon Engineering (Australasia) Pty Limited, Sydney, N.S.W. Incorporated in New South Wales

7451-02

RESOLUTE RESOURCES

BATEMAN KINHILL KILBORN

A0 D



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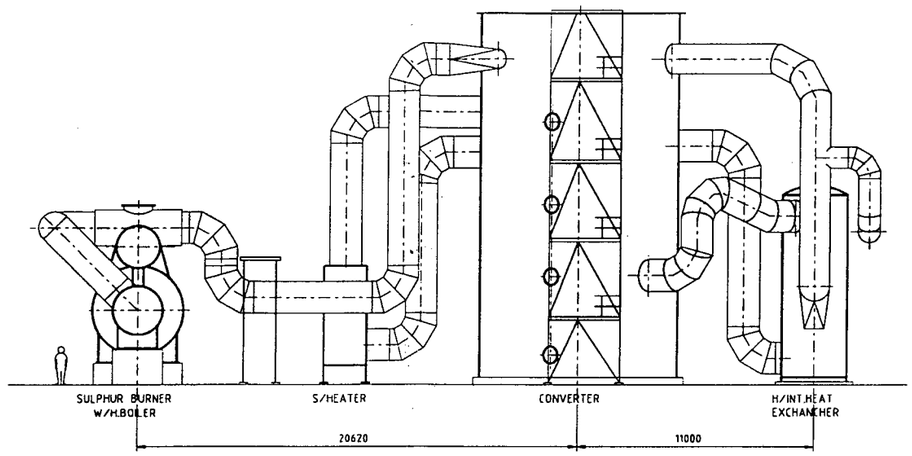

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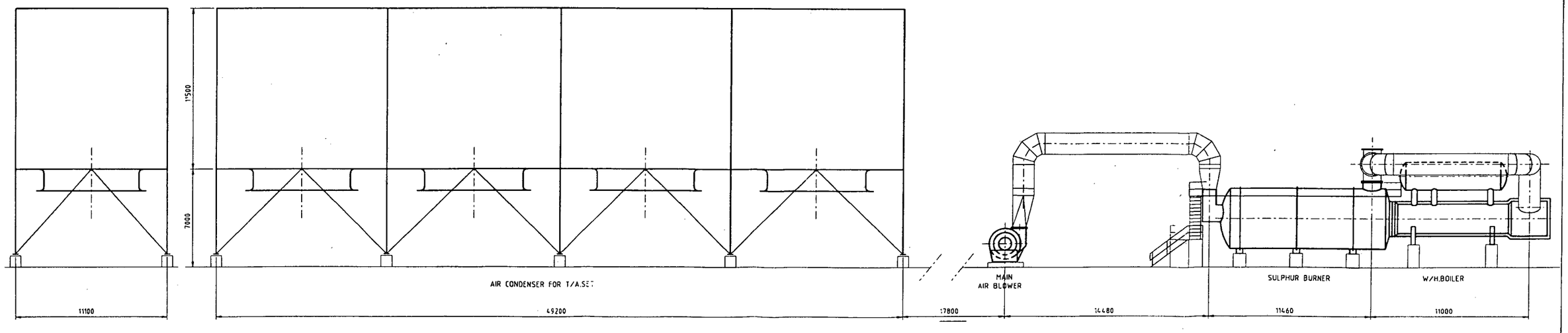

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ELEVATION C -02

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A	8-6-95	ISSUED TO B.K.K.	W.R		

REFERENCE

DRAWING NUMBER

TITLE

0

BULONG NICKEL PROJECT

CONTRACT No. 7451

900 T.P.D. SULPURIC ACID PLANT WITH HEAT RECOVERY SYSTEM ELEVATIONS

DRAWN W.R. 7-6-95

SCALES 1:100

simon-CARVES AUSTRALIA

Division of Simon Engineering (Australia) Pty. Limited Sydney, N.S.W. Incorporated in New South Wales

DRAWING NUMBER 7451-03

RESOLUTE RESOURCES

BATEMAN KINHILL KILBORN

AO A B

Appendix D

REGIONAL AND BNLP AREA FLORA

Appendix D1

REGIONAL FLORA DESCRIPTION

The BNPL area lies within both Salt Lake Features and Undulating Plains. The flora and vegetation associations of these landform units as they occurred in the Kalgoorlie–Kurnapli area are described below (WAM 1992):

Salt Lake Features

Vegetation and flora typical of Salt Lake Features generally consisted of low shrubs of Chenopodiaceae with scattered patches of *Casuarina cristata.* Other vegetation typical of this landform unit included *Myoporum platycarpum* and *Acacia aneura* trees to the north, the latter generally being confined to groves in the general cover of chenopodiaceous shrubs.

The salt lakes in the Study Area were virtually bare, consisting of low shrubs of *Halosarcia* spp. around the perimeter or in patches on the lake floors. The main species included *H.halocnemoides*, *H.doleiformis*, *H.indica* and *H.pruinosa.* Other perennials found included *Frankenia* spp and *Disphyma clavellatum.* Ephemerals such as *Brachycome* spp., *Cotula australis* and *Plantago* spp. were also present where salinity was not extreme.

Low shrubs of *Atriplex* spp. occurred in areas of slightly raised flats where soil had accumulated. In the north of the Study Area, discrete claypans supported *Muehlenbeckia cunninghamii* and heavy nutrient rich soils consisted of *Cratystylis subspinescens* and scattered *Sclerostegia disarticulata.*

Areas adjacent to Salt Lake Features which had slightly moister soil supported scattered shrubs up to 3 m high and included *Eremophila* spp. and *Lycium australe.* Small dunefields comprised of loose sand or sandy loam contained patches of low woodland of *Acacia aneura* and *Callitris columellaris.* The north-western margins of the salt lakes in the south of the Study Area supported low woodland of *Eucalyptus lesouefii* on shallow soils on eroded bedrock. The plains of reddish sandy loam on the outer parts of Salt Lake Features were dominated by relatively well-grown stands of *Casuarina cristata* which had a variable mixed understorey of *Eremophila*, *Olearia* and other species.

Adjacent to the salt lakes in the north-eastern part of the Study Area on dark red-brown alluvium with hardpan, *Casuarina cristata* (and patches of *Eucalyptus gracilis*) over *Eremophila scoparia* was patchy, giving way extensively to *Acacia aneura.* Flats of sandy loam supported open stands of *Hakea arida* over *Maireana pyramidata* and some

Cratystylis subspinescens over ephemerals. The nearby slightly raised bare lake margins and hummocky surfaces featured dense low stands of *Atriplex* spp. and scattered *Sclerostegia* spp., which were treeless except on crests of low dunes or in saucers.

Undulating Plains

In general, the Undulating Plains landform unit in the Study Area was covered with woodland and an understorey of tall shrubs on shallow soils and low shrubs on calcareous soils. Dry and well drained sites were characterized by stunted and scattered trees with a prominent understorey.

Within this landform unit, a definite change in vegetation structure and floristic composition occurred from the south to the north of the Study Area. Generally, the vegetation ranged from woodland of *Eucalyptus* spp. in the south to open woodland of *Casuarina cristata* (over low shrubs of *Maireana* spp.) in the north. *Eucalyptus lesouefii*, *E.clelandii* and *E.salmonophloia* occurred over most areas of Undulating Plains, with the latter confined to relatively deep, well-watered substrates.

In the south of the Study Area, Undulating Plains supported *E.transcontinentalis* and *E.salubris*. Flat areas of the landform unit from the centre of the Study Area and northwards ranged from tall trees of *Eucalyptus* spp. to more restricted groves, becoming dominated by *Acacia aneura* and *Casuarina cristata*. In the north of the Study Area, *C.cristata* over *Maireana sedifolia* became the general cover on the higher lying parts of Undulating Plains.

Appendix D2

BNLP AREA FLORA DESCRIPTION

Plant species were identified in the field or specimens collected for later identification and verification. Vegetation type, life-form strata, percentage cover, surface soil type, drainage, litter cover and the relative abundance of each species present were recorded by Ecologia at twenty-six sites (see Figure 4.2). Later survey areas were mapped using the site descriptions developed by Ecologia where possible. Previously unrecorded vegetation associations were described using the format and criteria set out in Ecologia (1995) for continuity purposes. The flora survey sites were selected so that the array of vegetation types observed was represented. The site data was later examined, analysed using two different cluster algorithms, and grouped into defined associations according to habitats, which were then mapped. Appendix D3 contains the flora species list for the Bulong Project Area.

One of the major vegetation types, which comprised *Eucalyptus griffithsii* woodland over shrubland, contained considerable variation in both shrub and herb understorey and encompassed approximately 70% of the Bulong Project Area. Of the total 285 taxa recorded, fifty-one species (14 of which were ephemeral Asteraceae species) were identified to genus level only, due to the absence of reproductive material or poorly developed vegetative parts. It is probable that some of these partially identified specimens are from taxa already included in the species list. However it is not anticipated that the species number would be reduced by more than ten to fifteen were it possible fully to identify these specimens. Conversely, a further eight specimens could not be identified to genus level and hence were excluded from the species list. Thus the total number of species expected to occur within the area is approximately 270–290. The area is therefore considered to be moderately rich floristically relative to other areas within the Goldfields, particularly when ephemeral species are considered within the analysis.

A total of eighteen introduced flora species were recorded from the Bulong Project Area, the most common of which were *Trisetaria cristata* (collected from six sites) and *Carrichtera annua*, *Erodium cicutarium* and *Sonchus oleraceus* (collected from five sites). All weed species were recorded at very low densities (i.e. less than 2% coverage) over the majority of the survey area. However some areas, such as Patch Dam, the Pinta Test Pit and the entry/exit road, have been subject to disturbance and the density of weeds is greater. In particular, *Anagallis arvensis*, *Salvia verbenaca* and *Hordeum leporinum* are dominant in the area immediately surrounding Patch Dam (Site 26 in Figure 4.2). The Chenopod *Rumex vesicarius* (ruby dock weed), an agressive weed species which commonly invades areas of disturbed soil such as rehabilitation areas, was recorded at low densities from one detailed flora site which was near the perimeter of the project area

south-west of the Griffin ore body. None of the weed species collected are gazetted as Declared Plants under the Agricultural Protection Board's categorization of declared noxious plants.

Vegetation associations

A: Sparse to open Eucalyptus salmonophloia woodlands over moderately-dense, low shrublands dominated by Chenopods: These associations occurred on heavy alluvial clay soils within the Bulong Project Area.

1 Sparse to open Eucalyptus salmonophloia over Chenopods dominated by Atriplex vesicaria: The open tall tree overstorey is dominated by an open cover of *Eucalyptus salmonophloia* with *E. salubris* often occurring as a co-dominant. The usually sparse tall shrub layer commonly features *Eremophila dempsteri*, *E. oldfieldii* ssp. *angustifolia* and *Atriplex nummularia*. The moderately dense low shrub strata are dominated by an open to moderately dense cover of *A. vesicaria* with lesser amounts of *A. nummularia*, *Maireana integra*, *Maireana* sp. 2 and *Solanum nummularium*. At ground level there is a dense cover of herbs with soft grasses typically open to sparse. The average species richness per site at the time of the survey was 41 species ± 6.7 (n = 3).

2 Sparse Eucalyptus salmonophloia over mixed tall shrubs and Chenopods: The open tall tree overstorey is more mixed than in sub-type 1 but is still dominated by *Eucalyptus salmonophloia*. Lesser densities of *E. griffithsii*, *E.lesouefii*, *E.salubris*, *E.stricklandii*, *E.transcontinentalis* and *Santalum acuminatum* also occur. The open tall shrub strata are dominated by a variety of species which typically include sparse to open densities of *E.dempsteri* and *Eremophila scoparia* and lesser amounts of *Acacia hemiteles*, *Casuarina obesa*, *E. oldfieldii* ssp. *angustifolia* and *Exocarpos aphyllus*. The lower shrub layer is moderately dense to dense and dominated by Chenopods including *Atriplex nummularia* and *Maireana sedifolia*. At ground level there is an open to dense cover of a variety of herbs with soft grasses generally providing an open to sparse cover. The average species richness per site at the time of the survey was 43 species ± 2.5 (n = 5).

B: Eucalyptus woodlands over mixed shrublands: These associations occur on sandier soils and on higher stony ground.

3 Eucalyptus griffithsii-dominated woodland over Eremophila oldfieldii ssp. angustifolia dominated shrubland: The relatively open woodland commonly features an open cover of *Eucalyptus griffithsii* with various species such as *Casuarina obesa*, *Eucalyptus celastroides*, *E.kochii*, *E.lesouefii* and *E.stricklandii* being co-dominant in different areas. The open tall shrub stratum (> 2 m tall) is dominated by an open cover of *Eremophila oldfieldii* ssp. *angustifolia*. *Acacia acuminata* ssp. *burkettii* or *Alyxia buxifolia* are co-dominant in some areas and various other shrubs including *Acacia hemiteles*, *A. tetragonophylla* and *Exocarpos aphyllus* occur at lesser densities. The moderately dense to dense 0.5–2 m tall shrub layer is dominated by open *Dodonaea lobulata*, *Eremophila oldfieldii* ssp. *angustifolia* and *Senna artemisioides* ssp. *filifolia* together with *Acacia acuminata* ssp. *burkettii*, *A. erinacea*, *Alyxia buxifolia*, *Eremophila glabra*, *E.pustulata* and *Hybanthus floribundus* at some sites. The open low shrub

stratum is dominated by *Ptilotus obovatus* and also includes species such as *Enchylaena tomentosa, Olearia muelleri, Solanum lasiophyllum, Westringia rigida* and various species of *Maireana.* At ground level there is an open cover of herbs which is often dominated by *Zygophyllum fruticulosum* and a sparse cover of soft grasses. An average of forty-two species ± 2.6 was collected from the five sites within this association at the time of the survey.

4 Eucalyptus griffithsii-dominated woodland over Acacia/Eremophila shrubland over open spinifex Triodia longiceps: The relatively open (10–20% cover) tree overstorey is dominated by *Eucalyptus griffithsii* which is often co-dominant with other species such as *E. celastroides, E.lesouefii, E.lucasii* or *E.transcontinentalis.* The relatively open cover of tall shrubs is dominated by *Acacia acuminata* ssp. *burkittii, A. quadrimarginea* and *Eremophila oldfieldii* ssp. *angustifolia* with a moderately dense middle stratum dominated by various combinations of *Acacia erinacea, Dodonaea lobulata, Eremophila dempsteri, E.oldfieldii* ssp. *angustifolia* and *Senna artemisioides* ssp. *filifolia.* The relatively open low shrub stratum commonly contains *Hybanthus floribundus, Ptilotus obovatus* and *Westringia rigida.* At ground level there is typically an open cover of spinifex *Triodia longiceps* interspersed with a sparse to sometimes open cover of herbs. Soft grasses are generally sparse. The average species richness of sites within this association at the time of this survey was thirty-seven species ±1.8 (n = 10).

5 Open Eucalyptus griffithsii woodland over Allocasuarina grossa/Eremophila ?glutinosa shrubland: This association appeared to be restricted to a small area near the northern boundary of the Bulong Project Area on a sandy substrate. The open tree overstorey is dominated by *Eucalyptus griffithsii* with lesser amounts of *E.lesouefii.* The relatively dense tall shrub strata are dominated by *Allocasuarina grossa* and *Acacia acuminata* ssp. *burkittii,* and the relatively open lower shrub layer is dominated by *Eremophila ?glutinosa.* At ground level there is an open cover of *Triodia longiceps.* Interspersed with the spinifex hummocks are sparse soft grasses and herbs including *Aristida contorta* and *Cheilanthes austrotenuifolia.* A total of forty-five species were collected from the single site within this association during the survey.

6 Open Eucalyptus griffithsii over Dodonaea lobulata-dominated shrubland: A single rocky outcrop was observed near the central eastern boundary of the Bulong Project Area. This supports a sparse to open cover of trees of *Eucalyptus griffithsii* with lesser densities of *Acacia oswaldii* and *Casuarina obesa.* Tall shrubs of *Dodonaea lobulata* and *Eremophila oldfieldii* ssp. *angustifolia* provide an open cover, with *Acacia tetragonophylla, Alyxia buxifolia* and *Grevillea acuaria* occurring more sparsely. The moderately dense 0.5–1 m tall shrubs are dominated by *Dodonaea lobulata* with lesser amounts of *Atriplex vesicaria, Eremophila parvifolia, Grevillea acuaria, Scaevola spinescens* and *Senna artemisioides* ssp. *artemisioides.* The open low shrub layer is dominated by *Westringia rigida* which occurs with sparse *Enchylaena tomentosa, Ptilotus obovatus, Solanum lasiophyllum* and *S. nummularium.* At ground level there is a sparse cover of herbs and soft grasses including the ferns *Cheilanthes austrotenuifolia* and *C.lasiophyllum.* A total of forty-seven species was collected from the single site within this vegetation association.

7 Eucalyptus griffithsii woodland over mixed shrubland: This association occurs along the borefield alignment and is similar to the open woodlands over mixed shrublands which occur in the main project area. It consists of an open to moderately-dense tree overstorey of *Eucalyptus griffithsii* with other species such as *Casuarina paupera* and *Eucalyptus celastroides* occurring sparsely. The open to moderately-dense tall shrub layer is dominated by *Eremophila scoparia* or *Acacia acuminata* subsp. *burkittii* with lesser amounts of *Eremophila oldfieldii* subsp. *anguistifolia* and *Acacia tetragonophylla*. The moderately-dense to dense 0.5–1 m tall shrubland is dominated by *Dodonaea lobulata* and *Senna artemisioides* subsp. *filifolia* with species such as *Acacia hemiteles* and *Scaevola spinescens* occurring at lesser densities. The open cover of low shrubs is dominated by *Ptilotus obovatus*. At ground level there is a sparse to open cover of herbs including *Ptilotus exaltatus, Maireana georgei, Maireana integra, Sclerolaena diacantha, Sclerolaena fusiformis* and a variety of ephemeral Asteraceae. Soft grasses may be sparse to open and dominated by *Stipia nitida,* while some areas have a sparse to open cover of *Triodia longiceps*. Along the northern section of the pipeline access the vegetation gradually shifts and becomes a mix of the above species and those described in Association 2. As such the moderately-dense 0.5–1 m tall shrub layer features a large component of chenopod species, primarily *Atriplex* species, and also contains *Maireana sedifolia* and *Senna artemisiodes* subsp. filifolia at lesser densities.

8 Eucalyptus celastroides woodland over mixed shrubland: This association occurs along the borefield alignment and consists of a moderately-dense tree overstorey dominated by *Eucalyptus celastroides* with sparse *Eucalyptus griffithsii* and occasionally *Callitris glaucophylla*. The sparse to open cover of tall shrubs is dominated by *Acacia acuminata* subsp. *burkittii* with lesser amounts of *Eremophila oldfieldii* subsp. *angustifolia* and *Acacia tetragonophylla*. The open to moderately-dense 0.5–1 m tall shrub layer is dominated by *Eremophila scoparia* and *Senna artemisioides* subsp. *filifolia* with *Scaevola spinescens* also present. The open cover of lower shrubs is dominated by *Olearia muelleri* and *Cratystylis microphylla* with *Ptilotus obovatus* occurring at lesser densities. The Priority 4 species *Eremophila parvifolia* occurs sparsely but widely within this stratum. At ground level there is generally a sparse cover of soft grasses such as *Stipa nitida* and herbs including *Ptilotus polystachyus, Ptilotus exaltatus, Zygophyllum fruticulosum* and *Maireana* species. The cover of *Triodia longiceps* ranges from sparse to dense, with patches of spinifex more dense in the vicinity of Billabong Dam.

9 Eucalyptus celastroides woodland: This association is a variation of Association 13 occurring on small patches of heavier clay soil along the western borefield alignment. It has a moderately-dense tree cover of *Eucalyptus celastroides* however the shrub layers are sparse and tend to be dominated by *Acacia acuminata* subsp. *burkittii*. At ground level there is a sparse to open cover of herbs and a moderately-dense cover of soft grasses dominated by *Agrostis avenacea*.

10 Dense stand of juvenile Eucalyptus celastroides: This association occurs within a small ring-shaped soak area approximately 250 metres form the apparent alignment of the borefield route. It consists of a dense stand of slender saplings of *Eucalyptus celastroides* around 3–4 m tall, with occasional mature trees of this species and *Eucalyptus salubris*. Shrubs are very sparse and are generally species form the surrounding area as described in Association 13. At ground level there is a very dense

cover of *Isolepis* aff. *congrua* together with an open cover of *Marsilea drummondii* and ephemeral daisies such as *Schoenia cassiniana*. **Anagallis arvensis* and *Angianthus tomentosus* occur sparsely.

11 Dense Melaleuca sheathiana thickets: Dense thickets of low *Melaleuca sheathiana* trees occur close to Site 16 in Figure 4.2 near the north-western perimeter of the Bulong Project Area. These have a sparse shrub understorey primarily of *Maireana* species but also including *Scaevola spinescens*. At ground level there is a relatively open (10–20%) cover of herbs dominated by *Zygophyllum fruticulosum* and including *Eriochiton sclerolaenoides* and *Erodium cygnorum*.

12 Cleared land with herbs and grasses: Areas such as those surrounding Patch Dam have largely been cleared of the natural perennial vegetation. These areas now support sparse densities of the eucalyptus species found in the surrounding vegetation associations over a very dense (virtually continuous) ground cover of herbs dominated by various species including *Angianthus tomentosus*. Weed species form a conspicuous component of the herb strata with *Anagallis arvensis* occurring densely in the areas fringing the dam itself and *Salvia verbenaca* providing an open cover. Eight other introduced species, *Brassica tournefortii*, *Carrichtera annua*, *Hypochaeris glabra*, *Malva parviflora*, *Medicago* sp. 1, *Sisymbrium erysimoides*, *Solanum nigrum* and *Sonchus oleraceus* occur sparsely. An open cover of soft grasses contains a variety of species and at Patch Dam is dominated by *Hordeum leporinum*.

Two vegetation associations were identified in close proximity to the western edge of Lake Yindarlgooda:

C: Vegetation associated with salt lakes: The following associations occurred only within the area of the pipeline access and borefield alignment.

13 Claypans/samphire community: Claypans occur frequently along the borefield alignment as low lying areas of heavy clay soil. Small claypans and regularly inundated areas surrounding water may be virtually bare of vegetation. Larger areas of heavy clay are generally characterized by a moderately-dense cover of low halophytes dominated by *Halosarcia pergranulata* and *Frankenia* aff. *pauciflora*. Trees and tall shrubs are frequently absent however species such as *Melaleuca lateriflora* and *Muehlenbeckia cunninghamii* may occur as an open shrub overstorey and *Pittosporum phylliraeoides* is sometimes present as a low tree. Herbs and soft grasses are typically sparse to open and include species such as *Agrostis avenacea*.

14 Moderately-dense chenopod shrubland: This association occurs broadly in the eastern section of the borefield area. Scattered trees include species such as *Santalum acuminatum*, *Pittosporum phylliraeoides* and *Eucalyptus griffithsii*. An open cover of tall shrubs is dominated by *Acacia acuminata* subsp. *burkittii* and also includes sparse *Acacia tetragonophylla* and *Eremophila alternifolia*. The moderately-dense 0.5–1 m tall shrub layer is dominated by *Maireana sedifolia* with lesser amounts of *Lycium australe*. The moderately-dense lower shrub layer is dominated by *Halosarcia* aff. *pergranulata* with lesser amounts of *Atriplex nummularia* and *Atriplex vesicaria* and sparse in patches and includes *Goodenia pinnatifida*, various *Sclerolaena* species such as *Sclerolaena cuneata*

and a number of Asteraceae such as *Podolepis capillaris* and the weed **Sonchus oleraceus*. Open soft grasses are dominated by *Aristida contorta*.

15 Open Callitris glaucophylla woodland: Low sand dunes in the eastern borefield area are characterized by an open (2–5% cover) *Callitris glaucophylla* woodland over open tall shrubs dominated by *Grevillea pityophylla*. Other scattered tall shrubs include species such as *Lycium australe*. There is generally an open to scattered cover of low shrubs of *Halosarcia* aff. *pergranulata*. At ground level the herb cover ranges from sparse to moderately-dense in patches and is dominated by ephemeral Asteraceae with lesser amounts of species such as *Zygophyllum ovatum*. The open cover of soft grasses is dominated by *Stipa nitida*.

16 Breakaway zone with sparse E. griffithsii, Pittosporum phylliraeoides over scattered Eremophila oldfieldii subsp. angustifolia with dense Atriplex vesicaria and Halosarcia doleiformis understorey: This association occurs on the escarpment between the mid to upper slope eucalypt woodland communities and the saline floodplain of Lake Yindarlgooda. The area shows evidence of long-term erosion and includes areas of unvegetated red brown loam soils with the underlying white/yellow clay exposed. The tree stratum consists of a very sparsely distributed mix of *Eucalyptus griffithsii* and *Pittosporum. phylliraeoides* with an occasional *Casuarina obesa*. The open tall shrub stratum (> 2 m) is dominated by *Eremophila oldfieldii subsp. angustifolia, E. scoparia, E. oppositifolia* and *Dodonaea viscosa*, though this vegetation layer is also very open. Other species occurring in this stratum include *Exocarpos aphyllus* and *Acacia tetragonophylla*. The low shrub stratum (0.3–1 m) is moderately dense and the dominant species are *Atriplex vesicaria* and *Halosarcia doleiformis*. Other species occurring in this stratum included *Lycium australe, Atriplex bunburyana, A. codonocarpa, Swainsona canescens, Ptilotus obovatus, Disphyma crassifolium* subsp. *clarellatum* and *Maireana aff. tomentosa*. Various grass species were also present, the most abundant being *Aristida contorta, Stipa elegantissima* and *S. scabra*.

17 Samphire flats and associated dunes and hillocks: This association includes the floodplain-generated samphire communities and their associated sand/silt dunes, as well as the communities present on the clay and granite hillocks which border the Western edge of the salt lake basin. The samphire community established on the alluvial silts is characterized by low shrubland (0–50 cm) with the dominant species being *Halosarcia doleiformis* and *H. halocnemoides*. Other species occurring at lesser densities include *Atriplex vesicaria, A. codonocarpa, A. bunburyana, Disphyma crassifolium* subsp. *clavellatum* and various annuals and grasses. The low sand dunes which emerge from the flats have a similar understorey to the flats but are remarkable in that they harbour the 'kopi poverty bush', *Eremophila miniata*. The granite/clay hillocks bordering the salt pan have an open tall shrub stratum of *Acacia ramulosa* with some *A. nyssophylla* and *Eremophila oldfieldii subsp. angustifolia*. The low shrub layer is sparse with *Atriplex vesicaria, A. codonocarpos, Maireana sedifolia, Ptilotus obovatus, Solanum nyssophylla* and *D. crassifolium* subsp. *clavellatum* with *Aristida contorta* and various annuals forming a sparse covering on the ground. Some stunted specimens of *Eucalyptus griffithsii* and *Pittosporum phylliraeoides* were located in protected washes on the edge of the salt pan where silt deposits were relatively thick.

Appendix D3

BNLP AREA FLORA SPECIES LIST

Flora species recorded in the BNLP area by Ecologica (1995):

Nomenclature is according to R.J. Hnatiuk (1991) Census of Australian Vascular Plants

Note * = Introduced species.
† = Priority species.

Family	Species	Site	Vegetation association
ADIANTACEAE	*Cheilanthes austrotenuifolia*	5, 10	3, 5
	Cheilanthes lasiophylla	6	6
MARSILEACEAE	*Marsilea drummondii*	26	10
CUPRESSACEAE	*Callitris glaucophylla*		8, 15
POACEAE	**Hordeum leporinum*	26	
	**Trisetaria cristata*	2, 6, 11, 19, 21, 23	1,2,6
	Aristida contorta	2, 3, 7,8, 9, 10, 11, 12, 13, 14, 16, 17, 18, 19, 20, 21, 22, 23, 24	1, 2, 3 ,4, 5, 14
	Bromus arenarius	11	1
	Cynodon dactylon	26	12
	Enneapogon caerulescens	6, 11, 16	1, 4, 6
	Eragrostis dielsii	2, 3, 8, 9, 11, 12, 14, 15, 18, 19, 21, 23	1, 2, 3, 4
	Eriachne pulchella	23	1
	Paspalidium gracile	6, 19, 25	2, 4, 6
	Stipa elegantissima	1, 3, 4, 5, 8, 9, 12, 13, 15, 17, 18, 19, 20, 22, 24, 25	2, 3, 4
	Stipa nitida	19	2, 7, 8, 15
	Stipa sp. 1	4, 5, 12, 15, 17, 18	3, 4

Family	Species	Site	Vegetation association
POACEAE (Continued)	*Stipa* sp. 2	2	2
	Triodia basedowii	10	5
	Triodia longiceps	3, 4, 7, 10, 13, 16, 17, 18, 22	3, 4, 5, 7, 8
	Agrostis avenacea		9, 13
	Danthonia caespitosa		
	Isolepis aff. *congrua*		10
CYPERACEAE	*Lepidosperma* aff. *effusum*	4, 26	4, 8
ANTHERICACEAE	*Thysanotus manglesianus*	5, 13, 17	3, 4
AGAVACEAE	*Agave americanan*		
CASUARINACEAE	*Allocasuarina grossa*	10	5
	Allocasuarina helmsii	13	4
	Casuarina obesa	3, 5, 6, 8, 12, 14, 16, 17, 18, 20, 24, 25	1,2,3,4,6
	Casuarina paupera	1, 7, 22	3, 4, 7
PROTEACEAE	*Grevillea ?petrophiloides*	4, 10	4, 5
	Grevillea acuaria	3, 5, 6, 7, 20, 22, 25	4, 3, 6
	Grevillea pityophylla		15
	Grevillea sp. 1	24	4
SANTALACEAE	*Exocarpos aphyllus*	1, 3, 5, 8, 9, 13, 14, 16, 19, 20, 25	3, 4, 2, 1
	Santalum acuminatum	8, 9, 16	2, 4, 14
	Santalum spicatum	1, 3, 4, 5, 7, 9, 12, 13, 17, 18, 20, 22, 22, 24, 25	4, 3, 2
LORANTHACEAE	*Amyema miquelii*	9, 15, 25	2, 3, 4
	Muchlenbeckia cunninghammii		13
POLYGONACEAE	**Rumex vesicarius*	6	6
	Rumex sp. 1	26	
	Persicaria prostata	26	

Family	Species	Site	Vegetation association
CHENOPODIACEAE	*Atriplex bunburyana*	–	3
	Atriplex codonocarpa	–	2, 3, 16, 17
	Atriplex nummularia	5, 8, 9, 11, 12, 19, 20, 21, 23, 26	2, 3, 1, 12, 14
	Atriplex quadrivalvata	26	12
	Atriplex vesicaria	5, 6, 11, 19, 21, 23	3, 6, 1, 2, 14
	Atriplex sp. 1		
	Atriplex sp. 2	2	2
	Chenopodium cristatum	6, 14, 19	6, 1, 2
	Chenopodium curvispicatum	7, 9, 14, 23	3, 2, 1
	Chenopodium pumilio	3	4
	Chenopodium sp. 1	9	2
	Dissocarpus paradoxus	8	2
	Dysphania glandulosa	10	5
	Enchylaena tomentosa	5, 6, 7, 8, 9, 11, 14, 19, 23, 25	3, 6, 2, 4, 1
	Eriochiton sclerolaenoides	2, 5, 6, 7, 8, 9, 16, 19, 20, 21, 24, 25, 26	2, 3, 6, 4, 1, 8, 12
	Halosarcia doleiformis	–	16, 17
	Halosarcia halocnemoides	–	17
	Halosarcia aff. *pergranulata* subsp. *pergranulata*	5	3, 13, 14, 15
	Halosarcia sp.	–	17
	Maireana erioclada	2, 7, 8, 15, 16, 26	2, 3, 4
	Maireana georgei	1, 2, 3, 7, 9, 10, 11, 12, 15, 16, 17, 18, 22, 24	2, 4, 3, 5, 1, 7, 6
	Maireana integra	1, 3, 5, 6, 7, 8, 9, 11, 12, 13, 14, 15, 17, 18, 19, 20, 21, 12, 23	4, 3, 6, 2, 1, 7
	Maireana pyramidata	23	1
	Maireana sedifolia	2, 8, 12, 19, 21	2, 3, 1, 7, 14
	Maireana aff. *suaedifolia*	26	12
	Maireana triptera	1, 4, 5, 6, 8, 12, 14, 15, 20, 21	4, 3, 6, 2, 1
	Maireana villosa	11, 23	1
	Maireana sp. 1	8, 19, 21	2, 1
	Maireana sp. 2	11	1
	Maireana sp. 3	8, 2, 3	2, 1
	Sclerolavea cuneata		14
	Maireana sp. 4	23	1
	Rhagodia eremaea	5, 8	3, 2

Family	Species	Site	Vegetation association
CHENOPODIACEAE (continued)	*Salsola kali*	23, 26	1, 12
	Sclerolaena articulata	8, 11, 14, 21, 23	2, 1
	Sclerolaena diacantha	1, 2, 5, 6, 7, 8, 9, 11, 14, 15, 16, 19, 20 21, 23, 24, 25, 26	2, 4, 3, 6, 1, 12, 7
	Sclerolaena fusiformis	3, 5, 9, 12, 15, 17, 18, 22	4, 2, 3, 7
	Sclerolaena patenticuspis	1, 8, 11, 14, 19, 26	4, 2, 1, 8, 12
AMARANTHACEAE	*Alternanthera nodiflora*	26	12
	Hemichroa diandra	–	16
	Ptilotus aervoides	1, 2, 8, 9, 10, 11, 14, 16, 17, 18, 19, 20, 24	4, 2, 5, 1, 3
	Ptilotus exaltatus	1, 2, 3, 5, 8, 9, 11, 12, 14, 15, 16, 18, 19, 20, 21, 22, 23, 24, 26	4, 2, 3, 1, 12, 7, 8
	Ptilotus helipteroides	10, 20	5, 3
	Ptilotus holosericeus	3	4
	Ptilotus obovatus	1, 3, 5, 6, 7, 8, 9, 10, 11, 12, 14, 15, 16, 19, 20, 24, 25, 26	4, 6, 3, 2, 5, 1, 7, 12, 148
	Ptilotus polystadnyus		8
	Ptilotus sp. 1	3	4
AIZOACEAE	*Tetragonia cristata*	14, 21	1
	Tetragonia eremaea	19, 23, 26	2, 1
	Tetragonia eripata	5	3
PORTULACACEAE	*Calandrinia polyandra*	10	5
BRASSICACEAE	**Brassica tournefortii*	26	12
	**Carrichtera annua*	2, 5, 15, 21, 24, 26	2, 3, 1, 4, 12
	Lepidium oxytrichum	12, 2	3, 1
	Lepidium rotundum	6, 23	6, 1
	Lepidium sp. 1	2	2
	Menkea ?australis	8, 9	2
	**Sisymbrium erysimoides*	26	12
	**Sisymbrium irio*	6	6
	Stenopetalum anatmota	1	4
	Stenopetalum anfractum	8, 11, 22	1, 2, 4
	Stenopetalum lineare	6, 14, 21, 24	6, 1, 4
	Stenopetalum sp. 1	3	4

Family	Species	Site	Vegetation association
BRASSICACEAE (Continued)	*Stenopetalum* sp. 2	23	1
	Stenopetalum sp. 3	7	3
PITTOSPORACEAE	*Pittosporum phylliraeoides*	14, 16	1, 4, 13, 14
MIMOSACEAE	*Acacia acuminata*	7, 13	3, 4
	Acacia acuminata subsp. *burkittii*	3, 10, 17, 18, 20, 22, 24, 25	4, 5, 3, 7, 8, 9, 14
	Acacia aneura	–	3, 16
	Acacia erinacea	1, 3, 4, 5, 7, 10, 12, 13, 14, 16, 17, 18, 20, 22, 24	4, 3, 5, 1
	Acacia hemiteles	3, 4, 7, 8, 9, 12, 13, 15, 18, 19, 22, 25	4, 3, 2, 7
	Acacia microcalyx	14	1
	Acacia murrayana	23	1
	Acacia nyssophylla	2, 8, 14, 17	2, 1, 4
	Acacia oswaldii	5, 6, 7, 10, 14, 15, 17, 18	3, 6, 5, 1, 4
	Acacia quadrimarginea	1, 4, 5, 6, 17, 23, 24	4, 3, 6, 1
	Acacia ramulosa	–	16, 17
	Acacia tetragonophylla	1, 3, 4, 5, 6, 7, 10, 12, 13, 16, 17, 18, 20, 22, 23, 24, 25	4, 3, 6, 5, 1, 7, 8, 14
	Acacia sp. 1	1, 5, 17, 21, 24	4, 3, 1
CAESALPINIACEAE	*Senna artemisioides* subsp. *artemisioides*	4, 6	4, 6
	Senna artemisioides subsp. *filifolia*	1, 2, 3, 4, 5, 7, 8, 9, 10, 12, 13, 14, 15, 16, 17, 18, 20, 21,	4, 3, 2, 5, 1, 7, 8
	Senna pleurocarpa	23, 24, 25	
PAPILIONACEAE	*Eutaxia neurocalyx*		
	Indigofera australis	26	12
	**Medicago polymorpha*	14, 15	1, 3
	**Medicago* sp. 1	2, 11, 26	2, 1
	Swainsona canescens	26	12
	Swainsona microphylla	2, 11, 19	2, 1
	Swainsona sp. 1	–	16
	Swainsona sp. 2	23	1

Family	Species	Site	Vegetation association
GERANIACEAE	**Erodium cicutarium*	2, 7, 11, 12, 25	2, 3, 1, 4
	Erodium cygnorum	2, 3, 5, 6, 7, 8, 11, 12, 13, 14, 15, 19, 21, 23, 25, 26	2, 4, 6, 3, 1, 12
ZYGOPHYLLACEAE	*Zygophyllum billardierei*	19	2
	Zygophyllum fruticulosum	1, 2, 3, 4, 5, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19 20, 21, 22, 23, 24, 26	1, 2, 3, 4, 5, 12, 8
	Zygophyllum glaucum	18, 23	1, 4
	Zygophyllum iodocarpum	6, 18, 23	6, 4, 1
	Zygophyllum ovatum	21	1, 15
RUTACEAE	*Eriostemon brucei*	10, 17	5, 4
EUPHORBIACEAE	*Euphorbia drummondii*	2, 3, 6, 9, 11, 19	2, 4, 6, 1
	Euphorbia sp. 1	23	1
STACKHOUSIACEAE	*Stackhousia viminea*	4	4
SAPINDACEAE	*?Diplopeltis* sp. 1	19	2
	Dodonaea lobulata	1, 4, 5, 6, 7, 10, 11, 12, 13, 15, 16, 17, 18, 20, 22, 24	1, 4, 3, 6, 5, 7
	Dodonaea microzyga	20	3
RHAMNACEAE	*Cryptandra aridicola*	10	5
	Cryptandra parvifolia	4, 13, 16, 18, 22, 24	4
	Spyridium ledifolium	7	3
	Spyridium sp. 1	24	4
	Trymalium ledifolium	17	4
	Trymalium sp. 1	13	4
MALVACEAE	*Abutilon otocarpum*	6	6
	Lavatera plebeia	26	12
	Lawrencia ?squamata	11	1
	Lawrencia sp. 1	8, 19, 26	2
	**Malva parviflora*	26	12
	Radyera farragei	26	12
	Sida ?calyxhymenia	6	6
	Sida sp.	–	3

Family	Species	Site	Vegetation association
DILLENIACEAE	*Hibbertia exasperata*	4, 7, 10, 13, 17, 18, 22, 24	4, 3, 5
FRANKENIACEAE	*Frankenia* aff. *pauciflora*	11	1, 13
VIOLACEAE	*Hybanthus floribundus*	2, 3, 4, 14, 17, 18, 22, 24, 25, 26	2, 4, 1, 12
THYMELAEACEAE	*Pimelea microcephala*	26	8
MYRTACEAE	*Eucalyptus ?optima*	3	4
	Eucalyptus celastroides	2, 12, 17, 20, 22	2, 3, 4, 7, 8, 9, 10
	Eucalyptus celastroides subsp. *celastroides*	1,8	4, 2
	Eucalyptus celastroides variant	16	4
	Eucalyptus effusa	11	1
	Eucalyptus gracilis		
	Eucalyptus griffithsi	26	12, 7, 8, 14
	Eucalyptus kochii	3, 7, 25	4, 3
	Eucalyptus lesouefii	2, 6, 9, 10, 12, 13, 16, 26	2, 6, 5, 3, 4, 12
	Eucalyptus lucasii	3, 5	3, 4
	Eucalyptus salmonophloia	1, 2, 6, 8, 9, 11, 12, 15, 16, 19, 21, 23	2, 4, 6, 1, 3
	Eucalyptus salubris	12, 19, 20, 21	3, 2, 1, 10
	Eucalyptus stricklandii	4, 14, 15, 17, 22	4, 1, 3
	Eucalyptus sp. 1	21	1
	Eucalyptus transcontinentalis	9, 13, 18, 22	2, 4
	Melaleuca lateriflora		13
	Melaleuca sheathiana	–	7
	Melaleuca uncinata	4, 10	4, 5
	Melaleuca sp. 1	10	5
HALORAGACEAE	*Haloragis gossei*	1, 3, 4, 5, 6, 7, 9, 10, 11, 12, 13, 17, 18, 20, 22, 24, 25	4, 3, 6, 2, 5, 1
APIACEAE	*Daucus glochidiatus*	5, 6, 10, 19	3, 6, 5, 2
	Trachymene ornata	11	1
PRIMULACEAE	**Anagallis arvensis*	13, 25, 26	4, 12, 10

Family	Species	Site	Vegetation association
APOCYNACEAE	*Alyxia buxifolia*	3, 4, 6, 7, 9, 13, 17, 18, 20, 22, 25	4, 6, 3, 2
ASCLEPIADACEAE	*Leichardtia australis*	6, 7, 8, 20	6, 3, 2
	Marsdenia australis	6, 7, 8, 20	
	Marsdenia sp. 1	5, 9, 20	3, 2
CONVOLVULACEAE	*Convolvulus erubescens*	11	1
BORAGINACEAE	*Omphalolappula concava*	26	8
VERBENACEAE	*Pityrodia* sp. 1	10	5
LAMIACEAE	*Prostanthera althoferi*	10	5
	Prostanthera aspalathoides	4, 7,10, 17, 24	4, 3, 5
	Prostanthera sp.	–	3
	**Salvia verbenaca*	2, 3, 25, 26	2, 4, 12
	Westringia dampieri	3, 4, 6, 7, 10, 12, 13, 16, 17, 18, 22, 24	4, 6, 3, 5
SOLANACEAE	*Lycium australe*	2, 21	2, 1, 14, 15
	Nicotiana rosulata	10	5
	Solanum lasiophyllum	5, 6, 7, 9, 10, 11, 12, 13, 15, 20, 24, 26	3, 6, 5, 1, 4, 2, 12, 14
	Solanum nummularium	2, 6, 8, 9, 11, 12, 13, 15, 16, 23, 26	2, 6, 1, 3, 4, 12
	Solanum orbiculatum	3	4
	Solanum plicatile	2	2
	Solanum nigrum	26	
MYOPORACEAE	*Eremophila alternifolia*	3	4, 14
	Eremophila decipiens	8, 24	2, 4
	Eremophila dempsteri	1, 2, 4, 8, 9, 11, 12, 14, 17, 19, 21, 22, 23	2, 4
	Eremophila aff. *gilesii*	4, 10, 14, 17, 18	4, 5, 1
	Eremophila glabra	5, 6, 10, 12, 15, 16	3,6, 5, 4
	Eremophila ?glutinosa	10	5
	Eremophila granitica	3, 13, 24	4
	Eremophila longifolia	19	2
	Eremophila miniata	–	17
	Eremophila oldfieldii	5, 6	3, 6

Family	Species	Site	Vegetation association
MYOPORACEAE (Continued)	*Eremophila oldfieldii* subsp. *augustifolia*	1, 4, 7, 9,10, 11, 12, 14, 15, 17, 18, 20, 23, 24	4, 3, 2, 5, 1, 7
	Eremophila oppositifolia	3, 4, 7, 9, 10, 12, 16, 17, 18	4, 3, 2, 5
	†*Eremophila parvifolia*	1, 2, 3, 4, 5, 6, 9, 13, 16, 17, 18, 20, 22	2, 4, 3, 6, 8
	†*Eremophila pustulata*	4, 5, 12, 13, 18, 20	3, 4
	Eremophila scoparia	2, 8, 9, 19	2, 7, 8
	Eremophila serrulata	10	5
	Eremophila weldii	12	3
	Eremophila sp. 1	22	4
	Eremophila sp. 2	22	4
	Eremophila sp. 3	24	3
PLANTAGINACEAE	*Plantago debilis*	11, 19, 23	1, 2
CAMPANULACEAE	*Wahlenbergia gracilenta*	10	5
GOODENIACEAE	*Brunonia australis*	10	5
	Goodenia occidentalis	4, 10, 11, 13, 16, 22	5, 1, 4
	Goodenia innatifidaia	1, 3, 9, 10, 11, 13, 17, 20, 26	4, 2, 5, 1, 3, 8, 12, 14
	Goodenia sp. 1	24	4
	Goodenia sp. 2	6	6
	Scaevola spinescens	1, 3, 4, 5, 6, 7, 9, 10, 12, 13, 15, 16, 17, 18, 20, 22, 24	4, 3, 6, 2, 5, 7, 8
	Velleia rosea	3, 5, 14, 17, 18, 24, 25	4, 3, 1
ASTERACEAE	*Angianthus tomentosus*	26	10
	Angianthus sp. 1	2, 19	2
	Asteridea sp. 1	17	4
	Brachycome ciliaris	23	1
	Brachycome iberidifolia	2, 23	2, 1
	Brachycome sp. 1	11	1
	Calotis erinacea		
	Calotis hispidula	2, 11	1, 2
	Calotis multicaulis	11, 19, 23, 26	1, 2, 8, 12
	Calotis sp. 1	2, 3	2, 4
	Centipeda cunninghamii	26	8
	Cephalipterum drummondii	2, 3, 12	2, 4, 3
	Cotula australis	8	2
	Cratystylis microphylla	–	3, 8

Family	Species	Site	Vegetation association
ASTERACEAE (continued)	*Erymophyllum* sp. 1	11	1
	Erymophyllum tenellum	11	1
	Gnaphalium alginosum	10	5
	†*Gnephosis intonsa*	Pinta Pit	3
	Hyalosperma gacchaucus	–	3
	**Hypochaeris glabra*	3, 5, 14, 17, 18, 24, 25	4, 3, 1
	Hyalosperma aff. *glutinosum*	6	6
	Hyalosperma pymacea	23	1
	Hyalosperma zaccharens	3, 5, 11, 12, 19, 20, 21	3, 4, 1, 2
	Hyalosperma sp. 1	8, 9	2
	Hyalosperma sp. 2	14	1
	Hyalosperma sp. 3	10	5
	Isoetopsis graminifolia	8	2
	Lawrencella sp. 1	12, 15, 16	3, 4
	Leucochrysum fitzgibbonii	5, 6, 17	3, 6, 4
	Olearia muelleri	1, 2, 3, 4, 5, 7, 8, 9, 13, 14, 16, 17, 18, 19, 20, 22, 24, 25	2, 4, 3, 1, 8
	**Osteospermum calendulaceum*	19	2
	Podolepis capillaris	5, 6, 7, 11, 12, 15, 16, 18, 25	6, 3, 1, 4, 14
	Podotheca sp. 1	13	4
	Rhodanthe charsleyae	7, 20	3
	Rhodanthe chlorocephala	19	2
	Rhodanthe fitzgibbonii	–	3
	Rhodanthe floribunda	2, 19	2
	Rhodanthe maryonii	7, 10, 26	3, 5
	Rhodanthe pygmaea	5	3
	Rhodanthe sterilescens	26	12
	Rhodanthe sp. 1	2, 19, 25	2, 4
	Rhodanthe sp. 2	11, 4	1, 4
	Rhodanthe sp. 3	7, 20,	3
	Schoenia cassiniana	14	1, 10
	Senecio glossanthus	21, 23	1
	**Sonchus oleraceus*	6, 11, 19, 21, 23, 26	6, 1, 2, 8, 12, 14
	**Sonchus tenerrimus*	2	2
	Vittadinia eremaea	2	2
	Vittadinia sp. 1	3, 9, 19	4, 2
	Waitzia acuminata	10, 20	3, 5

Family	Species	Site	Vegetation association
ASTERACEAE (continued)	*Waitzia suaveolens*	8, 9, 11	1, 2
STERCULIACEAE	*Rulingia kempeana*	–	3

Appendix D4

BNLP AREA PRIORITY FLORA SPECIES

The following priority flora species were recorded in the BNLP area (Ecologia 1995):

Priority 1—Gnephonsis intonsa

Gnephosis intonsa is a small herb up to 5 cm tall with woolly leaves and globular flower heads. The flowering period is listed as September. *Gnephosis intonsa* has been collected from Gibraltar, Boorabbin and Dundas in the Goldfields and South Coast Regions. The species is thus distributed in a relatively long band from near Norseman to north of Kalgoorlie. Within the Bulong Project Area *Gnephosis intonsa* was collected on the rehabilitated waste dump at the Pinta test pit, where it occurred sparsely. As this species was not included in the rehabilitation seed mix, the seed was either present in the topsoil respread on the dump or was blown in from surrounding populations. *Gnephosi intonsa* could also be a disturbance opportunistic organism that is present as seed in the soil of the area.

Priority 3—Eremophila pustulata

Eremophila pustulata is a glabrous, much branched shrub up to 1 m tall which has leathery to fleshy leaves with conspicuous glandular-warts on the lower surfaces. The blue/purple flowers have a tubular corolla which is two-lipped and the flowering period is recorded as occurring during September. *Eremophila pustulata* has been collected from Coolgardie to Menzies. This species was recorded at sparse to open densities from six sites broadly distributed within the Bulong survey area. Its occurrence is correlated to the distribution of *Eucalyptus griffithsii* over mixed shrubland.

Priority 4—Eremophila parvifolia

Eremophila parvifolia is a low (i.e. less than 0.5 m) slender or rounded shrub with semi-orbicular leaves 1-2 mm long and a small purple- to lilac-coloured flower. It appears palatable to stock and many specimens showed evidence of previous grazing. It is widely distributed, with previous collections from Kalgoorlie to South Australia. Within the survey area this shrub is this shrub is relatively common, occurring sparsely at thirteen of the twenty-five detailed flora site sites in a variety of vegetation associations. It was notably associated with the *Eucalyptus griffithsii* woodlands over *Acacia/Eremophila* shrublands over open spinifex (sub-type 4).

Appendix E

REGIONAL AND BNLP AREA FAUNA

Appendix E1

REGIONAL FAUNA DESCRIPTION

A description of the vertebrate fauna recorded in the Kalgoorlie–Kurnalpi Study Area is provided below (WAM 1992).

Mammals

Twenty species of native mammals were recorded from the Study Area, including three kangaroo, three dasyurid, one pygmy possum, three rodent, one echidna, eight insectivorous bat and one dingo species. Seven species of introduced mammals were also recorded. Records held by the Western Australian Museum from previous surveys identify forty-six indigenous and four introduced mammal species from the Study Area. Those which were not recorded during the 1980–83 survey include *Macrotis lagotis*, *Myrmecobius fasciatus*, *Camelis dromedarius* and *Felis catus*. Although not recorded in the Study Area itself, *Antechinomys laniger*, *Sminthopsis hirtipes* and *Nyctophilus major* would most likely be present as they have previously been recorded in the surrounding areas in habitats which are widespread in the Study Area.

Amphibians and reptiles

The survey also identified three frog and forty-five reptile species, which included eleven gecko, three legless lizard, eight dragon, sixteen skink, two goanna and five elapid snake species. At least another twenty-two species may occur on the basis of their known distributions or previous identification in the period of European settlement, during which a minimum of sixty-six species were extant in the Study Area.

Birds

The bird fauna of the Kalgoorlie area is rich, containing some south-western species but mostly species typical of the arid zone. Patchy seasonal abundance of birds is a feature of the Eyrean sub-region. Depending on conditions, the number of nomads, migrants and dispersive species using the area could, on occasion, be high. Ninety-seven species of passerines and non-passerines were recorded in the Kalgoorlie–Kurnalpi Study Area during the above survey. Although both Bassian and Eyrean components of avian fauna were present, the Eyrean component is richer in species because of the geographical location of the Study Area and its variety of distinctly Eremean vegetations.

Appendix E2

LIST OF VERTEBRATES RECORDED OR EXPECTED TO OCCUR WITHIN THE HABITATS PRESENT IN THE BNLP AREA

A list of the vertebrates recorded or expected to occur within the habitats present in the BNLP area is provided below in three tables (Table E1–3) (Ecologia 1995). The three tables consist of species lists for mammals, birds and herpetofauna.

Table E1 **Mammals recorded or expected to occur within the habitats present in the BNLP area**

		Fauna habitats				
		CW	SS	RS	RH	DM
TACHYGLOSSIDAE						
Tachyglossus aculeatus	Echidna	+	+	S	+	+
DASYURIDAE						
Sminthopsis murina	Common dunnart	+	+	+	+	
Sminthopsis crassicaudata	Fat-tailed dunnart	+				
Sminthopsis dolichura	Little long-tailed dunnart		+	+	+	
Sminthopsis hirtipes	Hairy-footed dunnart		+	+	+	
Ningaui yvonneae	Southern ningaui		X	X		
BURRAMYIDAE						
Cercartetus concinnus	Western pygmy-possum		+	+		
MACROPODIDAE						
Macropus fuliginosus	Western grey kangaroo	+	+	X	+	
Macropus robustus	Euro			X	X	
Macropus rufus	Red kangaroo	+			X	X
MOLOSSIDAE						
Nyctinomus australis	White-striped mastiff bat*	+	+	+	+	+
Mormopterus planiceps	Little mastiff-bat*	+	+	+	+	+
VESPERTILIONIDAE						
Chalinolobus gouldii	Gould's wattled bat*	+	+	+	+	+
Chalinolobus morio	Chocolate wattled bat*	+	+	+	+	+
Eptesicus baverstocki	Inland eptesicus*	+	+	+	+	+
Eptesicus regulus	King river eptesicus*	+	+	+	+	+
Nyctophilus geoffroyi	Lesser long-eared bat*	+	+	+	+	+
Scotorepens balstoni	Inland broad-nosed bat*	+	+	+	+	+

Table E1 **Mammals recorded or expected to occur within the habitats present in the BNLP area (Continued)**

		Fauna habitats				
		CW	SS	RS	RH	DM
MURIDAE						
Pseudomys hermannsburgensis	Sandy inland mouse		+	+		
Pseudomys bolami			X	+		
CANIDAE						
Canis familiaris dingo	Dingo	+	+	S	+	+
Expected number of species		14	18	19	16	11
INTRODUCED MAMMALS						
Capra hircus	Goat	+	X	X	X	+
Felis catus	Feral cat	S	S	+	S	+
Mus musculus	House mouse	+	X	X	X	+
Oryctolagus cuniculus	European rabbit	X	X	S	+	S
Vulpes vulpes	Fox	X	X	+	S	+
Ovis aries	Sheep	X	X	X	X	X
Expected number of species		6	6	6	6	6

KEY TO ABBREVIATIONS

CW *chenopod woodland*
SS *spinifex shrubland*
RS *rocky shrublands*
RH *rocky hill*
DM *Patch Dam*

X *species recorded during field survey*
S *signs of presence recorded: nests, scats, diggings and tracks*
\+ *species expected to occur*
* *predominantly aerial species*

Table E2 **Birds recorded or expected to occur within the habitats present in the BNLP area**

		Fauna habitats					
		CW	SS	RS	RH	DM	OPP
CASUARIDAE							
Dromaius novaehollandiae	Emu	S	S	X	S	S	
PODICIPEDIDAE							
Poliocephalus poliocephalus	Hoary-headed grebe					+	
ARDEIDAE							
Ardea pacifica	Pacific heron					+	
Egretta novaehollandiae	White-faced heron					+	
THRESKIORNITHIDAE							
Threskiornis spinicollis	Straw-necked ibis					+	
Platalea flavipes	Yellow-billed spoonbill					+	
ANATIDAE							
Tadorna tadornoides	Australian shelducks					X	
Anas superciliosa	Pacific black duck					+	
Anas gracilis	Grey teal					X	
Malacorhynchus membranaceus	Pink-eared duck					+	
Aythya australis	Hardhead					+	
Chenonetta jubata	Maned duck					X	
Biziura lobata	Musk duck					+	
ACCIPITRIDAE							
Elanus axillaris	Black-shouldered kite*	+	+	+	+	+	
Milvus migrans	Black kite*	+	+	+	+		
Lophoictinia isura	Square-tailed kite*	+	+	+	+		
Hamirostra melanosternon	Black breasted buzzard*	+	+	+	+		
Haliastur sphenurus	Whistling kite*	+	+	+	+	+	
Accipiter fasciatus	Brown goshawk*	+	+	+	+		
Accipiter cirrhocephalus	Collared sparrowhawk*	+	+	X	+		
Aquila audax	Wedge-tailed eagle*	+	+	+	+		
Hiraaetus morphnoides	Little eagle*	+	+	+	+		
Circus assimilis	Spotted harrier*	+				+	
FALCONIDAE							
Falco subniger	Black falcon*	+				+	
Falco peregrinus	Peregrine falcon*	+	+	+	+	+	
Falco longipennis	Australian hobby*	+	+	+	+	+	
Falco hypoleucos	Grey falcon*	+					
Falco berigora	Brown falcon*	+	+	X	+		
Falco cenchroides	Australian kestrel*	+	X	+	+		
MEGAPODIIDAE							
Leipoa ocellata	Mallee fowl	+	+				

Table E2 **Birds recorded or expected, to occur within the habitats present in the BNLP area (Continued)**

		Fauna habitats					
		CW	SS	RS	RH	DM	OPP
PHASIANIDAE							
Coturnix pectoralis	Stubble quail	+	+	+	X		
TURNICIDAE							
Turnix velox	Little button-quail	+	+	+	+		
OTIDIDAE							
Ardeotis australis	Australian bustard	+	+				
CHARADRIIDAE							
Elseyornis melanops	Black-fronted plover					X	
COLUMBIDAE							
Phaps chalcoptera	Common bronzewing	+	X	+	X	X	
Ocyphaps lophotes	Crested pigeon	X	+	+	+		
CACATUIDAE							
Cacatua roseicapilla	Galah	X	X	+	+	+	
Nymphicus hollandicus	Cockatiel	+	+	+	+		
PSITTACIDAE							
Glossopsitta porphyrocephala	Purple-crowned lorikeet	+	+				
Polytelis anthopeplus	Regent parrot	+	+	+	+		
Melopsittacus undulatus	Budgerigar	+	+	+	+	+	
Barnardius zonarius	Port Lincoln ringneck	X	X	X	X		
Psephotus varius	Mulga parrot	+	X	+	X		
CUCULIDAE							
Cuculus pallidus	Pallid cuckoo	X	X	X	X		
Cacomantis flabelliformis	Fan-tailed cuckoo	+	X	X	X		
Chrysococcyx osculans	Black-eared cuckoo	+	+	+	X		
Chrysococcyx basalis	Horsefield's bronze cuckoo	X	X	X	X		
STRIGIDAE							
Ninox novaeseelandiae	Southern boobook	+	+	+	+		
TYTONIDAE							
Tyto alba	Barn owl	+	+	+	+		
Tyto novaehollandiae	Masked owl	+					
PODARGIDAE							
Podargus strigoides	Tawny frogmouth	+	+	+	+		
AEGOTHELIDAE							
Aegotheles cristatus	Owlet-nightjar	+	+	+	+		
CAPRIMULGIDAE							
Eurostopodus argus	Spotted nightjar	+	+	+	+		
APODIDAE							
Apus pacificus	Fork-tailed swift*	+	+	+	+	+	
ALCEDINIDAE							
Todiramphus pyrrhopygia	Red-backed kingfisher	+	+	+	+		

Table E2 **Birds recorded or expected to occur within the habitats present in the BNLP area (Continued)**

		Fauna habitats					
		CW	SS	RS	RH	DM	OPP
MEROPIDAE							
Merops ornatus	Rainbow bee-eater*	+					
HIRUNDINIDAE							
Cheramoeca leucosternum	White-backed swallow*	+	+	+	+	+	
Hirundo neoxena	Welcome swallow*	+	+	+	+	X	
Hirundo nigricans	Tree martin*	+	+	+	+	X	
Hirundo ariel	Fairy martin*	+	+	+	+	+	
MOTACILLIDAE							
Anthus novaeseelandiae	Richard's pipit	+				+	X
CAMPEPHAGIDAE							
Coracina novaehollandiae	Black-faced cuckoo-shrike	X	X	X	X		
Coracina maxima	Ground cuckoo-shrike	+					X
Lalage sueurii	White-winged triller	+	+	+	+		
PETROICIDAE							
Drymodes brunneopygia	Southern scrub-robin		+				
Petroica goodenovii	Red capped robin	+	X	X	+		
Melanodryas cucullata	Hooded robin	+	+	+	+		
Microeca fascinans	Jacky winter	X					
PACHYCEPHALIDAE							
Pachycephala inornata	Gilbert's whistler	+	+	+	+		
Pachycephala pectoralis	Golden whistler	+	+	X	X		
Pachycephalus rufiventris	Rufous whistler	+	X	X	+		
Colluricincla harmonica	Grey shrike-thrush	X	X	X	X		
Oreocica gutturalis	Crested bellbird	X	X	X	X		
DICRURIDAE							
Rhipidura fuliginosa	Grey fantail	+					
Rhipidura leucophrys	Willie wagtail	+	X				
Grallina cycanoleuca	Australian magpie-lark	X	+	X	X	X	
CINCLOSOMATIDAE							
Cinclosoma castanotum	Chestnut quail-thrush		+	X			
POMATOSTOMIDAE							
Pomatostomus superciliosus	White-browed babbler		X	+	X		
SYLVIIDAE							
Cinclorhamphus mathewsi	Rufous songlark		+	+			
Cinclorhamphus cruralis	Brown songlark		+	+			
MALURIDAE							
Malurus splendens	Splendid fairy-wren	+	+	+	+		X
Malurus lamberti	Variegated fairy-wren	+	+	+	+		
Malurus leucopterus	White-winged fairy-wren	X	+	+	+	X	

Table E2 **Birds recorded or expected to occur within the habitats present in the BNLP area (Continued)**

		Fauna habitats					
		CW	SS	RS	RH	DM	OPP
PARDALOTIDAE							
Pyrrholaemus brunneus	Redthroat	+	X	X	X		
Calamanthus fuliginosus	Striated calamanthus	+	+	+	+		
Sericornis brevirostris	Weebill	X	X	X	X		
Gerygone fusca	Western gerygone	+	+	+	+		
Acanthiza apicalis	Inland thornbill	+	X	X	X		
Acanthiza ropygialis	Chestnut-rumped thornbill	X	X	X	X		
Acanthiza chrysorrhoa	Yellow-rumped thornbill	X	X	X	X		
Aphelocephala leucopsis	Southern white-face		+	+	+		
Pardalotus striatus	Striated pardalote	X	X	X	X		
NEOSITTIDAE							
Daphoenositta chrysoptera	Varied sittella	+	+	+	+		X
CLIMACTERIDAE							
Climacteris affinis	White-browed treecreeper	+	+	+	+		
Climacteris rufa	Rufous treecreeper	X	X	+	+		
MELIPHAGIDAE							
Anthochaera carunculata	Red wattlebird	X	X	X	X		
Acanthagenys rufogularis	Spiny-cheeked honeyeater	+	X	X	X		
Manorina flavigula	Yellow-throated miner	X	X	X	X		
Lichenostomus virescens	Singing honeyeater	+	+	+	+		
Lichenostomus leucotis	White-eared honeyeater	+	X	X	X		
Lichenostomus ornatus	Yellow-plumed honeyeater	X	X	+	+		
Lichenostomus plumulus	Grey-fronted honeyeater	+	+	+	+		
Melithreptus brevirostris	Brown-headed honeyeater	+	X	+	X		
Lichmera indistincta	Brown honeyeater	X	X	X	X		
Phylidonyris albifrons	White-fronted honeyeater	+	+	+	X		
Certhionyx niger	Black honeyeater		+	+	+		
Certhionyx variegatus	Pied honeyeater	+	+	+	+		
Ephthianura tricolor	Crimson chat		+	+	+		
Ephithianura albifrons	White-fronted chat					+	
DICAEIDAE							
Dicaeum hirundinaceum	Mistletoe bird	+	+	+	+		
ZOSTEROPIDAE							
Zosterops lateralis	Silvereye	+	+	+	+		
PASSERIDAE							
Stagonopleura guttata	Zebra finch	+				+	

Table E2 **Birds recorded or expected to occur within the habitats present in the BNLP area (Continued)**

		Fauna habitats					
		CW	SS	RS	RH	DM	OPP
ARTAMIDAE							
Artamus personatus	Masked woodswallow	+					
Artamus superciliosus	White-browed Woodswallow	+					
Artamus cinereus	Black-faced woodswallow	+	+	+	+		
Artamus cyanopterus	Dusky woodswallow	+					
Artamus minor	Little woodswallow				+		
Cracticus torquatus	Grey butcherbird	+	X	X			
Cracticus nigrolgularis	Pied butcherbird	X	X	X	X	+	
Gymnorhina tibicen	Australian magpie	X	X	X	X	X	
Strepera versicolor	Grey currawong	+	X	+	+		
CORVIDAE							
Corvus coronoides	Australian raven	X	X	X	X	X	
Corvus bennetti	Little crow	+	+	+	+		
Corvus orru	Torresian crow	+	+				
Expected number of species		101	94	89	87	36	

KEY TO ABBREVIATIONS

CW *chenopod woodland*
SS *spinifex shrubland*
RS *rocky shrublands*
RH *rocky hill*
DM *Patch Dam*
OPP *only those species recorded opportunistically, but not in a cencus, or at Patch Dam*

X *species recorded during field survey*
S *signs of presence recorded: nests, scats, diggings and tracks*
\+ *species expected to occur*
* *predominantly aerial species*

Table E3 **Herpetofauna recorded or expected to occur within the habitats present in the BNLP area**

		Fauna habitats				
		CW	SS	RS	RH	DM
MYOBATRACHIDAE						
Neobatrachus kunapalari	Kunapalari frog	+				+
Pseudophryne occidentalis	Western toadlet	+				+
GEKKONIDAE						
Diplodactylus assimilis		+	+	+	+	
Diplodactylus elderi			+			
Diplodactylus granariensis		+	+	+		
Diplodactylus maini		+	+	+	+	
Diplodactylus pulcher			+	+		
Diplodactylus squarrosus			+	+		
Diplodactylus wellingtoniae			+			
Gehyra purpurascens		+	+	+		
Gehyra variegata	Tree dtella	X	+	X	X	
Heteronotia binoei	Bynoe's gecko	X	X	X	X	
Rhynchoedura ornata	Beaked gecko	+	+	+	+	
Underwoodisaurus milii	Thick-tailed gecko	+	+	+	+	
PYGOPODIDAE						
Delma australis		+	+			
Delma butleri			X	+		
Lialis burtonis	Burton's snake lizard	+	X	+		
Pygopus lepidopodus	Common scaly-foot		+			
Pygopus nigriceps	Hooded scaly-foot	+				
AGAMIDAE						
Ctenophorus cristatus	Crested dragon	+				
Ctenophorus fordi	Mallee dragon		+			
Ctenophorus isolepis	Military dragon	+	+			
Ctenophorus reticulatus	Western netted dragon	+	+	+		
Ctenophorus salinarum	Salt lake dragon	+				
Ctenophorus scutulatus	Lozenge-marked dragon	+	+	+		
Moloch horridus	Thorny devil	+				
Pogona minor	Dwarf bearded dragon	+	+	+	+	
Tympanocryptis cephalus				+		
VARANIDAE						
Varanus caudolineatus	Stripe-tailed monitor	+	+	+	+	
Varanus giganteus	Perentie	+	+	+	+	
Varanus gouldii	Gould's monitor	+				
Varanus tristis		+	X	+	X	

Table E3 **Herpetofauna recorded or expected to occur within the habitats present in the BNLP area (Continued)**

		Fauna habitats				
		CW	SS	RS	RH	DM
SCINCIDAE						
Cryptoblepharus plagiocephalus	Fence skink	X	+	X	X	
Ctenotus atlas			+			
Ctenotus leonhardii			+	+		
Ctenotus pantherinus		+	+	+		
Ctenotus schomburgkii		+	+	+		
Ctenotus severus			+	+	+	
Ctenotus uber		+				+
Cyclodomorphus branchialis		+	X	+		
Egernia carinata		+	+	+	+	
Egernia depressa	Pygmy spiny-tailed skink	+	+	+	X	
Egernia formosa		X	X	X		
Egernia inornata	Desert skink		+			
Eremiascincus richardsonii	Broad-banded sand swimmer		+	+		
Hemiergis initialis		X	X	X		
Lerista muelleri		X	X	X		
Lerista picturata		X				
Menetia greyii	Grey's skink	X	X	X	X	
Morethia adelaidensis		+				
Morethia butleri		X	X	X	X	
Tiliqua occipitalis	Western blue-tongued lizard		+			
Trachydosaurus rugosus	Shingle-back	X	+	+		
TYPHLOPIDAE						
Ramphotyphlops australis		+	+	+	+	
Ramphotyphlops bituberculatus		+	+	+		
Ramphotyphlops waitii		+	+			
BOIDAE						
Aspidites ramsayi	Ramsay's python	+	+			
Morelia spilota	Carpet python	+	+	+	+	
ELAPIDAE						
Acanthophis antarcticus	Common death-adder	+	+			
Demansia psammophis	Yellow-faced whipsnake	+	+			
Furina ornata	Orange-naped snake	+	+	+	+	
Pseudechis australis	Mulga snake	+	+	+	+	
Pseudonaja modesta	Ringed brown snake	+	+	+	+	
Pseudonaja nuchalis	Gwardar	+	+	+	+	
Simoselaps bertholdi	Jan's banded snake	+	+	+	+	
Simoselaps bimaculatus	Black-naped snake		+	+		
Simoselaps fasciolatus	Narrow-banded snake	+	+	+		
Simoselaps semifasciatus	Southern shovel-nosed snake	+	+			
Suta fasciata	Rosen's snake	+	+	+		
Suta monachus	Hooded snake	X	+	X	+	
Expected number of species		55	59	46	24	3

KEY TO ABBREVIATIONS

CW *chenopod woodland*
SS *spinifex shrubland*
RS *rocky shrublands*
RH *rocky hill*
DM *Patch Dam*

X *species recorded during field survey*
\+ *species expected to occur*

Appendix E3

BNLP AREA FAUNA HABITATS

Four terrestrial and two aquatic habitats were identified within the BNLP area by Ecologia (1995) as listed below:

Chenopod woodland

Open, tall *Eucalyptus* woodland over moderately dense, low chenopod shrubland. Soils are red loam.

The tall Chenopod woodlands are expected to display one of the richest fauna assemblages. The eucalypts in this habitat provide the highest canopy in the Bulong Project Area. Not surprisingly, the dominant birds are tree dwelling, and include the yellow-throated minor *Manorina flavigula* and pied butcherbird *Cracticus nigrogularis*. This habitat type also has both dense and open patches, providing the greatest microhabitat diversity. Such high habitat heterogeneity provides a rich array of ecological niches for exploitation by invertebrate and vertebrate fauna. The denser parts of the woodland have significant accumulations of leaf litter which may support many insects, which in turn attract a wide array of reptiles and small carnivorous mammals. The high count of reptiles from this site was largely the result of litter-dwelling species such as *Hemiergis initialis*. Low faunal diversity was also recorded during the survey. The open nature of this habitat has resulted in large scale degradation, both by over-grazing and trampling by livestock and by removal of timber for use in the nearby mine shafts. This was emphasised by the fact that only introduced species of mammals were recorded.

Spinifex shrubland

Open *Eucalyptus* woodland over moderately dense *Triodia* shrub association. Soils are sandy loam interspersed with rocks.

The spinifex shrubland provides a wide range of habitats, particularly low shrubs and ground cover. These microhabitats provide protection for many small mammals, birds and reptiles. Many of the niches available in this habitat are not found elsewhere in the Bulong Project Area. In particular, many reptiles are spinifex specialists (for example, *Diplodactylus elderi, D. pulcher* and *Ctenotus atlas*) and therefore would only be found in this habitat type. The avifauna was the most diverse within the Bulong Project Area, although only the weebill *Sericornis brevirostris* and chestnut-rumped thornbill *Acanthiza ropygialis* were recorded in high numbers. The dense low shrubs and spinifex provide ideal habitat for small mammals such as the southern ningaui *Ningaui yvonneae* and ash-

grey mouse *Pseudomys albocinereus*. This is the only habitat in which all species of introduced mammals were recorded.

Rocky shrubland

Moderately dense *Eucalyptus* woodland over moderately dense shrubland. Soils are light clay, dominated by lateritic ironstone.

The rocky shrubland habitat occurs on laterite slopes with low shrubs and eucalypts. Parts of this habitat have dense patches of small trees with little understorey. Typically, this habitat has many flowering shrubs, particularly melaleuca species, which would be utilised by nectivorous birds (for example. brown honeyeater *Lichmera indistincta*) and mammals (for example pygmy possum *Cercartetus cincinnus*). The chestnut quail-thrush *Cinclosoma castanotum* appears to be restricted to this habitat type. The stony ground associated with this habitat would support a slightly different herpetofauna, including *Tympanocryptis cephalus*. This habitat appears to be the least disturbed in the Bulong Project Area.

Rocky hill

Moderately dense *Eucalyptus* woodland over moderately dense shrubland. Soils and boulder outcrops interspersed with light clay.

The rocky hill habitat is largely restricted to the central eastern part of the Bulong Project Area, around Gumbulgera Hill. Woodlands interspersed by abundant rocky outcrops with large exposed boulders provide a range of microhabitat types. Rock dwelling species such as *Ctenotus severus* and carpet python *Morelia spilota* utilise the outcrops, while the typical woodland species of the other habitats may be found in the surrounding wooded areas. The only bird species expected to be confined to this habitat is the little woodswallow *Artamus minor*, which is generally restricted to rocky areas. It is also a favourable habitat for the euro *Macropus robustus*. There is extensive evidence of mining exploration in the area, which is also near an apparently regularly used camping area.

Patch Dam

Degraded sparse *Eucalyptus* woodland over dense herbs and weeds. Open body of water surrounded by muddy claypan soils.

This artificial water body is expected to support a range of water birds and provide a favourable habitat for frogs. Many native mammals (and birds) are also expected to use the resource, particularly during dry conditions. The habitat is severely degraded, largely from over-grazing and trampling, and is dominated by introduced weeds. Introduced mammals are probably largely dependent on this resource.

Lake Yindarlgooda

Large natural ephemeral saline water body bordered by samphire communities, low granite hillock communities and red sand dunes on the eastern shore. Water depth is predominantly 0–0.5 m.

This ephemeral water body supports aquatic vegetation and a wide variety of fauna, including ephemeral crustaceans such as ostracods and the brine shrimp *Parartemia* species, as well as transitory water fowl and waders. Islands within the lake would also be potential breeding habitats for many migratory bird species. Further investigation of this habitat is required to determine its ecological significance to the region.

This survey does not include the lake environment as the project was not expected to impact on this area when the survey conducted by Ecologia (1995) was commissioned.

Appendix F

CLIMATIC DATA

Appendix F

CLIMATIC DATA

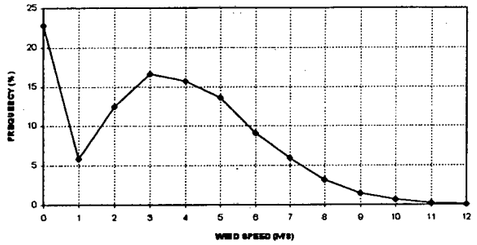
Meteorological and climatic data recorded by the Bureau of Meteorology since 1939 for the City of Kalgoorlie–Boulder is summarised in Table F1.

Table F1 **Mean climatic statistics for Kalgoorlie–Boulder**

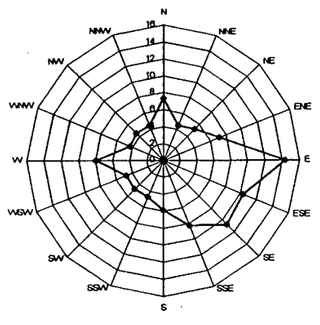
	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec
Max temp (°C)	33.7	32.1	29.6	24.8	20.4	17.4	16.4	18.3	22.0	25.3	28.8	32.2
Min temp (°C)	18.2	17.7	16.0	12.3	8.3	6.1	4.7	5.4	7.7	10.9	13.9	16.7
Rainfall (mm)	22.0	28.0	19.0	20.0	28.0	31.0	25.0	21.6	14.0	16.0	18.0	15.0
Evaporation (mm/month)	392.0	312.0	271.0	178.0	111.0	77.0	85.0	114.0	169.0	255.0	30.0	372.0
Rain days (no.)	4	4	4	5	7	8	9	7	5	4	4	3

1

FREQUENCY VS WIND SPEED
FROM 1/1/89 TO 19/7/95 MEASURED AT 3 HOURLY INTERVALS



FREQUENCY (%) VS WIND DIRECTION
FROM 1/1/89 TO 19/7/95 MEASURED AT 3 HOURLY INTERVALS



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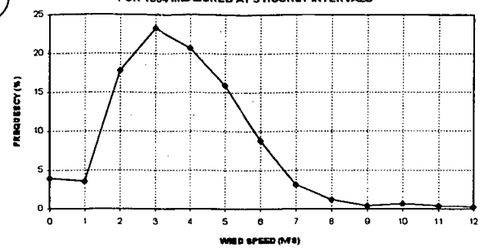

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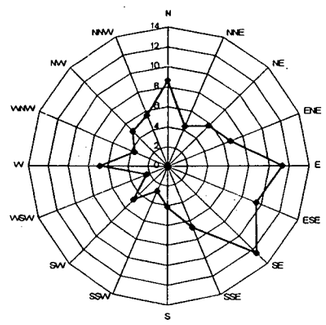
FOR 1994 MEASURED AT 3 HOURLY INTERVALS



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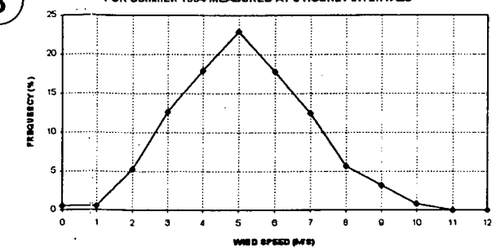
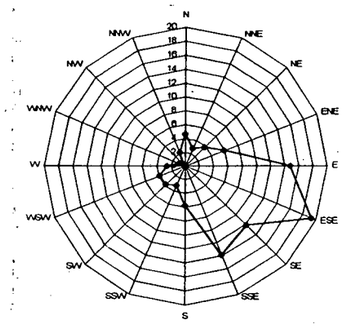
FREQUENCY VS WIND SPEED
FOR SUMMER 1994 MEASURED AT 3 HOURLY INTERVALS



FREQUENCY (%) VS WIND DIRECTION
FOR SUMMER 1994 MEASURED AT 3 HOURLY INTERVALS



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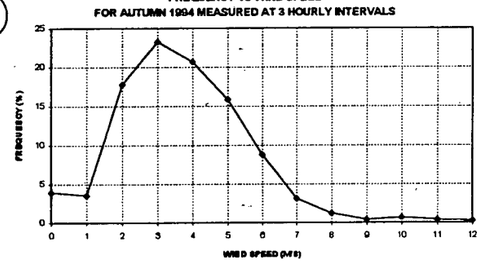
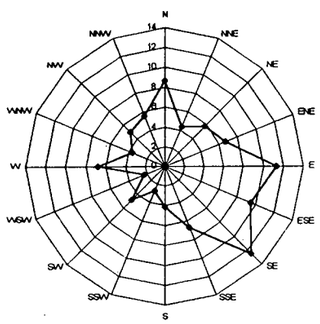


FREQUENCY (%) VS WIND DIRECTION
FOR AUTUMN 1994 MEASURED AT 3 HOURLY INTERVALS



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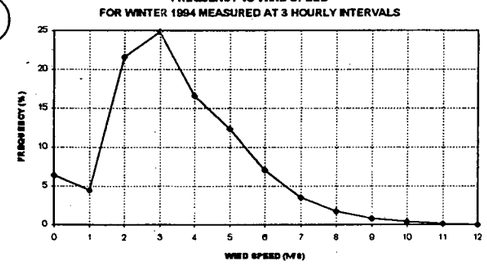
FREQUENCY VS WIND SPEED
FOR WINTER 1994 MEASURED AT 3 HOURLY INTERVALS



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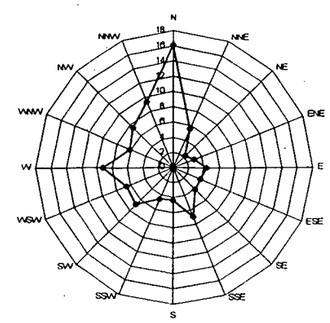
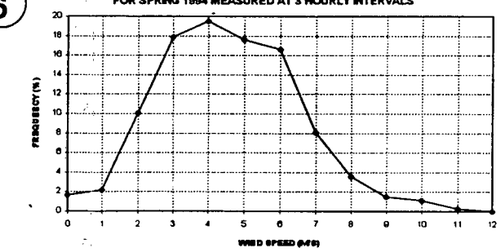
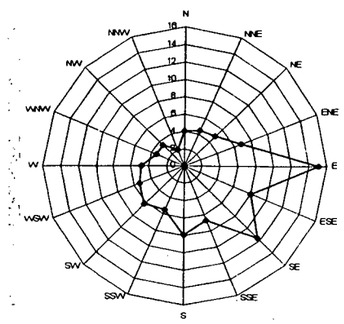


6

FREQUENCY VS WIND SPEED
FOR SPRING 1994 MEASURED AT 3 HOURLY INTERVALS



FREQUENCY (%) VS WIND DIRECTION
FOR SPRING 1994 MEASURED AT 3 HOURLY INTERVALS



Appendix G

CHEMICAL ANALYSIS OF WATER AND SEDIMENTS FROM LAKE YINDARLGOODA

Appendix G

CHEMICAL ANALYSIS OF WATER AND SEDIMENTS FROM LAKE YINDARLGOODA

The hydrochemical and chemical characteristics of Lake Yindarlgooda's water and sediments is shown below in Tables G1 and G2 respectively.

Table G1 **Hydrochemical characteristics of Lake Yindarlgooda**

Hydrochemical characteristics	Lake water concentration
General hydrochemical characteristics	
pH	7.3–7.6
Electrical conductivity (25ºC)	6,000–6,600
Total dissolved solids	34,000–38,000
Alkalinity (as $CaCO_3$)	65–70
Major ions	
Sodium	10,000–12,000
Potassium	50–60
Magnesium	800–980
Calcium	1,200–1,400
Chloride	18,000–20,000
Sulphate	3,900–4,100
Bicarbonate	80–85
Nutrients (forms of N and P)	
Ammonia	<0.05
Nitrate	0.3–0.4
Trace elements	
Cobalt	<0.05
Nickel	<0.05

Notes: *In mg/L except electrical conductivity (mS/m).*
pH is dimensionless.
Total dissolved solids dried at 180ºC.

Table G2 **Chemical characteristics of Lake Yindarlgooda sediments**

Chemical characteristics	Lake bed sediments					
	Sandy silt			Yellow clay		
Sample number	**1**	**2**	**3**	**1**	**2**	**3**
General chemical characteristics						
pH	7.7	7.8	8.2	7.6	7.5	8.4
Electricity conductivity (25°C)	1,200	1,100	420	8,500	1,100	570
Total dissolved solids	51,000	40,000	17,000	40,000	51,000	21,000
Water solubles						
Sodium	14,000	13,000	6,700	13,000	16,000	8,700
Magnesium	2,000	1,500	190	1,800	2,200	94
Calcium	110	150	94	91	110	38
Chloride	28,000	20,000	9,400	21,000	29,000	12,000
Sulphate	2,900	2,000	640	1,800	2,300	850
Total available metals						
Cobalt	36	31	45	24	35	23
Manganese	590	480	970	2,200	2,800	810
Nickel	370	360	540	95	99	140
Nutrients						
Total Kjeldahl Nitrogen	250	170	560	40	36	100
Total phosphorus	140 (composite)			220 (composite)		

Notes: *In mg/kg except electrical conductivity (mS/m).*
pH is dimensionless.
Water solubles, pH, electrical conductivity and TDS on 1:5extracts.
TDS and water solubles as mg/kg of dried solid.
Total available metals according to USEPA 3050.

Appendix H

ASSAYS OF BULONG ORE FLITCH STOCKPILES

WMC ENGINEERING SERVICES PTY LIMITED

AUSTRALIAN COMPANY NUMBER 004 562 092

MEMORANDUM

TO: Distribution List FROM: **Tom Salinovich**

REF. 93TS316.cgh DATE: 21 June 1993

SUBJECT: ASSAYS OF BULONG ORE FLITCH STOCKPILES

Sample numbers AB689044 to AB689059 represent samples of each of the ore flitch stockpiles that were collected by Mike Botting and John Cathcart (after completion of mining at Pinta). These samples were sealed in plastic bags and delivered to the WMC Belmont Laboratories for preparation and assay. Mass of samples ranged from about 14 kg to 21 kg. The total sample was crushed wet to about -12mm, mixed and then a 3 kg portion was cut out from each. These 3 kg portions were then oven dried at 110°C to constant weight and moisture contents determined. The dried samples were then further processed to produce pulverised dry material for assay. The moisture determinations do not represent insitu ore but rather a minimum moisture content of each stockpile on the presumption that the interior of each stockpile is likely to be of higher moisture content than the exterior.

Sample portions submitted for detailed analyses were presented in paper envelopes. The time lapsed between drying of samples in sample preparation to weighing of portions for assay was greater than several weeks. Analyses were done on the basis of weighing direct from each of the envelopes. These analyses are presented as Series A.

In April of this year, these Series A nickel assays when compared to other data generated from Pinta, appeared to have a bias to the low side in regard to Ni assays. It was thus decided to retrieve the original sample envelopes and re-assay for Ni but to redry the samples beforehand. Of the 16 original sample envelopes, all but two were retrieved from storage. Each was then redried at 110°C then cooled in a desiccator and separate portions immediately weighed out for Ni and LOI determinations. Each was found to contain water, content of which ranged from 4.50 to 7.84 grams per 100 grams of resultant redried sample.

		AB689044	AB689055
i.e.	weight before redrying	104.50 grams	107.84 grams
	weight after redrying	100.00 grams	100.00 grams

This re-dried material was then assayed for Ni and LOI (loss of ignition at 1000°C) only. The new nickel assays in most cases were higher than the original assays and in all cases the new LOI determinations were all lower than the original values. The conclusion from this is that the original assays were performed on ore that had reacquired moisture between the initial drying and the consequent assaying thus diluting the true assay values for dry mass. Ores containing clays can reacquire

moisture following drying from humidity in the air because of their hygroscopic properties.

The probable analyses presented in Series B are derived by multiplying all the original analyses (other than LOI) by the ratio of new Ni assay to original Ni assay. The factor was based on Ni assays rather than on LOI determinations since hygroscopic moisture is probably determined by an equilibrium with humidity and is thus subject to constant change whereas Ni content per unit of dry mass remains constant.

All other samples analysed at WMC Belmont may contain similar errors. These samples include the 20m x 20m and the later 5m x 5m infill drilling prior to the mining of Pinta plus the miscellaneous samples collected during Pinta. All other samples collected during the mining of Pinta, i.e. ditchwitch, truckdump etc; were analysed at the WMC Silverlake Laboratory in Kambalda and are not subject to the error due to procedure in use at that facility. At Silver Lake, all samples from Bulong, after sample preparation are redried in their envelopes in an oven. The envelopes are taken directly from the oven to weighing for assay. Similar procedure is now standard at WMC Belmont for all Bulong samples i.e. as from May 1993.

In respect to the original drilling program at Bulong in the period 1978/1980 or thereabouts, approximately 3000 drill holes produced samples for analyses which were analysed at the WMC Ex Div Laboratories in Kalgoorlie. These analyses form the base for all ore reserve grades for Bulong and unless shown otherwise, it is to be presumed that these assays do not contain a systematic error due to hygroscopic moisture. If such error does apply to the ore reserve analyses, then ore reserve grades will be conservative. An indication as to whether there may have been an error would be to examine LOI data determined at that time if such data exists.

T SALINOVICH
Manager - Process Development

Distribution

D Barrett - KNM
M Botting - WNP
P Burger - Consultant
J Cathcart - Nifty
M Elias - WMC Belmont
G Hollis - Ex Div Kalgoorlie
G Hopkins - WMC Kalgoorlie
J O'Neill - Silverlake
J Reeve - WMC Kalgoorlie
F Stanford - WES Belmont
P Wilkin - WES Belmont

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LATERITE RESEARCH COMPANY
RUN OF MINE ORE ANALYSIS

Updated: 15/6/93

Pinta Test Pit
Samples of Ore Flitch Stockpiles

Stockpile		R.L	Bench	R.L Interval			Dry	Sample (as received)		* Prepared Sample		
										Wet Wt	Dry Wt	Moisture
Number	Sample ID		(Flitch)	From	To	m	Tonnes	Description	Wet Wt (g)	g	g	% wt/wt
TD 1385		385	385	385	384	1	148					
TD 1384	AB689059	384	384	384	383	1	261	First Ore Flitch Mined.	18,900	3,000.6	2,529.4	15.7
TD 1383	AB689058	383	383	383	382	1	413	Second Ore Flitch Mined.	17,300	2,999.6	2,468.7	17.7
TD 1382	AB689057	382	382	382	381	1	495	Third Ore Flitch Mined.	16,888	3,442.7	2,810.8	18.4
TD 1381	AB689056	381	381	381	380	1	449	Fourth Ore Flitch Mined.	16,474	3,061.7	2,598.2	15.1
TD 1380	AB689055	380	380	380	379	1	448	Fifth Ore Flitch Mined.	19,344	3,000.6	2,319.0	22.7
TD 1379	AB689054	379	379	379	378	1	440	Sixth Ore Flitch Mined.	16,178	2,999.9	2,285.6	23.8
TD 1378	AB689053	378	378	378	377	1	405	Seventh Ore Flitch Mined.	16,737	3,007.3	2,204.5	26.7
TD 1377	AB689052	377	377	377	376	1	401	Eighth Ore Flitch Mined.	19,400	3,142.3	2,487.3	20.8
TD 1376	AB689051	376	376	376	375	1	409	Ninth Ore Flitch Mined.	14,900	3,000.4	2,343.6	21.9
TD 1375	AB689050	375	375	375	374	1	405	Tenth Ore Flitch Mined.	16,569	3,014.2	2,290.2	24.0
TD 1374	AB689049	374	374	374	373	1	404	Eleventh Ore Flitch Mined.	13,919	2,968.3	2,282.8	23.1
TD 1373	AB689048	373	373	373	372	1	400	Twelfth Ore Flitch Mined.	17,824	3,128.1	2,350.2	24.9
TD 1372	AB689047	372	372	372	371	1	409	Thirteenth Ore Flitch Mined.	18,872	3,072.2	2,347.6	23.6
TD 1371	AB689046	371	371	371	370	1	384	Fourteenth Ore Flitch Mined.	16,200	3,000.8	2,251.2	25.0
TD 1370	AB689045	370	370	370	369	1	333	Fifteenth Ore Flitch Mined.	14,735	2,521.0	1,739.5	31.0
TD 1366	AB689044		366/369	369	366	3	740	Last 3 Flitches mined as a sump.	21,203	3,007.7	2,194.2	27.0

* Note: These moisture assays relate to material obtained from the exterior of surface stockpiles
The moisture content within the stockpile is probably higher.
These assays do not reflect the in-situ moisture of ore prior to mining.

LATERITE RESEARCH COMPANY
RUN OF MINE ORE ANALYSIS

Updated: 15/6/93

Pinta Test Pit
Analyses of Ore Flitch Stockpiles - Series A
(Note:- These samples contain hygroscopic moisture which reports with LOI)

Stockpile		Ni	Co	NiO	CoO	Fe2O3	MgO	Al2O3	Cr2O3	MnO	CuO	ZnO	SiO2	CaO	Na2O	K2O	L.O.I
Number	Sample ID	%	ppm	%	ppm	%	%	%	%	%	ppm	ppm	%	ppm	%	%	(1000°C)
TD 1385	AB689059	0.84	640	1.07	872	43.0	1.60	9.50	1.10	0.17	94	218	28.3	200	1.07	0.12	13.5
TD 1384	AB689058	1.10	885	1.40	1205	33.2	2.60	7.36	0.91	0.26	49	229	34.8	360	0.87	0.07	16.4
TD 1383	AB689057	1.35	1540	1.72	2097	32.0	3.40	5.90	0.75	0.56	38	193	38.3	400	1.09	0.11	13.0
TD 1382	AB689056	1.38	1540	1.76	2097	32.1	4.00	5.80	0.77	0.62	26	168	38.7	200	1.04	0.08	12.1
TD 1381	AB689055	1.31	1120	1.67	1525	26.8	4.60	4.70	0.64	0.42	25	149	40.5	200	1.23	0.12	14.3
TD 1380	AB689054	1.21	950	1.54	1294	26.5	4.80	4.50	0.69	0.39	20	137	40.7	600	1.17	0.11	15.2
TD 1379	AB689053	1.37	945	1.74	1287	26.6	5.30	4.00	0.63	0.42	21	143	44.5	400	1.28	0.12	12.6
TD 1378	AB689052	1.17	595	1.49	810	26.9	5.17	4.62	0.76	0.29	15	131	43.2	265	1.22	0.09	15.0
TD 1377	AB689051	1.00	460	1.27	627	22.7	5.20	3.30	0.60	0.27	13	122	48.9	345	1.18	0.10	14.2
TD 1376	AB689050	1.10	605	1.40	824	23.5	7.00	3.70	0.60	0.34	24	124	46.4	100	1.34	0.12	13.4
TD 1375	AB689049	1.00	510	1.27	695	22.3	7.60	3.40	0.53	0.29	13	118	48.7	500	1.27	0.12	12.4
TD 1374	AB689048	1.04	535	1.32	729	23.4	8.20	3.70	0.54	0.29	46	122	48.6	600	1.38	0.14	10.3
TD 1373	AB689047	1.02	550	1.30	749	21.7	8.70	3.60	0.56	0.30	11	121	46.7	1700	1.36	0.11	12.8
TD 1372	AB689046	0.95	420	1.21	572	19.6	11.40	3.20	0.39	0.30	9	123	45.9	430	1.23	0.09	14.3
TD 1371	AB689045	0.99	405	1.26	552	24.7	8.90	4.10	0.54	0.24	14	115	45.1	1500	1.41	0.12	11.3
TD 1370	AB689044	0.80	315	1.02	429	17.7	18.20	3.30	0.41	0.22	14	100	43.5	5400	1.07	0.09	11.9

Sample ID	Li	P	Ti	V	Sr	Ba
	ppm	ppm	ppm	ppm	ppm	ppm
AB689055	<5	<30	1797	90.0	6.0	97.0
AB689054	<5	<30	1738	95.0	6.0	98.0
AB689052	<5	<30	1861	107.0	7.0	71.0
AB689049	<5	<30	1359	70.0	6.0	54.0
AB689047	<5	<30	1410	63.0	5.0	46.0
AB689044	<5	<30	1264	43.0	<5	21.0

Note: Refer to Series B analyses for proposed correction factors to relate above analyses to dry mass (dried at 110°C). Major Elements only.

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LATERITE RESEARCH COMPANY
RUN OF MINE ORE ANALYSIS

Updated: 15/6/93

Pinta Test Pit
Analyses of Ore Flitch Stockpiles - Series A
(Note:- These samples contain hygroscopic moisture which reports with LOI)

Stockpile		SO4	Cl	As	Se	Hg	Bi	Cd	U3O8	Au	Platinum Group Metals						
Number	Sample ID	%	ppm	ppm	ppb	ppb	ppm	ppm	ppm	ppb	Ru ppb	Rh ppb	Pd ppb	Os ppb	Ir ppb	Pt ppb	Total %
TD 1385	AB689059	0.28	1400	20	490	<10	<0.1	<0.5	0.7	<1	18	<1	16	19	19	7	99.99
TD 1384	AB689058	0.18	2050	5	640	<10	0.2	0.5	0.8	12	16	2	12	13	13	6	98.40
TD 1383	AB689057	0.17	2600	10	370	<10	0.7	<0.5	0.7	3	17	<1	7	11	18	7	97.53
TD 1382	AB689056	0.12	3100	10	130	<10	<0.1	<0.5	0.5	<1	15	<1	4	13	15	4	97.65
TD 1381	AB689055	0.19	3300	5	120	<10	<0.1	<0.5	0.2	3	16	<1	2	21	12	3	95.69
TD 1380	AB689054	0.17	3300	5	110	20	<0.1	<0.5	0.4	<1	17	<1	2	40	16	4	96.30
TD 1379	AB689053	0.17	4100	5	40	<10	<0.1	0.8	0.2	20	19	<1	1	10	16	5	97.96
TD 1378	AB689052	0.12	4250	10	40	<10	<0.1	0.8	0.1	102	11	<1	<1	7	12	3	99.39
TD 1377	AB689051	0.21	4010	10	20	10	<0.1	0.6	0.2	7	14	<1	8	6	12	3	98.48
TD 1376	AB689050	0.13	4500	5	20	<10	<0.1	0.6	0.1	7	16	<1	<1	8	13	2	98.49
TD 1375	AB689049	0.14	4200	<5	10	<10	<0.1	0.8	0.1	9	12	<1	<1	8	11	2	98.58
TD 1374	AB689048	0.26	4400	5	10	40	<0.1	<0.5	<0.1	35	13	<1	<1	8	12	3	98.72
TD 1373	AB689047	0.13	4700	10	<10	<10	<0.1	<0.5	0.1	9	14	<1	<1	8	12	2	97.99
TD 1372	AB689046	0.18	4800	5	20	10	<0.1	<0.5	0.1	10	13	<1	<1	32	12	5	98.39
TD 1371	AB689045	0.12	2300	10	70	<10	<0.1	0.7	0.1	36	12	<1	9	59	14	5	98.24
TD 1370	AB689044	0.12	4400	10	10	10	0.1	0.6	0.1	3	8	<1	<1	6	9	2	98.56

LATERITE RESEARCH COMPANY
RUN OF MINE ORE ANALYSIS

Updated: 15/6/93

Pinta Test Pit
Probable analyses of Ore Flitch Stockpiles (Major Elements)- Series B
(Note:- These analyses are corrected for hygroscopic moisture which, in series A, reported with LOI)

Stockpile		Reassayed Data			Calculated Assays															
Number	Sample ID	H2O *	Ni %	L.O.I 1000°C	Ni %	Co ppm	NiO %	CoO ppm	Fe2O3 %	MgO %	Al2O3 %	Cr2O3 %	MnO %	CuO ppm	ZnO ppm	SiO2 %	CaO ppm	Na2O %	K2O %	Total %
TD 1385	AB689059	N/A	N/A	N/A																
TD 1384	AB689058	7.17	1.28	10.50	1.28	1030	1.63	1403	38.6	3.03	8.56	1.05	0.30	57	267	40.5	419	1.01	0.08	105.47
TD 1383	AB689057	4.93	1.44	9.83	1.44	1643	1.83	2237	34.1	3.63	6.29	0.80	0.60	40	206	40.9	427	1.16	0.12	99.54
TD 1382	AB689056	4.57	1.48	9.74	1.48	1652	1.88	2249	34.4	4.29	6.22	0.83	0.66	28	180	41.5	214	1.12	0.09	101.02
TD 1381	AB689055	7.84	1.46	9.42	1.46	1248	1.86	1700	29.9	5.13	5.24	0.71	0.47	28	166	45.1	223	1.37	0.13	99.55
TD 1380	AB689054	7.30	1.36	9.22	1.36	1068	1.73	1454	29.8	5.40	5.06	0.78	0.44	23	154	45.7	674	1.32	0.12	99.82
TD 1379	AB689053	5.72	1.45	9.13	1.45	1000	1.85	1362	28.2	5.61	4.23	0.67	0.44	23	152	47.1	423	1.35	0.13	98.86
TD 1378	AB689052	7.11	1.30	9.53	1.30	661	1.65	900	29.9	5.74	5.13	0.84	0.33	17	145	48.0	294	1.36	0.10	102.69
TD 1377	AB689051	N/A	N/A	N/A																
TD 1376	AB689050	7.57	1.16	8.79	1.16	638	1.48	869	24.8	7.38	3.90	0.63	0.36	25	131	48.9	105	1.41	0.13	97.91
TD 1375	AB689049	5.63	1.09	8.77	1.09	556	1.39	757	24.3	8.28	3.71	0.58	0.32	14	129	53.1	545	1.38	0.13	102.09
TD 1374	AB689048	5.29	1.12	8.34	1.12	576	1.43	785	25.2	8.83	3.98	0.58	0.31	50	131	52.3	646	1.49	0.15	102.81
TD 1373	AB689047	5.66	1.11	9.03	1.11	599	1.41	815	23.6	9.47	3.92	0.61	0.33	12	131	50.8	1850	1.48	0.12	101.08
TD 1372	AB689046	7.01	1.05	9.32	1.05	464	1.34	632	21.6	12.60	3.54	0.44	0.34	10	136	50.7	475	1.36	0.10	101.53
TD 1371	AB689045	6.19	1.09	8.75	1.09	446	1.39	607	27.2	9.80	4.51	0.59	0.26	15	126	49.7	1652	1.55	0.13	104.08
TD 1370	AB689044	4.50	0.83	9.60	0.83	327	1.06	445	18.4	18.88	3.42	0.43	0.23	15	104	45.1	5603	1.11	0.09	98.93

Note:

1. * H2O is expressed as grams of hygroscopic moisture per 100 grams dry mass.
   H2O is for information only, no factors are derived from this assay.
2. The original sample pulps were retrieved from storage then oven dried at 110°C to determine hygroscopic moisture.
   The dry mass was then re-assayed for Ni and LOI only. All of the calculated assays presented above are multiplied by a factor
   to account for the effect of contained hygroscopic moisture. The factor is obtained by dividing the original Ni assay into the re-assayed
   Ni value. This factor is applied from Co to K2O.
3. Total accounts for elements listed, it does not include minor elements as included in Series A results.

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LATERITE RESEARCH COMPANY
RUN OF MINE ORE ANALYSIS

Updated: 15/6/93

Pinta Test Pit
Miscellaneous Samples

Stockpile		Sample (as received)		* Prepared Sample		
				Wet Wt	Dry Wt	Moisture
Number	Sample ID	Description	Wet Wt (g)	g	g	% wt/wt
	AB689040		17,990	3,000.0	2,243.0	25.2
	AB689041		18,600	3,000.0	2,319.0	22.7
	AB689042		22,000	3,000.7	2,204.5	26.5
	AB689043		25,110	3,000.0	2,290.2	23.7
	AB689110		18,817	3,051.6	2,243.0	26.5
	AB689124		19,980	3,000.4	2,281.3	24.0
	AB689125		20,221	3,000.3	2,270.0	24.3
	AB689132		23,827	2,999.9	2,078.5	30.7
	AB689133		16,953	3,000.7	2,186.5	27.1
	AB689134		20,221	3,005.3	2,207.2	26.6
	AB689135		17,164	3,000.1	2,141.9	28.6
	AB689147		14,200	3,000.3	2,092.7	30.3
	AB689148		17,158	2,492.8	1,651.4	33.8
	AB689153		25,936	2,469.0	1,827.3	26.0
	AB689154		29,550	2,586.7	1,897.6	26.6

* Note: These moisture assays relate to material obtained from within the Pinta Test Pit during mining. These may not reflect the total in-situ moisture of ore prior to mining. Partial drying of samples may have occurred before sampling.

LATERITE RESEARCH COMPANY
RUN OF MINE ORE ANALYSIS

Updated: 15/6/93

Pinta Test Pit
Analyses of Miscellaneous Samples

Stockpile		Ni	Co	NiO	CoO	Fe2O3	MgO	Al2O3	Cr2O3	MnO	CuO	ZnO	SiO2	CaO	Na2O	K2O	L.O.I	SO4
Number	Sample ID	%	ppm	%	ppm	%	%	%	%	%	ppm	ppm	%	ppm	%	%	(1000°C)	%
	AB689040	1.78	1620	2.27	2206	26.3	2.78	6.66	1.01	0.60	34	237	42.2	140	1.32	0.12	14.2	0.30
	AB689041	1.27	1010	1.62	1376	17.6	7.69	2.49	0.42	0.27	28	137	54.2	86	1.09	0.10	14.3	0.27
	AB689042	1.59	2290	2.02	3119	25.9	4.98	4.21	0.54	0.94	31	172	44.1	98	1.22	0.10	14.5	0.30
	AB689043	1.80	1340	2.29	1825	17.9	5.18	3.78	0.48	0.43	28	142	54.3	98	1.16	0.10	13.4	0.27
	AB689110	1.49	1540	1.90	2097	25.4	5.14	4.63	0.66	0.56	30	188	43.3	100	1.27	0.12	15.3	0.27
	AB689124	1.05	810	1.34	1103	22.6	5.10	2.60	0.53	0.42	19	124	52.7	200	1.40	0.12	11.9	0.10
	AB689125	1.11	600	1.41	817	20.5	6.90	2.90	0.53	0.30	15	113	52.6	100	1.23	0.10	11.3	0.18
	AB689132	1.02	600	1.30	817	21.8	6.40	3.30	0.57	0.34	11	118	50.1	100	1.34	0.12	11.5	0.15
	AB689133	1.11	660	1.41	899	24.0	7.60	3.10	0.48	0.36	10	143	47.0	100	1.44	0.11	12.0	0.14
	AB689134	1.05	510	1.34	695	20.9	8.30	2.90	0.51	0.27	15	124	51.2	400	1.30	0.10	12.1	0.06
	AB689135	1.02	630	1.30	858	24.2	7.30	2.70	0.51	0.36	15	131	50.5	100	1.44	0.10	11.1	0.22
	AB689147	1.00	495	1.27	674	21.3	8.70	2.40	0.45	0.30	13	120	52.3	300	1.26	0.09	11.0	0.07
	AB689148	1.00	550	1.27	749	22.0	8.40	2.70	0.47	0.32	31	124	50.6	400	1.30	0.09	8.5	0.16
	AB689153	1.06	560	1.35	763	21.9	9.40	4.00	0.53	0.32	10	124	48.7	7500	1.33	0.10	9.6	0.12
	AB689154	1.10	605	1.40	824	25.4	6.40	2.50	0.45	0.39	21	131	51.3	100	1.30	0.09	9.8	0.14

Note:

1. Samples assayed contain undetermined quantities of hygroscopic moisture which reports with LOI.

LATERITE RESEARCH COMPANY
RUN OF MINE ORE ANALYSIS

Updated: 15/6/93

Pinta Test Pit
Analyses of Miscellaneous Samples

Stockpile		Cl	As	Se	Hg	Bi	Cd	U3O8	Au	Platinum Group Metals						Total
Number	Sample ID	ppm	ppm	ppb	ppb	ppm	ppm	ppm	ppb	Ru ppb	Rh ppb	Pd ppb	Os ppb	Ir ppb	Pt ppb	%
	AB689040	3770	<5	70	20	<0.1	<0.5	0.2	19	14	<1	25	8	12	16	98.39
	AB689041	2800	5	170	20	<0.1	0.7	0.4	24	22	2	4	6	11	8	100.48
	AB689042	3540	5	420	20	<0.1	0.6	0.4	10	11	<1	10	10	15	5	99.49
	AB689043	3470	<5	60	<10	<0.1	0.7	<0.1	4	4	<1	<1	4	6	3	99.82
	AB689110	3640	<5	220	<10	0.3	0.6	0.5	1	14	<1	5	10	14	4	99.20
	AB689124	4000	10	20	<10	0.2	0.6	0.1	1	9	<1	<1	8	11	2	99.35
	AB689125	4200	<5	10	10	<0.1	0.9	0.1	7	10	<1	<1	6	10	2	98.48
	AB689132	4500	<5	<10	10	<0.1	0.8	0.2	<1	11	<1	<1	8	12	2	97.47
	AB689133	5400	<5	10	<10	<0.1	1.0	<0.1	18	17	<1	2	8	14	4	98.30
	AB689134	4300	5	10	10	0.1	<0.5	0.1	<1	10	<1	<1	6	12	2	99.53
	AB689135	4300	<5	10	10	<0.1	0.8	<0.1	54	27	<1	5	10	15	3	100.27
	AB689147	4200	5	10	10	<0.1	<0.5	0.1	6	21	<1	<1	9	14	4	99.67
	AB689148	4400	<5	10	20	<0.1	0.6	0.2	2	12	<1	<1	7	12	3	96.38
	AB689153	4900	<5	40	10	<0.1	0.7	<0.1	4	15	<1	<1	8	11	2	98.68
	AB689154	4700	<5	20	20	<0.1	<0.5	<0.1	<1	15	<1	1	10	13	3	99.75

Note:

1. Samples assayed contain undetermined quantities of hygroscopic moisture which reports with LOI.

Appendix I

VALLEY IMPOUNDMENT LEACH RESIDUE STORAGE FACILITY TEST PIT LOGS AND LABORATORY RESULTS

Knight Piésold Consulting Engineers	Project: Bulong Nickel	Test Pit No: BNTP1
	Project No. 656	Sheet 1 of 1
	Site: Leached Residue Facility	Pit Size: 6 x 1 x 4.0 m
	Logged By: BAS Date: 7/9/95	Elevation: ≈ 363.5 m
Contractor: Donlo Excavations	Machine Type: Komatsu PC220	Location: 389470E 6603350N
Operator: Peter	Date Started: 7/9/95	Completed: 7/9/95

TEST PIT LOG

Field Engineer: Brett Stevenson

Checked by: Date:

Depth in Meters	Sample	Unified Soil Class. (USCS)	Description
0.0-0.1	-	-	Loose reddish brown silty SAND with occasional fine to medium gravels.
0.1-1.0	-	-	Medium dense reddish brown silty SAND.
1.0-4.0	Disturbed	CH	Very stiff pale yellow/greyish mottled red sandy CLAY of intermediate to high plasticity.

Remarks: Pit dry throughout.

Pit excavated to refusal.

Knight Piésold Consulting Engineers	Project: Bulong Nickel	Test Pit No: BNTP2
	Project No. 656	Sheet 1 of 1
	Site: Leached Residue Facility	Pit Size: 8 x 1 x 2.4 m
	Logged By: BAS Date: 6/9/95	Elevation: ≈ 363.5 m
Contractor: Donlo Excavations	Machine Type: Komatsu PC220	Location: 389550E 6603430N
Operator: Peter	Date Started: 6/9/95	Completed: 7/9/95

TEST PIT LOG

Depth in Meters	Sample	Unified Soil Class. (USCS)	Field Engineer: Brett Stevenson Checked by: Date: Description
0.0-0.2	-	-	Loose reddish brown silty SAND (Topsoil)
0.2-0.7	-	-	Medium Dense pale grey mottled red silty SAND
0.7-1.6	-	-	Reddish brown highly fractured strong fine grained rock
1.6-2.4	Disturbed	CI	Stiff to very stiff pale grey mottled reddish brown sandy CLAY of intermediate plasticity with medium to coarse gravels.

Remarks: Pit dry throughout.

Pit excavated to refusal.

Knight Piésold Consulting Engineers	Project: Bulong Nickel	Test Pit No: BNTP3
	Project No. 656	Sheet 1 of 1
	Site: Leached Residue Facility	Pit Size: 10 x 1 x 4.0 m
	Logged By: BAS Date: 7/9/95	Elevation: ≈ 364.8 m
Contractor: Donlo Excavations	Machine Type: Komatsu PC220	Location: 389420E 6603470N
Operator: Peter	Date Started: 6/9/95	Completed: 6/9/95

TEST PIT LOG

Field Engineer: Brett Stevenson

Checked by: Date:

Depth in Meters	Sample	Unified Soil Class. (USCS)	Description
0.0-0.1	-	-	Loose reddish brown silty SAND (Topsoil)
0.1-0.6	-	-	Loose reddish brown silty SAND with medium gravels
0.6-0.9	-	-	Medium dense pale grey mottled red silty SAND
0.9-4.0	Disturbed	CI	Very stiff pale grey mottled red CLAY of intermediate plasticity

Remarks: Pit dry throughout.

Pit excavated to refusal.

Knight Piésold Consulting Engineers	Project: Bulong Nickel	Test Pit No: BNTP4
	Project No. 656	Sheet 1 of 1
	Site: Leached Residue Facility	Pit Size: 8 x 1 x 3.0 m
	Logged By: BAS Date: 7/9/95	Elevation: ≈ 362 m
Contractor: Donlo Excavations	Machine Type: Komatsu PC220	Location: 389700E 6603730N
Operator: Peter	Date Started: 7/9/95	Completed: 7/9/95

TEST PIT LOG

Field Engineer: Brett Stevenson

Checked by: Date:

Depth in Meters	Sample	Unified Soil Class. (USCS)	Description
0.0-0.1	-	-	Loose reddish brown silty SAND with occasional fine to medium gravels (Topsoil) Complete gravels on surface
0.1-0.6	-	-	Medium dense pale grey fine to coarse GRAVEL in a reddish brown silty matrix of low plasticity
0.6-3.0	Disturbed	SC	Stiff to very stiff pale grey/greenish mottled reddish brown clayey SAND. Less sand with increasing depth

Remarks: Pit dry throughout.

Pit excavated to refusal.

Knight Piésold Consulting Engineers	Project: Bulong Nickel	Test Pit No: BNTP5
	Project No. 656	Sheet 1 of 1
	Site: Leached Residue Facility	Pit Size: 8 x 1 x 2.3 m
	Logged By: BAS Date: 7/9/95	Elevation: ≈ 362 m
Contractor: Donlo Excavations	Machine Type: Komatsu PC220	Location: 389600E 6603730N
Operator: Peter	Date Started: 6/9/95	Completed: 6/9/95

TEST PIT LOG

Depth in Meters	Sample	Unified Soil Class. (USCS)	Field Engineer: Brett Stevenson Checked by: / Date: Description
0.0-0.9	-	-	Loose reddish brown silty SAND with occasional fine to medium gravels (Topsoil)
0.9-1.5	-	-	Loose pale grey fine to coarse sub rounded GRAVEL in a reddish brown silty sand matrix
1.5-1.7	-	-	Medium dense pale grey fine to coarse sub rounded GRAVELS in a reddish brown silt matrix
1.7-2.3	Disturbed	SC	Stiff to very stiff pale grey mottled red/light green silty sandy clayey SAND/sandy CLAY.

Remarks: Pit dry throughout.

Pit excavated to refusal.

Knight Piésold Consulting Engineers	Project: Bulong Nickel	Test Pit No: BNTP6
	Project No. 656	Sheet 1 of 1
	Site: Leached Residue Facility	Pit Size: 10 x 1 x 3.1 m
	Logged By: BAS Date: 7/9/95	Elevation: ≈360 m
Contractor: Donlo Excavations	Machine Type: Komatsu PC220	Location: 389700E 6603830N
Operator: Peter	Date Started: 6/9/95	Completed: 7/9/95

TEST PIT LOG

Field Engineer: Brett Stevenson

Checked by: Date:

Depth in Meters	Sample	Unified Soil Class. (USCS)	Description
0.0-0.3	-	-	Loose reddish brown silty SAND (Topsoil)
0.3-1.8	-	-	Firm reddish brown gravelly sandy SILT - gravels typically sub rounded fine to medium
1.8-2.2	-	-	Stiff reddish brown sandy SILT with sub rounded gravel
2.2-3.0	-	-	Medium dense to dense reddish brown mottled white silty SAND with fine to medium sub rounded gravels.
3.0-3.1	-	-	Very stiff pale grey mottled red sandy CLAY of intermediate plasticity

Remarks: Pit dry throughout.

Pit excavated to refusal.

Knight Piésold Consulting Engineers	Project: Bulong Nickel	Test Pit No: BNTP7
	Project No. 656	Sheet 1 of 1
	Site: Leached Residue Facility	Pit Size: 5 x 1 x 3.2 m
	Logged By: BAS Date: 7/9/95	Elevation: ≈ 363 m
Contractor: Donlo Excavations	Machine Type: Komatsu PC220	Location: 389610E 6603840N
Operator: Peter	Date Started: 6/9/95	Completed: 7/9/95

TEST PIT LOG

Depth in Meters	Sample	Unified Soil Class. (USCS)	Field Engineer: Brett Stevenson Checked by: Date: Description
0.0-0.1	-	-	Loose reddish brown silty SAND (Topsoil)
0.1-0.25	-	-	Loose to medium dense reddish brown silty GRAVEL. Gravels fine to coarse and sub rounded. Fines of low plasticity
0.25-1.2	-	-	Stiff to very stiff pale grey mottled red becoming redder with depth, sandy CLAY of intermediate plasticity
1.2-3.2	Disturbed	SL	Very stiff pale grey mottled green and reddish brown clayey SAND. Fines of intermediate plasticity

Remarks: Pit dry throughout.

Pit excavated to refusal.

Intrusion of whitish highly fractured slightly weathered strong fine grained rock ≈ ½ m wide in northern extent of pit

Knight Piésold Consulting Engineers	Project: Bulong Nickel	Test Pit No: BNTP8
	Project No. 656	Sheet 1 of 1
	Site: Leached Residue Facility	Pit Size: 5 x 1 x 1.5 m
	Logged By: BAS Date: 7/9/95	Elevation: ≈ 372.5 m
Contractor: Donlo Excavations	Machine Type: Komatsu PC220	Location: 389340E 6603650N
Operator: Peter	Date Started: 6/9/95	Completed: 6/9/95

TEST PIT LOG

Depth in Meters	Sample	Unified Soil Class. (USCS)	Field Engineer: Brett Stevenson Checked by: Date: Description
0.0-0.2	-	-	Loose reddish brown silty SAND (Topsoil)
0.2-1.5	Disturbed	GP-GM	Stiff to very stiff pale grey becoming reddish brown fine to coarse subangular GRAVEL in a sandy silt matrix of low plasticity

Remarks: Pit dry throughout.

Pit excavated to refusal.

Knight Piésold Consulting Engineers	Project: Bulong Nickel	Test Pit No: BNTP9
	Project No. 656	Sheet 1 of 1
	Site: Leached Residue Facility	Pit Size: 12 x 1 x 4.3 m
	Logged By: BAS Date: 7/9/95	Elevation: ≈ 367.5 m
Contractor: Donlo Excavations	Machine Type: Komatsu PC220	Location: 389460E 6603960N
Operator: Peter	Date Started: 6/9/95	Completed: 6/9/95

TEST PIT LOG

Depth in Meters	Sample	Unified Soil Class. (USCS)	Field Engineer: Brett Stevenson Checked by: Date: Description
0.0-0.2	-	-	Loose reddish brown silty SAND (Topsoil)
0.2-1.4	-	-	Firm to stiff reddish brown sandy SILT of low plasticity with fine to coarse gravels
1.4-4.3	-	-	Stiff to very stiff reddish brown mottled white CLAY

Remarks: Pit dry throughout.

Pit excavated to refusal.

Knight Piésold Consulting Engineers	Project: Bulong Nickel	Test Pit No: BNTP10
	Project No. 656	Sheet 1 of 1
	Site: Leached Residue Facility	Pit Size: 5 x 0.3 x 1 m
	Logged By: BAS Date: 7/9/95	Elevation: ≈378 m
Contractor: Donlo Excavations	Machine Type: Komatsu PC220	Location: 389160E 6603640N
Operator: Peter	Date Started: 6/9/95	Completed: 6/9/95

TEST PIT LOG

Depth in Meters	Sample	Unified Soil Class. (USCS)	Field Engineer: Brett Stevenson Checked by: Date: Description
0.0-0.3	-	-	Reddish brown highly weathered highly fractured strong fine grained rock. (rock weathered to low plasticity silt in places)

Remarks: Pit dry throughout.

Pit excavated to refusal.

Knight Piésold Consulting Engineers	Project: Bulong Nickel	Test Pit No: BNTP11
	Project No. 656	Sheet 1 of 1
	Site: Leached Residue Facility	Pit Size: 10 x 1 x 3.5 m
	Logged By: BAS Date: 7/9/95	Elevation: ≈ 368.5 m
Contractor: Donlo Excavations	Machine Type: Komatsu PC220	Location: 389250E 6604000N
Operator: Peter	Date Started: 6/9/95	Completed: 6/9/95

TEST PIT LOG

Field Engineer: Brett Stevenson

Checked by: Date:

Depth in Meters	Sample	Unified Soil Class. (USCS)	Description
0.0-0.3	-	-	Loose reddish brown silty SAND (Topsoil)
0.3-1.5	-	-	Medium dense pale grey silty SAND with fine to medium gravels
1.5-2.2	-	-	Stiff, reddish brown mottled pale grey becoming reddish brown mottled red CLAY with occasional fine to coarse gravel. Occasional quartz gravels
2.2-3.5	-	-	Stiff to very stiff reddish brown mottled pale grey CLAY

Remarks: Pit dry throughout.

Pit excavated to refusal.

Knight Piésold Consulting Engineers	Project: Bulong Nickel	Test Pit No: BNTP12
	Project No. 656	Sheet 1 of 1
	Site: Leached Residue Facility	Pit Size: 3 x 1 x 0.5 m
	Logged By: BAS Date: 7/9/95	Elevation: ≈ 372 m
Contractor: Donlo Excavations	Machine Type: Komatsu PC220	Location: 389090E 6603775N
Operator: Peter	Date Started: 6/9/95	Completed: 6/9/95

TEST PIT LOG

Field Engineer: Brett Stevenson

Checked by: Date:

Depth in Meters	Sample	Unified Soil Class. (USCS)	Description
0.0-0.1	-	-	Loose reddish brown silty SAND (Topsoil)
0.1-0.5	-	-	Reddish brown highly weathered highly fractured fine grained moderately strong to strong ROCK with silt. Joints tight.

Remarks: Pit dry throughout.

Pit excavated to refusal.

Knight Piésold Consulting Engineers	Project: Bulong Nickel	Test Pit No: BNTP13
	Project No. 656	Sheet 1 of 1
	Site: Leached Residue Facility	Pit Size: 10 x 1 x 0.6 m
	Logged By: BAS Date: 7/9/95	Elevation: ≈ 369.5 m
Contractor: Donlo Excavations	Machine Type: Komatsu PC220	Location: 388970E 6603940N
Operator: Peter	Date Started: 6/9/95	Completed: 6/9/95

TEST PIT LOG

Field Engineer: Brett Stevenson

Checked by: Date:

Depth in Meters	Sample	Unified Soil Class. (USCS)	Description
0.0-0.1	-	-	Loose reddish brown silty SAND with fine to medium sub rounded gravels (Topsoil)
0.1-0.6	-	-	Pale grey mottled red highly weathered highly fractured fine grained moderately strong to strong ROCK in a matrix of very stiff clayey SILT of low plasticity. Joints tight.

Remarks: Pit dry throughout.

Pit excavated to refusal.

Knight Piésold Consulting Engineers	Project: Bulong Nickel	Test Pit No: BNTP14
	Project No. 656	Sheet 1 of 1
	Site: Leached Residue Facility	Pit Size: 10 x 1 x 4.2 m
	Logged By: BAS Date: 7/9/95	Elevation: ≈ 370 m
Contractor: Donlo Excavations	Machine Type: Komatsu PC220	Location: 389020E 6604000N
Operator: Peter	Date Started: 6/9/95	Completed: 6/9/95

TEST PIT LOG

Field Engineer: Brett Stevenson

Checked by: Date:

Depth in Meters	Sample	Unified Soil Class. (USCS)	Description
0.0-0.2	-	-	Loose reddish brown silty SAND, occasional fine to medium gravels (Topsoil)
0.2-0.6	-	-	Loose to medium dense pale grey medium to coarse GRAVEL in a reddish brown silt matrix of low plasticity
0.6-1.0	-	-	Medium dense pale grey medium to coarse GRAVEL in a reddish brown silty sand matrix
1.0-4.2	-	-	Stiff to very stiff reddish brown mottled grey sandy CLAY

Remarks: Pit dry throughout.

Pit excavated to refusal.

Knight Piésold Consulting Engineers	Project: Bulong Nickel	Test Pit No: BNTP15
	Project No. 656	Sheet 1 of 1
	Site: Leached Residue Facility	Pit Size: 5 x 1 x 1.7 m
	Logged By: BAS Date: 7/9/95	Elevation: ≈ 375 m
Contractor: Donlo Excavations	Machine Type: Komatsu PC220	Location: 386670E 6603880N
Operator: Peter	Date Started: 6/9/95	Completed: 6/9/95

TEST PIT LOG

Depth in Meters	Sample	Unified Soil Class. (USCS)	Field Engineer: Brett Stevenson Checked by: Date: Description
0.0-0.5	-	-	Loose reddish brown silty SAND (Topsoil)
0.5-0.7	-	-	Stiff pale grey mottled red CLAY of medium plasticity
0.7-1.7	-	-	Stiff to very stiff reddish brown CLAY with medium to coarse gravels

Remarks: Pit dry throughout.

Pit excavated to refusal.

Knight Piésold Consulting Engineers	Project: Bulong Nickel	Test Pit No: BNTP16
	Project No. 656	Sheet 1 of 1
	Site: Leached Residue Facility	Pit Size: 2 x 1 x 0.8 m
	Logged By: BAS Date: 7/9/95	Elevation: ≈ 359 m
Contractor: Donlo Excavations	Machine Type: Komatsu PC220	Location: 389660E 6603780N
Operator: Peter	Date Started: 7/9/95	Completed: 7/9/95

TEST PIT LOG

Field Engineer: Brett Stevenson

Checked by: Date:

Depth in Meters	Sample	Unified Soil Class. (USCS)	Description
0.0-0.7	-	-	Loose reddish brown sandy GRAVELS. Gravels typically sub rounded becoming medium dense with depth
0.7-0.8	-	-	Stiff to very stiff pale grey mottled red sandy CLAY of low plasticity

Remarks: Pit dry throughout.

Pit excavated to refusal.

Knight Piésold Consulting Engineers	Project: Bulong Nickel	Test Pit No: BNTP17
	Project No. 656	Sheet 1 of 1
	Site: Leached Residue Facility	Pit Size: 4 x 1 x 0.5 m
	Logged By: BAS Date: 7/9/95	Elevation: ≈ 366 m
Contractor: Donlo Excavations	Machine Type: Komatsu PC220	Location: 389670E 6603630N
Operator: Peter	Date Started: 7/9/95	Completed: 7/9/95

TEST PIT LOG

Depth in Meters	Sample	Unified Soil Class. (USCS)	Field Engineer: Brett Stevenson Checked by: Date: Description
0.0-0.1	-	-	Loose reddish brown silty SAND with subrounded fine to medium gravels.
0.1-0.5	-	-	Stiff to very stiff pale grey slightly cemented sandy CLAY of low plasticity

Remarks: Pit dry throughout.

Pit excavated to refusal.

Knight Piésold Consulting Engineers	Project: Bulong Nickel	Test Pit No: BNLTP1
	Project No. 656	Sheet 1 of 1
	Site: Lake Yindarlgooda	Pit Size: 5 x 1 x 2.3 m
	Logged By: BAS Date: 7/9/95	Elevation: ≈ 320 m
Contractor: Donlo Excavations	Machine Type: Komatsu PC220	Location: 392100E 6602000N
Operator: Peter	Date Started: 7/9/95	Completed: 7/9/95

TEST PIT LOG

Field Engineer: Brett Stevenson

Checked by: Date:

Depth in Meters	Sample	Unified Soil Class. (USCS)	Description
0.0-0.5	-	-	Loose reddish brown sandy GRAVEL. Gravels sub rounded
0.5-2.3	Disturbed	ML	Stiff to very stiff pale grey to white sandy SILT, of low plasticity with veins of orange brown clay

Remarks: Pit excavated to refusal

Inflow of water at 2.5 m

≈ 30 m from shoreline

Knight Piésold Consulting Engineers	Project: Bulong Nickel	Test Pit No: BNLTP2
	Project No. 656	Sheet 1 of 1
	Site: Lake Yindarlgooda	Pit Size: 3 x 1 x 2.9m
	Logged By: BAS Date: 7/9/95	Elevation: ≈ 320 m
Contractor: Donlo Excavations	Machine Type: Komatsu PC220	Location: 392200E 6602000N
Operator: Peter	Date Started: 7/9/95	Completed: 7/9/95

TEST PIT LOG

Field Engineer: Brett Stevenson

Checked by: Date:

Depth in Meters	Sample	Unified Soil Class. (USCS)	Description
0.0-0.15	-	-	Loose reddish brown gravelly SAND
0.15-2.9	Disturbed	ML	Stiff to very stiff pale grey to white sandy SILT, of low plasticity

Remarks: Pit dry throughout.

Pit excavated to refusal

≈ 100 m from shoreline

WESTERN GEOTECHNICS

WESTERN GEOTECHNICS PTY LTD ACN 008 946 638 NATA REG No. 5367
ENGINEERING MATERIALS TESTING: SOIL-AGGREGATE-CONCRETE-BRICK-ROCK
18 LANE STREET, KALGOORLIE, W.A. 6430, PHONE & FAX: (090) 914-718

TEST CERTIFICATE

CLIENT: Knight Piesold
PROJECT: Bulong Nickle Project
LOCATION: Bulong

JOB NO: 273-03-011
CLIENT JOB NO: —
DATE TESTED: 22.9.95

ATTERBERG LIMITS
- according to AS 1289 *

Lab Ref No:	KG5648	KG5649	KG5650	KG5651	KG5652
Site Location:	—	—	—	—	—
Sample Id:	BNTP1	BNTP2	BNTP3	BNTP4	BNTP5
Depth (m):	—	—	—	—	—
Liquid Limit (%): (*~~C1.1~~/C1.2)	54	35	40	26	43
Plastic Limit (%): (*C2.1)	28	19	25	21	23
Plasticity Index (%): (*C3.1)	26	16	15	5	20
Linear Shrinkage (%): (*C4.1)	5.0	9.0	5.5	1.5	10

NOTES:

Sample History:	~~Oven~~/Air Dried	~~Oven~~/Air Dried	~~Oven~~/Air Dried	~~Oven~~/Air Dried	~~Oven~~/Air Dried
Preparation Method:	Dry Sieved	Dry Sieved	Dry Sieved	Dry Sieved	Dry Sieved
Shrinkage Mould Length (mm):	250	250	250	250	250
Nature of Shrinkage:	Flat/~~Curled~~	Flat/~~Curled~~	Flat/~~Curled~~	Flat/~~Curled~~	Flat/~~Curled~~

Note: Sample supplied by client.

Certificate No. : KG5648-5657

Approved Signatory : D. Corrie (D. Corrie) **Date :** 29.9.95

WESTERN GEOTECHNICS

WESTERN GEOTECHNICS PTY LTD ACN 008 946 638 NATA REG No. 5367
ENGINEERING MATERIALS TESTING: SOIL-AGGREGATE-CONCRETE-BRICK-ROCK
18 LANE STREET, KALGOORLIE, W.A. 6430, PHONE & FAX: (090) 914-718

TEST CERTIFICATE

CLIENT: Knight Piesold
PROJECT: Bolong Nickle Project
LOCATION: Bolong

JOB NO: 273-03-011
CLIENT JOB NO: —
DATE TESTED: 22.9.95

ATTERBERG LIMITS
- according to AS 1289 *

Lab Ref No:	KG5653	KG5654	KG5655	KG5656	
Site Location:	—	—	—	—	
Sample Id:	BNTP7	BNTP8	BNSL1	BNSL2	
Depth (m):	—	—	—	—	
Liquid Limit (%): (*C1.1/C1.2)	35	34	37	30	
Plastic Limit (%): (*C2.1)	22	33	31	26	
Plasticity Index (%): (*C3.1)	13	1	6	4	
Linear Shrinkage (%): (*C4.1)	5.5	1.0	2.5	1.5	

NOTES:

Sample History:	~~Oven~~/Air Dried	~~Oven~~/Air Dried	~~Oven~~/Air Dried	~~Oven~~/Air Dried	Oven/Air Dried
Preparation Method:	Dry Sieved	Dry Sieved	Dry Sieved	Dry Sieved	Dry Sieved
Shrinkage Mould Length (mm):	250	250	250	250	
Nature of Shrinkage:	Flat/~~Curled~~	Flat/~~Curled~~	Flat/~~Curled~~	Flat/~~Curled~~	Flat/Curled

Note: Sample supplied by client.

Certificate No. : KG KG5648-5657

Approved Signatory : D Corrie (D. Corrie) **Date :** 29.9.95

WESTERN GEOTECHNICS

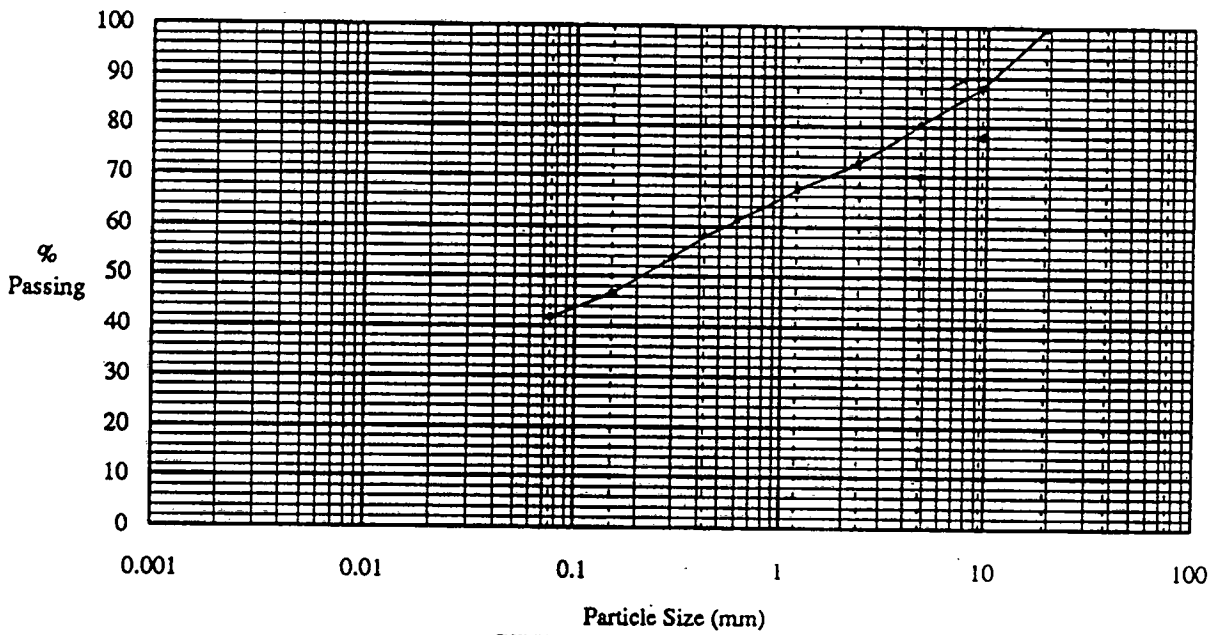
WESTERN GEOTECHNICS PTY LTD ACN 008 946 638 NATA REG No. 5367
ENGINEERING MATERIALS TESTING: SOIL-AGGREGATE-CONCRETE-BRICK-ROCK
18 LANE STREET, KALGOORLIE, W.A. 6430, PHONE & FAX: (090) 914-718

PARTICLE SIZE DISTRIBUTION TEST CERTIFICATE

CLIENT : Knight Piesold
PROJECT : Bulong Nickle Project
LOCATION : Bulong
Sample Description: Sand Silt

JOB No. : 273-03-011
Lab No. : KG 5648
Date Tested: 14·9·95
Sample Id.: BNTP 1

PARTICLE SIZE DISTRIBUTION - according to AS 1289 C6.1



SIEVE ANALYSIS

Sieve Size (mm)	% Passing
75.0	
37.5	
19.0	100
9.5	88
4.75	80
2.36	73
1.18	67
0.600	61
0.425	58
0.300	54
0.150	47
0.075	42

Note: Sample supplied by client.

Certificate No. : KG 5648-5657

Approved Signatory : D. Corrie **(D. Corrie) Date :** 29·9·95

WESTERN GEOTECHNICS

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ENGINEERING MATERIALS TESTING: SOIL-AGGREGATE-CONCRETE-BRICK-ROCK
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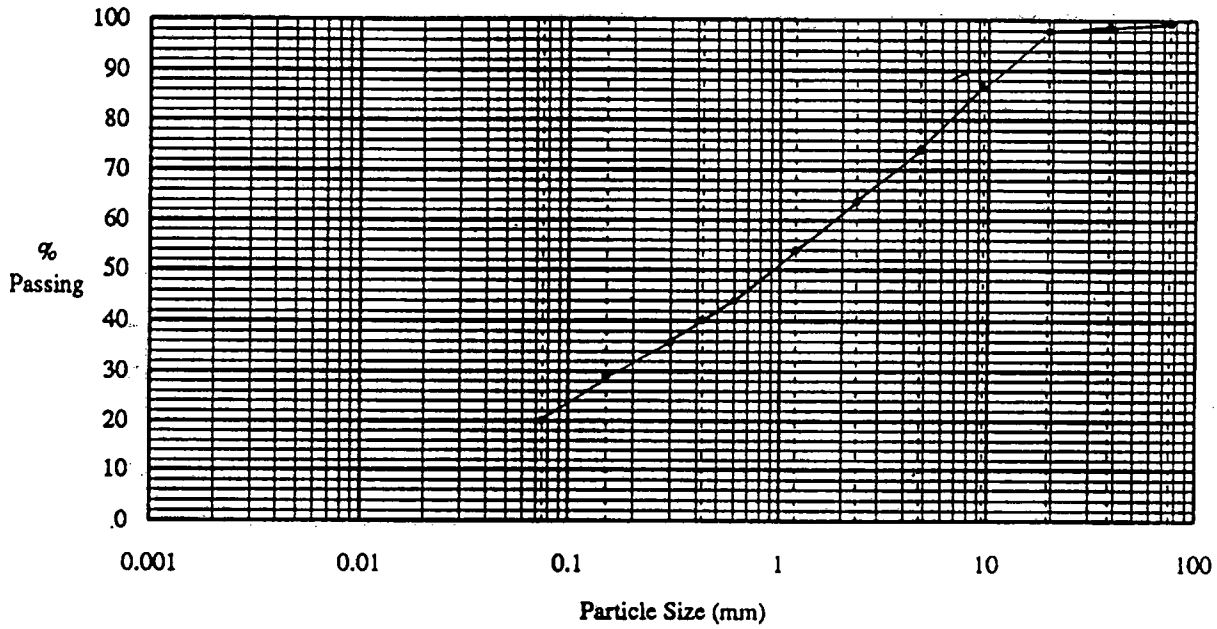
PARTICLE SIZE DISTRIBUTION TEST CERTIFICATE

CLIENT : Knight Piesold
PROJECT : Bulong Nickle Project
LOCATION : Bulong
Sample Description: S.H Sand Gravel
PARTICLE SIZE DISTRIBUTION - according to AS 1289 C6.1

JOB No. : 273-03-011
Lab No. : KG 5651
Date Tested: 18·9·95
Sample Id.: BNTP4



SIEVE ANALYSIS

Sieve Size (mm)	% Passing
75.0	100
37.5	99
19.0	98
9.5	87
4.75	74
2.36	64
1.18	54
0.600	44
0.425	40
0.300	36
0.150	29
0.075	20

Note: Sample supplied by client.

Certificate No. : KG5648-5657

Approved Signatory : D. Corrie (D. Corrie) Date : 29·9·95

WESTERN GEOTECHNICS
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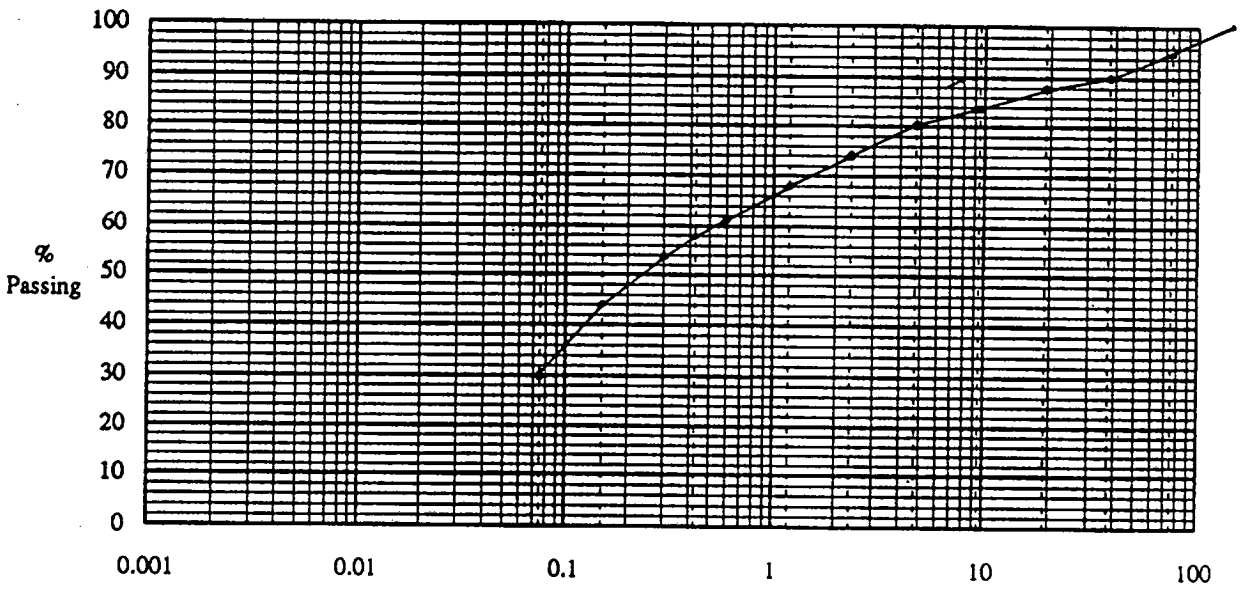
ENGINEERING MATERIALS TESTING: SOIL-AGGREGATE-CONCRETE-BRICK-ROCK
18 LANE STREET, KALGOORLIE, W.A. 6430, PHONE & FAX: (090) 914-718

PARTICLE SIZE DISTRIBUTION TEST CERTIFICATE

CLIENT : Knight Piesold
PROJECT : Bulong Nickle Project
LOCATION : Bulong
Sample Description: Clay Gravel Sand

JOB No. : 273-03-011
Lab No. : KG 5652
Date Tested: 18-9-95
Sample Id.: BNTP5

PARTICLE SIZE DISTRIBUTION - according to AS 1289 C6.1



SIEVE ANALYSIS

Sieve Size (mm)	% Passing
150 / 75.0	100 / 95
37.5	90
19.0	88
9.5	84
4.75	80
2.36	74
1.18	68
0.600	61
0.425	58
0.300	54
0.150	44
0.075	30

Note: Sample supplied by client.

Certificate No. : KG 5648-5657

Approved Signatory : D Corrie (D. Corrie) Date : 29-9-95

WESTERN GEOTECHNICS

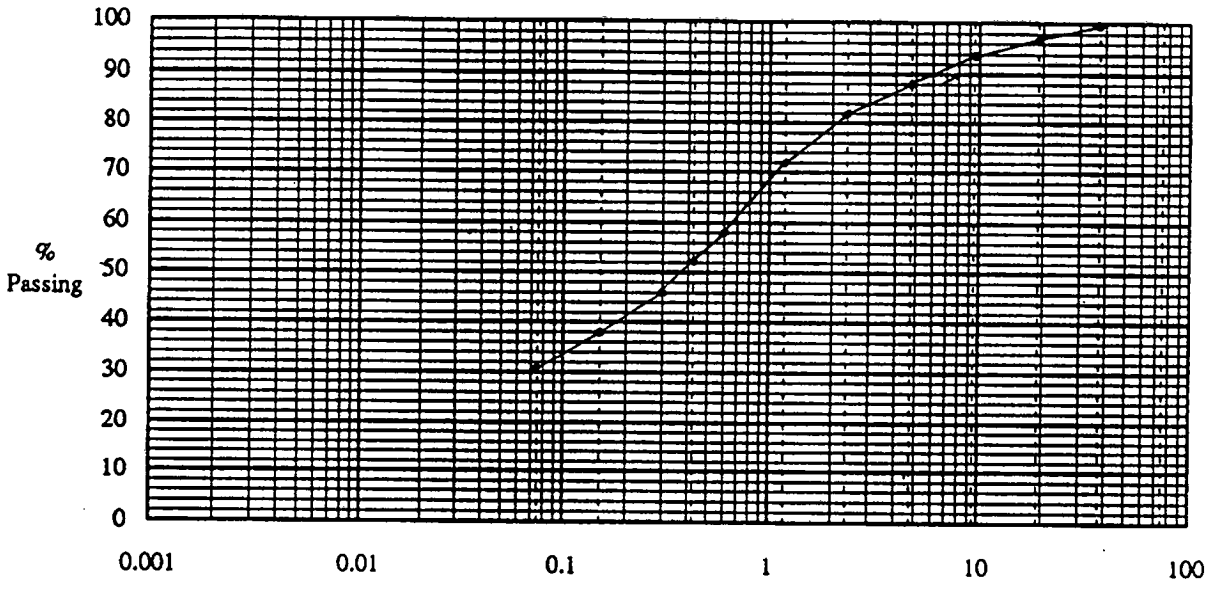
WESTERN GEOTECHNICS PTY LTD ACN 008 946 638 NATA REG No. 5367
ENGINEERING MATERIALS TESTING: SOIL-AGGREGATE-CONCRETE-BRICK-ROCK
18 LANE STREET, KALGOORLIE, W.A. 6430, PHONE & FAX: (090) 914-718

PARTICLE SIZE DISTRIBUTION TEST CERTIFICATE

CLIENT : Knight Piesold
PROJECT : Bulong Nickle Project
LOCATION : Bulong
Sample Description: Gravel Clay Sand

JOB No. : 273-03-011
Lab No. : KG 5653
Date Tested: 18.9.93
Sample Id.: BNTP7

PARTICLE SIZE DISTRIBUTION - according to AS 1289 C6.1



SIEVE ANALYSIS

Sieve Size (mm)	% Passing
75.0	
37.5	100
19.0	97
9.5	94
4.75	88
2.36	82
1.18	72
0.600	58
0.425	52
0.300	46
0.150	38
0.075	31

Note: Sample supplied by client.

Certificate No. : KG 5648-5657

Approved Signatory : D. Corrie (D. Corrie) Date : 29.9.95

WESTERN GEOTECHNICS

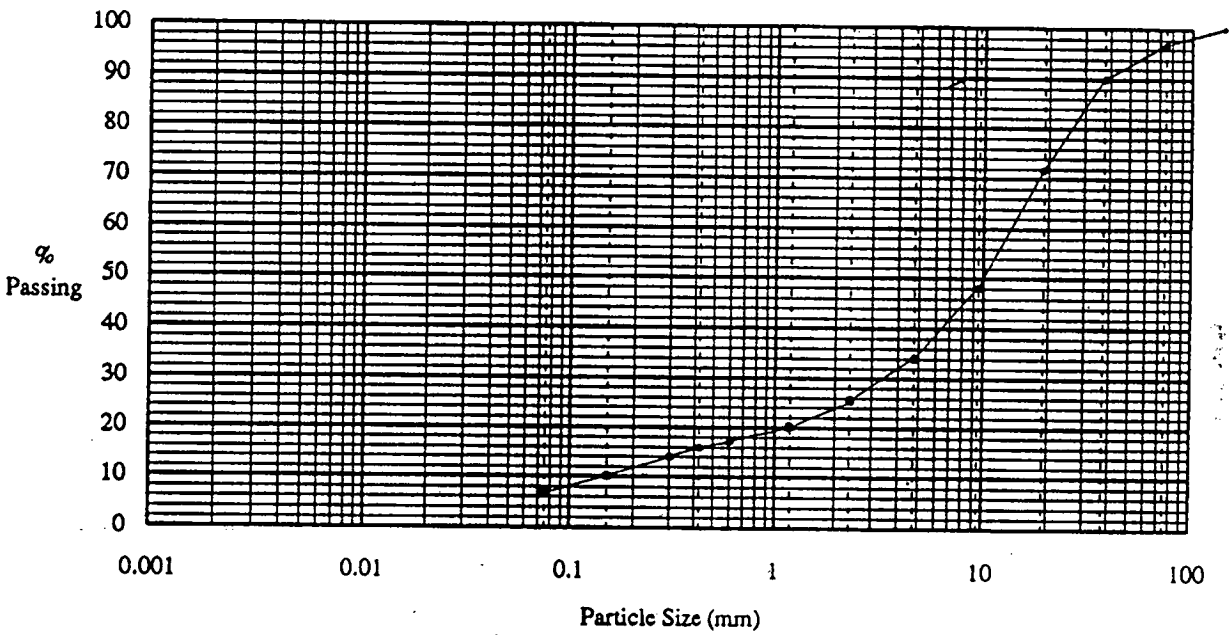
WESTERN GEOTECHNICS PTY LTD ACN 008 946 638 NATA REG No. 5367
ENGINEERING MATERIALS TESTING: SOIL-AGGREGATE-CONCRETE-BRICK-ROCK
18 LANE STREET, KALGOORLIE, W.A. 6430, PHONE & FAX: (090) 914-718

PARTICLE SIZE DISTRIBUTION TEST CERTIFICATE

CLIENT : Knight Piesold
PROJECT : Bulong Nickle Project
LOCATION : Bulong
Sample Description: Sandy Gravel

JOB No. : 273-03-011
Lab No. : KG 5654
Date Tested: 21·9·95
Sample Id.: BNTP8

PARTICLE SIZE DISTRIBUTION - according to AS 1289 C6.1



SIEVE ANALYSIS

Sieve Size (mm)	% Passing
150 / 75.0	100 / 97
37.5	90
19.0	72
9.5	48
4.75	34
2.36	26
1.18	20
0.600	17
0.425	16
0.300	14
0.150	10
0.075	7

Note: Sample supplied by client.

Certificate No. : KG5648-5657

Approved Signatory : D. Corrie (D. Corrie) **Date :** 29·9·95

WESTERN GEOTECHNICS

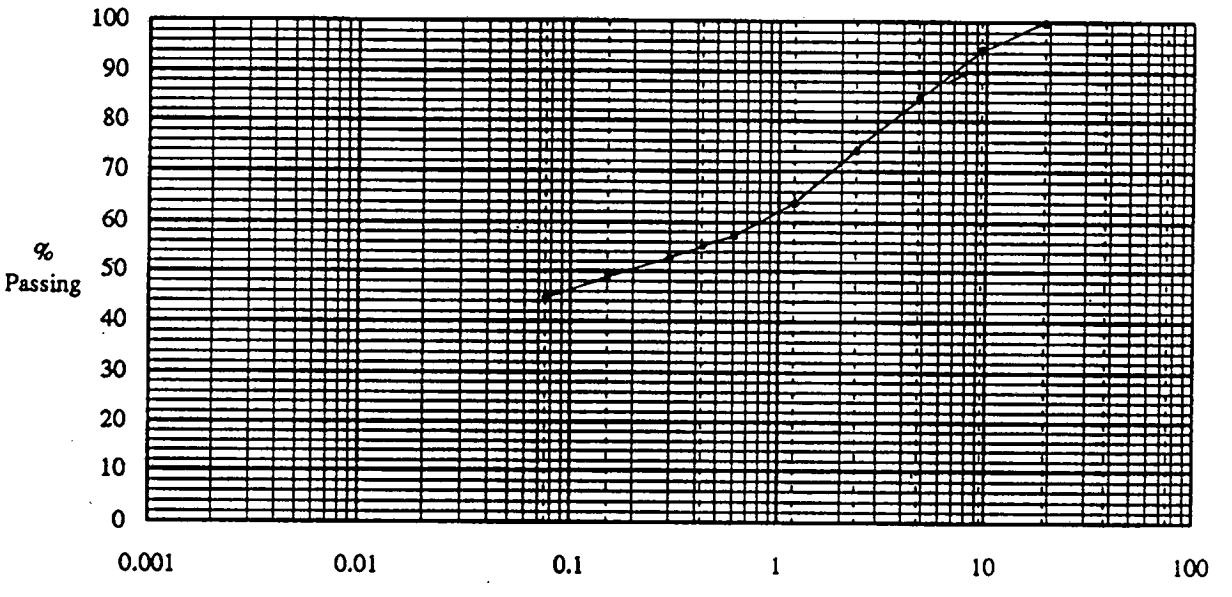
WESTERN GEOTECHNICS PTY LTD ACN 008 946 638 NATA REG No. 5367
ENGINEERING MATERIALS TESTING: SOIL-AGGREGATE-CONCRETE-BRICK-ROCK
18 LANE STREET, KALGOORLIE, W.A. 6430, PHONE & FAX: (090) 914-718

PARTICLE SIZE DISTRIBUTION TEST CERTIFICATE

CLIENT : Knight Piesold
PROJECT : Bulong Nickle Project
LOCATION : Bulong
Sample Description: Gravel Sand Clay

JOB No. : 273-03-011
Lab No. : KG 5655
Date Tested: 18·9·95
Sample Id.: BNSL1

PARTICLE SIZE DISTRIBUTION - according to AS 1289 C6.1



SIEVE ANALYSIS

Sieve Size (mm)	% Passing
75.0	
37.5	
19.0	100
9.5	95
4.75	85
2.36	74
1.18	64
0.600	57
0.425	55
0.300	53
0.150	49
0.075	45

Note: Sample supplied by client.

Certificate No. : KG5648-5657

Approved Signatory : D. Corrie (D. Corrie) **Date :** 29·9·95

WESTERN GEOTECHNICS

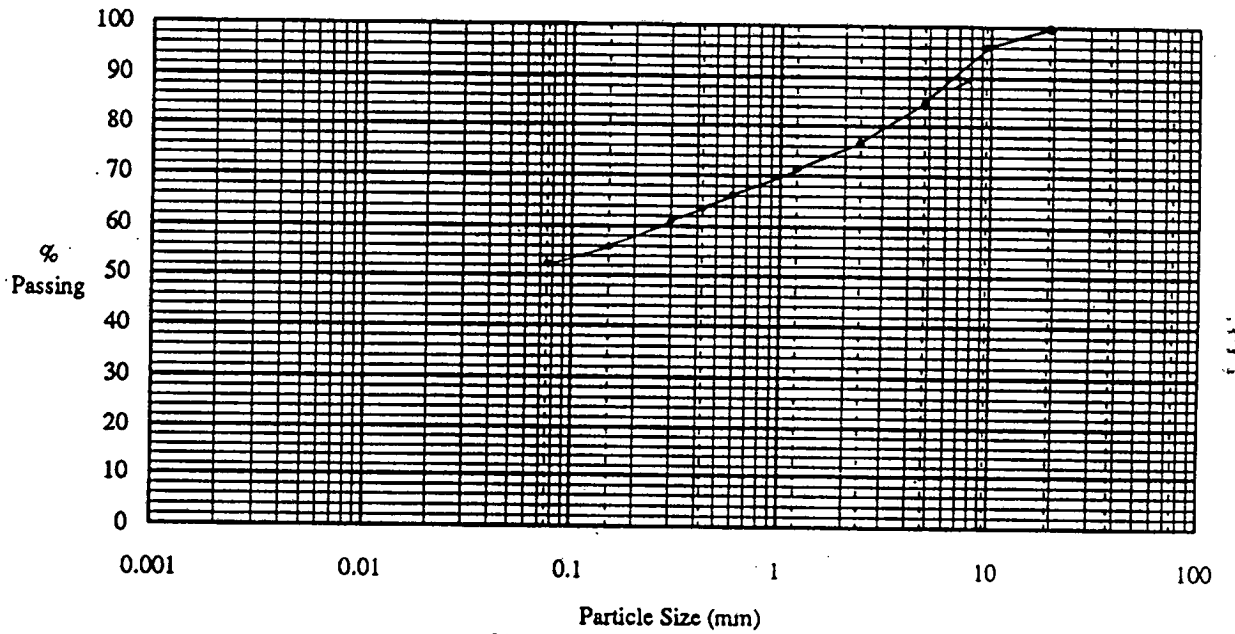
WESTERN GEOTECHNICS PTY LTD ACN 008 946 638 NATA REG No. 5367
ENGINEERING MATERIALS TESTING: SOIL-AGGREGATE-CONCRETE-BRICK-ROCK
18 LANE STREET, KALGOORLIE, W.A. 6430, PHONE & FAX: (090) 914-718

PARTICLE SIZE DISTRIBUTION TEST CERTIFICATE

CLIENT : Knight Piesold
PROJECT : Bulong Nickle Project
LOCATION : Bulong
Sample Description: Gravel Sand Clay

JOB No. : 273-03-011
Lab No. : KG 5656
Date Tested: 21.9.95
Sample Id.: BNSL2

PARTICLE SIZE DISTRIBUTION - according to AS 1289 C6.1



SIEVE ANALYSIS

Sieve Size (mm)	% Passing
75.0	
37.5	
19.0	100
9.5	96
4.75	85
2.36	77
1.18	71
0.600	66
0.425	64
0.300	61
0.150	56
0.075	52

Note: Sample supplied by client.

Certificate No. : KG5648-5657

Approved Signatory : D. Corrie (D. Corrie) Date : 29.9.95

WESTERN GEOTECHNICS

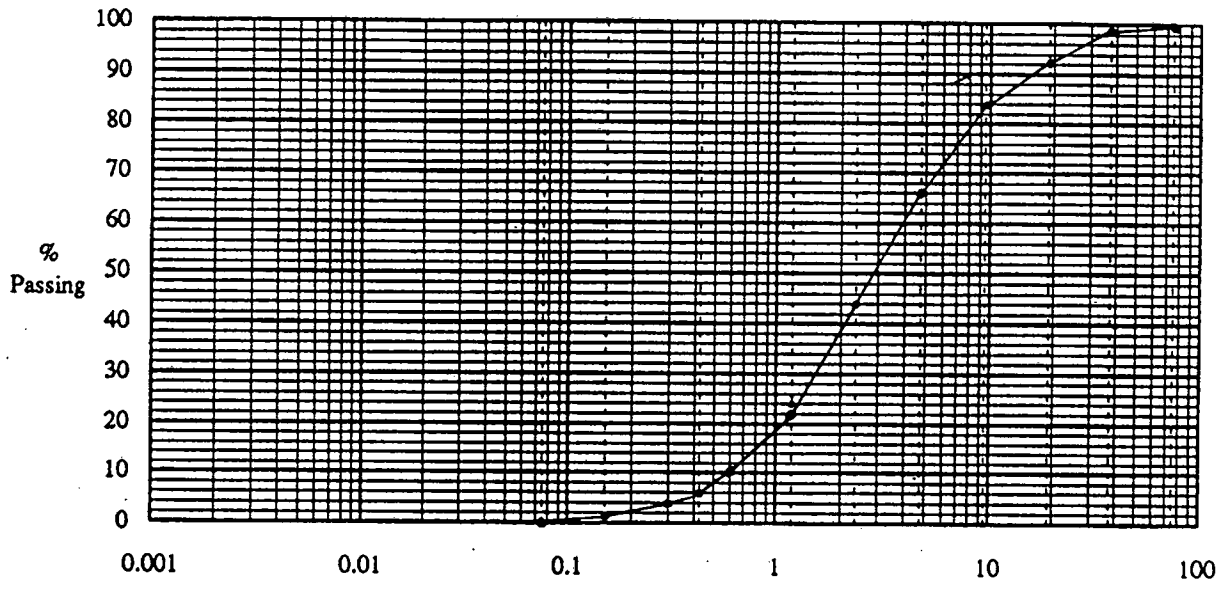
WESTERN GEOTECHNICS PTY LTD ACN 008 946 638 NATA REG No. 5367
ENGINEERING MATERIALS TESTING: SOIL-AGGREGATE-CONCRETE-BRICK-ROCK
18 LANE STREET, KALGOORLIE, W.A. 6430, PHONE & FAX: (090) 914-718

PARTICLE SIZE DISTRIBUTION TEST CERTIFICATE

CLIENT : Knight Piesold
PROJECT : Bulong Nickle Project
LOCATION : Bulong
Sample Description: Sand Gravel

JOB No. : 273-03-011
Lab No. : KG 5657
Date Tested: 21·9·95
Sample Id.: BNSAM1

PARTICLE SIZE DISTRIBUTION - according to AS 1289 C6.1



SIEVE ANALYSIS

Sieve Size (mm)	% Passing
75.0	100
37.5	99
19.0	92
9.5	84
4.75	66
2.36	42
1.18	22
0.600	10
0.425	6
0.300	4
0.150	1
0.075	0

Note: Sample supplied by client.

Certificate No. : KG 5648-5657

Approved Signatory : D. Corrie (D. Corrie) Date : 29·9·95

WESTERN GEOTECHNICS
WESTERN GEOTECHNICS PTY LTD ACN 008 946 638 NATA REG No 2418
ENGINEERING MATERIALS TESTING: SOIL-AGGREGATE-CONCRETE-BRICK-ROCK
16 MALVERN RD, RIVERVALE, WA 6103 PHONE (09)470 3211 FAX 470 4141

TEST CERTIFICATE

Attachment 1 of 1

CLIENT : Knight Piesold Pty Ltd
PROJECT: Bulong Nickel Project
LOCATION: Bulong

JOB NO: 273-03-011
CLIENT JOB NO: -
DATE TESTED : 10-19.10.95

PERMEABILITY TEST RESULTS
-by Falling Head Method

LAB REF NO.	SAMPLE ID.	DRY DENSITY (t/m^3)	MOISTURE CONTENT Initial (%)	MOISTURE CONTENT Final (%)	PERMEABILITY, k (m/sec)
WG 28204	BNTP4, KG 5651	1.80	13.3	19.1	1.1×10^{-8}
WG 28205	BNTP5, KG 5652	1.65	18.3	24.4	5.4×10^{-8}
WG 28206	BNTP7, KG 5653	1.85	11.1	20.0	9.9×10^{-9}

NOTES:

1. The samples were remoulded to 95% of SMDD (AS1289 5.1.1)
2. Dimensions of permeameter tube specimen :
   diameter = 61 mm
   length = 100 mm
3. Initial saturation achieved by de-airing under vacuum.
4. The "Falling Head" Permeability tests were started at an initial head height of two metres.
5. Successive falling head readings were taken until steady state conditions were achieved, i.e. constant value for permeability.
6. Tap water was used as the permeant.
7. Sample supplied by client.

Authorised Signatory: Melissa Castle (M. Castle) Date: 24/10/95

Form No. PERM #2 94/1

656/K

WESTERN GEOTECHNICS

WESTERN GEOTECHNICS PTY LTD ACN 008 946 638 NATA REG No 2418
ENGINEERING MATERIALS TESTING: SOIL-AGGREGATE-CONCRETE-BRICK-ROCK
16 MALVERN RD, RIVERVALE, WA 6103 PHONE (09)470 3211 FAX 470 4141

TEST CERTIFICATE

CLIENT : DE Cooper & Associates Pty Ltd
PROJECT: Bulong Tailings Dam
LOCATION: -

JOB NO: 201-01-024
CLIENT JOB NO: -
DATE TESTED : 20.4.95

PERMEABILITY TEST RESULTS
-by Falling Head Method

LAB REF NO.	SAMPLE ID.	DRY DENSITY (t/m³)	MOISTURE CONTENT Initial (%)	MOISTURE CONTENT Final (%)	PERMEABILITY, k (m/sec)
WG 25007	-	1.29	40.6	44.2	7.4×10^{-11}

Description: Composite Clay Sample
(From Borrow Area)

NOTES:

1. The sample was remoulded.
2. Dimensions of permeameter tube specimen :
   diameter = 64 mm
   length = 100 mm
3. Initial saturation achieved by de-airing under vacuum.
4. The "Falling Head" Permeability tests were started at an initial head height of two metres.
5. Successive falling head readings were taken until steady state conditions were achieved, i.e. constant value for permeability.
6. Tap water was used as the permeant.
7. Sample supplied by client.

Authorised Signatory: Melvyn Castle (M. Castle) **Date:** 19/5/95

Appendix J

ABBREVIATIONS

Appendix J

ABBREVIATIONS

BNLP	Bulong Nickel Laterite Project
CALM	Department of Conservation and Land Management
CAMBA	China–Australia Migratory Bird Agreement
CCD	counter-current decantation circuit
CER	Consultative Environmental Review
DOME	Department of Minerals and Energy
EC	Electrical Conductivity
ECP	erosion control plan
EMP	Environmental Management Plan
EPA	Environmental Protection Authority of Western Australia
GDAC	Goldfields Dust Abatement Committee
JAMBA	Japan–Australia Migratory Bird Agreement
KBULG	Kalgoorlie–Boulder Urban Landcare Group
Kinhill	Kinhill Engineers Pty Ltd
KNO	Kambalda Nickel Operations
KNS	Kalgoorlie Nickel Smelter
MCC	Motor Control Centre
NOI	Notice of Intent
SAG	semi-autogenous grinding
Study Area	Kalgoorlie–Kurnalpi Study Area
SX	solvent extraction
TDS	total dissolved solids
WAM	Western Australian Museum
WCWA	Water Corporation of Western Australia
WMC	Western Mining Corporation Ltd

Appendix K

WEIGHTS AND MEASURES

Appendix K

WEIGHTS AND MEASURES

°C	degree(s) centigrade
1 in 100 year rainfall event	worst possible rainfall event having a 99% chance of occurring within a 100-year period
2.75(H):1(V)	ratio of 2.75:1, horizontal vs vertical
AHD	Australian height datum
ANC	acid neutralisation capacity
ASL	above sea level
BCM	bulk cubic metre(s)
BOD_5	five-day biochemical oxygen demand
BTOC	below top of casing
cm	centimetre(s)
dB(A)	decibel(s) A-weighted
g/L	grams(s) per litre
g/m^3	gram(s) per cubic metre
ha	hectare(s)
kg/ha/a	kilogram(s) per hectares(s) per annum
kg/sec	kilogram(s) per second
kg/t	kilogram(s) per tonne
kL	kilolitre(s)
km/h	kilometre(s) per hour
kL/d	kilolitre(s) per day
km^2	square kilometre(s)
kPa	kilopascal(s)
kV	kilovolt(s)

kW	kilowatt(s)
m	metre(s)
m/d	metre(s) per day
m/sec	metre(s) per second
m^3	cubic metre(s)
m^3/d	cubic metre(s) per day
m^3/h	cubic metre(s) per hour
mBTOC	metre(s) below top of the casing
mg/L	milligram(s) per litre
mg/m^3	milligram(s) per cubic metre
$mg/m^2/d$	milligram(s) per square metre per day
mm/a	millimetre(s) per annum
Mm^2	million square metre(s)
mm	millimetre(s)
mRL	metre(s) relative level
mS/m	millisiemens(s) per metre
Mt	million tonne(s)
Mt/a	million tonne(s) per annum
MW	megawatt(s)
ppm	part(s) per million
S/R Vol/Vol	strip ratio volume for volume
t	tonne(s)
t/a	tonne(s) per annum
t/d	tonne(s) per day
t/m^3	tonne(s) per cubic metre
TDS	total dissolved solids
Vol/Vol	volume for volume
$\mu g/m^3$	microgram(s) per cubic metre

Appendix L

GUIDELINES FOR THE CONSULTATIVE ENVIRONMENTAL REVIEW

BULONG NICKEL COBALT LATERITE PROJECT(996)
RESOLUTE SAMANTHA LTD

CONSULTATIVE ENVIRONMENTAL REVIEW GUIDELINES

Overview

All environmental reviews have the objective of protecting the environment, and environmental impact assessment is deliberately a public process in order to obtain broad ranging advice. The review requires the proponent to describe the proposal, receiving environment, potential environmental impacts and the management of the issues arising from the environmental impacts, so that the environment is protected to an acceptable level.

Throughout the assessment, the Department of Environmental Protection (DEP) aims to assist the proponent to improve the proposal so that environmental impacts are minimised. The DEP also co-ordinates advice from relevant government agencies and the public about environmental matters during the assessment of the Consultative Environmental Review (CER).

Objectives of the CER

- To communicate clearly with the public and government agencies, so that the EPA can obtain informed comment to assist in providing advice to government.
- To describe all aspects of the proposal adequately, so that the Minister for the Environment can consider approval of a well-defined project.
- To provide the basis for the environmental management programme, which should demonstrate that the environmental issues resulting from the proposal can be acceptably managed.

The contents of the CER should reflect these objectives.

Contents of the CER

The text of the CER should be simple, concise, and referenced. This document would form the legal basis of the Minister for the Environment's approval of the proposal and should include a description of all the components of the proposal.

The environmental management programme for the proposal should be developed in conjunction with the engineering and economic programs of the proposal. That is, the CER should be designed to be immediately useful at the start of the proposal, and the DEP recommends that an environmental management and audit programme be incorporated as a concluding part of the CER.

The textual content of the CER should include:

- introduction to the proponent, the project and location;
- the legal framework, decision making authorities and involved agencies;
- description of the components of the proposal and identification of the potential environmental impacts;
- description of the receiving environment which may be affected;
- discussion of the key environmental topics (shown in the next section), including an assessment of their significance in comparison to relevant objectives, policies or standards;
- discussion of the objectives for management of the issues, including commitments to appropriate action; and
- a summary of the environmental management programme, including the key commitments, monitoring work and the auditing of the programme.

The EPA considers that the proponent should approach environmental management in terms of best practice, which includes:

- development of an environmental policy;
- agreed environmental objectives;
- management practices to achieve the objectives;
- involve the public as appropriate;
- audit environmental performance against agreed indicators;
- regular reporting to the EPA (or nominated agency);
- commitment to a quality assured management system and continuous improvement; and
- periodic review in conjunction with the EPA (or nominated agency).

Additional content requirements for the CER are included in the next section.

Key environmental topics

The key topics can be determined from a consideration, called scoping, of the potential impacts of the proposal on the environment. The receiving environment includes social surroundings.

The CER should focus on the key topics for the proposal as agreed in consultation with the DEP and relevant government agencies. A description of the project component and the receiving environment should be directly included with, or referenced to, the discussion of the topic. The technical basis for measuring the impact and any specifications or standards for assessing and managing the topic should be provided.

The key topics identified at this stage and the EPA objectives include:

Environmental topic	EPA objective
Leach residue disposal area and evaporation pond	Ensure the leach residue disposal area and evaporation pond are located and designed so as to minimise environmental impacts.
Social surroundings	Develop procedures in accordance with: Working with Communities, A Guide for Proponents, November 1993, Dept. Commerce and Trade
Rehabilitation	Develop process to identify post-mining land uses and define appropriate rehabilitation criteria.
Risk	Implement project to comply with criteria in EPA Bulletins 611 and 627
Environmental Management Programme	Implement an approved and effective EMP
NO_2 emissions	The maximum one hour average of NO_2 should not exceed 320 ug/m^3 at the nearest residence (World Health Organisation Standard).
SO_2 emissions	The maximum one hour average of SO_2 should not exceed 350 ug/m^3 at the nearest residence (World Health Organisation Standard).
H_2S emissions	Ground level concentration (3 minute glc value) should not exceed 0.00014 mg/m^3 or 0.0001ppm at nearest residence (Victorian EPA 1981 SEPP Policy Schedule 3).
CO emissions	Maximum one hour average of CO should not exceed 30 mg/m^3 at nearest residence. Maximum 8 hour average of CO should not exceed 10 mg/m^3 at nearest residence (NHMRC standards).
Greenhouse gas emissions	Consistent with EPA requirements.

Environmental topic	EPA objective
Effects of gaseous emissions / dust on native vegetation.	Protect native vegetation from effects of gaseous emissions / dust on advice from CALM and DEP.
Fugitive dust - storage, transport and handling of materials	Control fugitive dust to an acceptable standard as determined by DEP.
Solid and liquid wastes	Implement best practice to avoid creating a contaminated site; refer to ANZECC & NHMRC 1992 Guidelines
Surface drainage	Ensure no adverse changes to existing drainage systems, vegetation/land systems, and dependent fauna.
Powerlines, pipelines, other utilities	Select route which avoids sensitive areas; rehabilitate to agreed landowner specifications.
Protect groundwater resource from pollution	Implement best practice to avoid contaminating the groundwater, refer to EPA Bulletin 711.
Water supply	Calculate water budget and ensure groundwater resource is not depleted.
Flora and fauna	Protect rare and endangered species. Minimise the loss of locally and regionally significant vegetation associations.

Commonwealth requirements (if applicable)

Environmental topic	objective
National Estate Areas	Protect National Estate areas
Endangered species	Protect species listed in Schedule 1 of the Endangered Species Protection Act

Further key topics may be raised during the preparation of the CER, and on-going consultation with the DEP and relevant agencies is recommended. Minor issues which can be readily managed as part of normal operations may be briefly described. Information used to reach conclusions should be properly referenced, including personal communications. Assessments of the significance of an impact should be soundly based rather than unsubstantiated opinions, and the assessment should lead to a discussion of the management of the issue.

In discussing the key topics identified in the table above, the CER should contain:

- the results of recent, comprehensive, fauna and flora surveys;
- an assessment of the regional significance of the vegetation associations likely to be affected by this proposal, including discussion of the representation of these associations in secure conservation areas;
- the probable pond water budget for the pond area remaining once mining is complete;
- evidence of an adequate EMS and demonstrated proponent commitment to environmental performance;
- a table summarising the key characteristics of the proposal. For example, clearing rates, mining rate, separation & processing rates, and trucking rate. This will facilitate the assessment of any future changes to the operation;
- pollution source flow sheet which quantifies point source emissions;
- two base maps and an overlay of the proposed project layout. The base maps should show the existing physical and social environment, which when displayed with the overlay illustrate the physical disturbance likely, and the impacts on residents and

residential centres;

- a table summarising the environmental impacts of the proposal and describing:
  - the present state of the environment;
  - potential impacts of the proposal on the environment;
  - environmental management objectives for those aspects which require management;
  - environmental management proposed to manage impacts to meet those objectives; &
  - envisaged resultant state of the environment.

  These topics should be presented under the major headings used in the table above ie, biophysical environment, pollution potential, and social surroundings.

Public consultation

A description should be provided of the public participation and consultation activities undertaken by the proponent in preparing the CER. It should describe the activities undertaken, the dates, the groups/individuals involved and the objectives of the activities. Cross reference should be made with the description of environmental management of the issues which should clearly indicate how community concerns have been addressed. Those concerns which are dealt with outside the EPA process can be noted and referenced.

Environmental management commitments

The method of implementation of the proposal and all commitments made by the proponent in the CER become legally enforceable under the conditions of environmental approval issued by the Minister for the Environment. Commitments which address key environmental topics form a schedule to the Minister's environmental conditions and will be audited by the DEP. The commitments have the form of: the proponent (who) will prepare a plan or take action (what) to meet an objective, to the timing for its achievement (when), and to which agencies will be consulted or to whose requirements, if not the DEP, the action/plan will be prepared.

Other commitments show that the proponent is dedicated to good environmental management of the project, and the DEP expects that the proponent will audit these commitments by internal processes under an Environmental Management System. Though not subject to routine audit, the DEP may request that compliance with, or the in-house audit of, these commitments be demonstrated, so as to verify satisfactory environmental performance. The commitments define the goals/objectives for the environmental management programme and procedures (the details of how the commitment will be met), which should be described in as much detail as possible. The DEP acknowledges that, with the implementation of best practice and continuous improvement for the project, the procedures may need to be modified, or added to, in regular updates to the environmental management programme. An example of a typical commitment is:

Issue	Objective	Commitment	Timing (Phase)	Whose requirements	Specification (Performance Indicator)
EMP	Implement effective EMP	Develop and implement an effective EMP	Pre-construction and on-going	DEP	EMP developed and implemented to requirements of DEP.