DEFARTMENT OF MINES SOUTH AUSTRALIA

GEOLOGICAL SURVEY ENVIRONMENT AND RESOURCE DIVISION

BALLAST SUFFLIES FOR MURRAY LANDS RAILWAYS SITE INVESTIGATIONS AT TAILEN BEND

County of Russel, Hundred of Seymour, Section 68

CLIENT: SOUTH AUSTRALIAN RAILWAYS

by

D. Nichol Geologist Industrial Minerals Section

> Rept.Bk.No. 74/111 G.S. No. 5429 D.M. No. 559/73

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PLANS ACCOMPANYING REPORT

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74-316	Murray Lands Railways. Tailem Bend Site. Sec. 68, Hd. Seymour. Locality Plan.	1:1 000 000
S10065a	Murray Lands Railways Ballast Supplies. Tailem Bend Area. Geological Plan.	1:40 000
74-314	Murray Lands Railways. Tailem Bend Site. Sec. 68, Hd. Seymour. Location of Drillholes and Seismic Traverses.	1:5 000 and 1:1 000
74-315	Murray Lands Railways. Tailem Bend Site. Secl 68, Hd. Seymour. Cross Section AA'.	1:5000
s10821	Murray Lands Railways. Tailem Bend Site. Sec.68 Hd. Seymour. Screen Size Analysis Sample A327/73	

DEPARTMENT OF MINES SOUTH AUSTRALIA

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BALLAST SUPPLIES FOR MURRAY LANDS RAILWAYS SITE INVESTIGATIONS AT TAILEM BEND

County of Russel, Hundred of Seymour, Section 68

CLIENT: South Australian Railways

ABSTRACT

Railway ballast was sought from amphibolite of the Kanmantoo Group of Cambrian age which subcrops on a bedrock ridge in the Murray Basin near Tailem Bend.

A surface sample of amphibolite returned low Los Angelese Abrasion and Sodium Sulphate Soundness losses of 12 per cent and 0.5 per cent respectively. No deleterious minerals were observed.

Forty-two rotary air drill holes and five seismic traverses defined a target area of 2650 square metres. Overburden, averaging 2.9 metres in thickness comprised Loxton Sands, Blanchetown Clay, calcrete of the Bakara Soil and Molineaux Sand.

Four diamond core drillholes intersected a sequence of amphibolites and quartzites suitable for ballast with interbeds of weathered schist which would be deleterious in crushed rock. The high proportion of weathered schist is unacceptable for railway ballast.

Before the site is abandoned trenching is recommended to examine the lateral extension of a favourable zone, 18 metres wide intersected in diamond core hole DT1.

INTRODUCTION

The South Australian Railways requested the Department of Mines to locate sources of railway ballast for the Murray Lands Railways.

A reconnaissance inspection between Renmark and Tailem
Bend was made by M.N. Hiern, Supervising Geologist, Environment and
Resource Division and G. Brookman, Chief Engineers Department,
South Australian Railways on 30th and 31st August, 1972. Exploration
near Pungonda and in the vicinity of Tailem Bend was recommended.

Investigation of the ballast source at Pungonda is reported by Nichol (1972).

This report describes detailed investigations of the Tailem Bend site, located 5 kilometres east of Tailem Bend and 1 kilometre south of the Tailem Bend to Alawoona Railway line in section 68, hundred of Seymour (see locality plan No.74-316).

The project entailed the following work supervised by the author:

Reconnaissance mapping from 27.11.72 to 30.11.72
Topographic Survey by D.Borchardt from 25.6.73 to 29.6.73
Rotary air drilling from 25.6.73 to 5.7.73
Seismic traversing by R.G. Nelson from 19.9.73 to 20.9.73
Diamond Drilling from 29.11.73 to 17.12.73

Petrographic examination was performed by the Australian Mineral Development Laboratories. Abrasion and soundness tests were carried out by the South Australian Highways Department Materials and Research Laboratories. The results of these investigations are referred to in the text of this report and the full petrographic descriptions and test results comprise Appendix A and Appendix B respectively.

Section 68, hundred of Seymour is freehold land. Entry was negotiated with the landowner by South Australian Railways.

GEOLOGICAL SETTING

The area lies in the western portion of the Murray Basin. Regional geology is shown on BARKER (Thomson and Horwitz, 1962) and is described in Parkin (1969).

Bedrock comprises schists, gneisses, quartzites and amphibolites of the Kanmantoo Group of Cambrian age intruded by Murray Bridge Granite emplaced during the Lower Palaeozoic Delamerian Orogeny. Rocks of the Kanmantoo Group are also widespread in the

eastern Mount Lofty Ranges.

The Murray Basin was shaped and infilled with sediments during the Tertiary period. The Tertiary and younger formations overlying bedrock in the Tailem Bend site area are Pliocene Loxton Sands, Pleistocene Blanchetown Clay and calcrete of the Bakara Soil and Recent aeolian Molineaux Sand.

Isolated bedrock exposures in the Murray Bridge and Tailem Bend district are the surface expression of bedrock ridges formed by block faulting in the early Tertiary associated with the development of the Murray Basin.

The pronounced bend in the River Murray at Tailem Bend is caused by the presence of a bedrock ridge which trends northeast-southwest. (see plan No.S10065a).

AMPHIBOLITE IN THE TAILEM BEND AREA

Abundant large boulders of amphibolite subcrop in a railway cutting in section 336, hundred of Seymour (see geological plan No.S10065a) and a small area of amphibolite float was noted in section 68, hundred of Seymour during the August 1972 reconnaissance. Closely spaced traversing revealed two other areas of subcrop in sections 488 and 335, hundred of Seymour.

Patches of float provide the sole surface indication of amphibolite below ground surface.

Section 68, hundred of Seymour was selected for detailed investigation because it lies near the Tailem Bend to Alawoona railway line and surface extent of float was widest.

SITE INVESTIGATIONS

Topography

The Tailem Bend atte lies on the bedrock ridge and occupies a minor depression in locally high ground, 40 to 50 metres above sea

level. The site is flanked to the north, south and west by sand ridges which conceal the area from the surrounding public roads. The land is cultivated.

Laboratory Testing

Petrographic examination of a representative surface sample from section 336, hundred of Seymour (see Appendix A) showed the rock to be composed of 45 per cent amphibole, 45 per cent plagicalse and minor chlorite, opaques, apatite and epidote. No swelling type clay minerals or other deleterious alteration products were present.

Los Angeles Abrasion and Sodium Sulphate Soundness tests

Sample
were performed on a representative surface, from section 366, hundred
of Seymour (see Appendix B). The results of the tests are presented
in Table 1.

TABLE 1

ABRASION AND SOUNDNESS VALUES

Rock Type	Los Angeles Abrasion	Sodium Sulphate Soundness
	(per cent loss)	(per cent loss)
Amphibolite	12	0-5

All testing was conducted on minus 1% inch plus % inch size material. Amphibolite from the deposit tested in section 68, hundred of Seymour is identical in hand specimen to the samples tested.

Rotary Air Drilling

A programme of rotary air drilling was devised to establish the area underlain by amphibolite and to determine the nature and thickness of overburden at the selected site. Drillholes were sited on a grid basis, initially at 100 metre centres, with later intermediate holes at 25 metre centres (see Plan No.74-314).

An additional reconnaissance hole, MX1, was sited on top of the highest hill in the area in section 68, hundred of Seymour (see plan No.S10065a). This hole was drilled to a depth of 15 metres and failed to intersect bedrock.

Geological logs of 43 rotary air drillholes are presented in Appendix C.

Amphibolite was intersected in 10 holes and quartzite was intersected in 6 holes shown on plan No.74-314. The quality of the material could not be ascertained from the powder and fine chip samples. However, intersections of mica schist were soft due to weathering breakdown.

Material overlying amphibolite and quartzite ranges from

1.8 metres to 4.6 metres and average 2.9 metres in depth. Thicknesses
for each unit are summarised in Table 2.

TABLE 2
THICKNESSES OF UNITS IN OVERBURDEN

<u>Unit</u>	Range in thickness intersected (metres)	Average thickness intersected (metres)	NO. of holes
Molineaux Sand	0.4-1.0	0.7	2
Calcrete of the Bakara Soil	1.0-2.4	1.2	15
Blanchetown Clay	0.8-3.0	1.7	16
Loxton Sands	0.6-1.8	0.8	3

Rotary air drillholes MT3, MT8 and MX1 intersected a thick sequence of Lexton Sands. Size grading of sand sample A327/73 representing the interval 11 to 16 metres of drillhole MT8 is shown graphically on plan No.S10821. The material is suitable for mortar sand and, after washing to remove excessive minus 200 mesh material, would comply with Australian Standard A77 for concrete sand.

Seismic Traversing

A programme of seismic traversing was devised to define the outer limit of the amphibolite area located by rotary air drillholes.

The location of seismic spreads is shown on plan No.74-314 and the results are detailed by Nelson (1973).

Marked contrast between high velocity rocks and low velocity rocks defined the contact between amphibolite and quartzite (velocity range 4,500 to 6,000 m/s) and schist (2,400 - 3,400 m/s). A target area of 3650 square metres enclosing the area outlined by rotary air drilling was established.

Accurate depth estimations are not possible as the calcrete horizon forms a velocity inversion layer within the low velocity clay and sand overburden.

Diamond Drilling

Diamond core drilling was undertaken with the following objectives:-

- 1. to check the limits of the target area outlined by seismic traversing.
- 2. to block out reserves.
- 3. to investigate weathering effects on the upper portion of the bedrock.
- 4. to provide subsurface material for laboratory evaluation.

The four diamond core drillholes detailed in Table 3 were completed in a programme totalling 76.30 metres.

TABLE 3
DIAMOND DRILLHOLE PROGRAMME

Hole No.	<u>Inclination</u>	Depth (metres)
DT1	52° to 271° (true)	28.30
DT2	vertical	2.00
DT3	45° to 274° (true)	30.40
DT4	45° to 267° (true)	15.60

Drillhole locations are shown on plan No.74-314. Geological logs are presented in Appendix B, summarised in Table 4 and shown graphically on cross-section AA' (plan No.74-315).

TABLE 4
SUMMARY OF DIAMOND DRILLHOLES

Hole No.	Interval from	(metres)	Description
DT1	0	2.10	overburden
	2.10	7.65	quartzite
	7.65	28.20	amphibolite with minor quartzite and schist
	28.20	28.30	mica schist
DT2	0	1.3	overburden
	1.3	2.0	amphibolite
DT3	0	2.30	overburden
	2.30	18.78	schist
	18.78	28.90	amphibolite with minor shhist
	28.90	30.40	quartzite
DT4	0	3.00	overburden
	3.00	15.60	schist with minor amphibolite

Interlayered black amphibolite, pink and grey quartzite and dark green hornblende schist and mica schist were encountered.

The schist layers are heavily weathered to a known depth of 12 metres from the surface and are unsuitable for ballast.

The layered bedrock sequence dips at 85° eastwards. A strike direction of north-northeast was assumed based on a general alignment of the four amphibolite subcrop areas and a single measured strike direction of 020° (true) at outcrop of schist in section 336, hundred of Seymour. (See geological plan No.810065a).

The only possible workable zone, 18 metres wide intersected in DT1 consists of 69 per cent amphibolite and quartzite. A potential 100,000 cubic metres could be obtained from an excavation 17 metres deep provided material of similar quality persisted along strike for at least 330 metres. Trenching is recommended to investigate the lateral extension of this zone. Proposed back-hoe trench sites are shown on plan No.74-314.

SUMMARY AND CONCLUSIONS

Detailed site investigations for railway ballast for the Murray Lands Railways have been carried out near Tailem Bend.

Steeply dipping, interlayered amphibolite, quartzite and schist of the Kanmantoo Group of Cambrian age subcrop along a pronounced bedrock ridge within the western portion of the Murray Basin.

Petrographic examination of a surface sample of amphibolite revealed no deleterious minerals. Laboratory testing showed a Los Angeles Abrasion loss of 12 percent with low Sodium Sulphate Soundness loss.

Rotary air drilling and seismic traversing at a site close to the Tailem Bend to Alawoona railway line defined a promising area for further testing. Here, amphibolite and quartzite are overlain

by Loxton Sands, Blanchetown Clay, calcrete of the Bakara Soil and Molineaux Sand. Overburden thickness ranges from 1.8 metres to 4.6 metres and averages 2.9 metres in depth.

Diamond core drillholes revealed a high proportion of weathered hornblende schist and mica schist which would be deleterious in crushed rock. The widest zone poor in schist was 18 metres intersected by DT1. An excavation 330 metres long and 17 metres deep is needed to produce 100,000 cubic metres of rock. Trenching is recommended to investigate the strike extension of this zone before the site is finally abandoned.

DN:JL 9th May, 1974 Douglas Nichol Geologist Industrial Minerals Section

REFERENCES

- Nelson, R.G., 1973. Amphibolite Deposit near Tailem Bend Seismic Survey. Hd. Seymour. Co. Russel.. Dept. Mines unpublished Report RB.73/268.
- Nichol, D., 1972. Ballast Supplies for Murray Lands Railways.

 Pungonda Deposit. Dept. Mines unpublished report RB.72/218.
- Parkin, L.W. (Editor), 1969. Handbook of South Australian Geology.

 Geol. Surv. S.Aust., 268 pp.
- Thomson, B.P., and HORWITZ, R.C., 1962. BARKER map sheet, Geological

 Atlas of South Australia, 1:250 000 series, geol.Surv.S.Aust.

APPENDIX A

Petrographic description of sample.
The Australian Mineral Development
Laboratories, Adelaide, South Australia.
Extract from report No. MP 1047/73

by

DR. R. DAVY

APPENDIX A

AMDEL report No. MP 1047/73

Sample P623/72: TS29557

Location:

Hundred of Seymour, Section 331, Railway Cutting.

Rock Name:

Amphibolite

Hand Specimen:

The rock consists of white phenocrysts set in a fine-medium grained grey black groundmass. There are no visible signs of weathering in the hand specimen, which is quite massive, even though from the surface.

Thin Section:

An optical estimate of the constituents gives the following:

		<u>%</u>
Opaques		5
Plagioclase)	40-50
Quartz)	5
Chlorite		5
Amphibole		40-50
Apatite		Trace-1
White mica		Trace-1
Epidote		1-2

The rock consists of amphibole and plagioclase in an irregular, randomly orientated distribution. There are abundant signs of retrogressive metamorphism.

The amphibole consists of once prismatic, pleochroic brown grains now partly replaced by a rather paler greenish brown amphibole and the grains have a sieved aspect. The margins of the "primary" grains are now highly irregular with many signs of corrosion by the faldspar. Amphibole grains commonly vary from 0.4 - 3 mm long.

The large white patches noted in the hand specimen are probable relicts of phenocrysts of feldspar present in the original igneous rock. These are now highly altered to a mixture of chlorite, clay and sericite; however, in some cases, a later, less affected feldspar has overgrown on the margins of the phenocrysts. The overgrowth feldspar and the remaining, recrystallised feldspar, which is present in polygonal shapes typically 0.100.2 mm in diameter, contain abundant inclusions of amphibole, apatite and a colourless mineral of uncertain origin (possibly tremolite).

Sheaves of chlorite with minor white mica, are present in association with opaques in some places. The greater part of the opaques, however, occurs in clusters up to 0.5 mm in diameter of grains each less than 0.05-0.1 mm long. These opaques are associated mainly with amphibole.

This is a basic igneous rock, probably once porphyritic, which has been subjected to two phases of metamorphism, one in the upper amphibolite facies, the later in the lower amphibolite facies near the upper greenschist facies border. Though there is some alteration there are no major planes of weakness and the rock is considered suitable for use as ballast.

APPENDIX B

Abrasion and soundness test results. The South Australian Highways Department, Materials and Research Laboratories, Adelaide, South Australia. Extract from report of 21st September, 1972.

APPENDIX B

Abrasion and soundness test results. The South Australian Highways Department, Materials and Research Laboratories

Extract from report of 21st September, 1972

The results of laboratory tests conducted on one sample of proposed ballast material are shown below. All testing was conducted on material passing 1½ inch and retained on ¾ inch.

Material	Los Angeles Abrasion %	S odium Sulphat e	Specific Gravity							
		Soundness	S.G. (APPT)	s.G. (SSD)	s.G. (BULK)	WATER AB- SORPTION %				
Amphibolite Spalls Ex. Tailem Bend Cutting (712-A-659)	12	0.5	2.99	2.92	2.89	1.1.				

APPENDIX C

Explanatory notes and logs of rotary air drillholes

APPENDIX C

EXPLANATORY NOTES AND LOGS OF ROTARY AIR DRILLHOLES Explanatory Notes on Drilling Procedures

All drillholes were put down using a truck mounted
Mayhew 1000 rotary drill. Only highly disturbed, air-blown samples
were recovered during drilling, but these were sufficient to
determine the type of rock material present at different depths.

Rock-cuttings for each sample interval were collected in annular sample pans and placed in sample bags marked with the Location, Hole No. and Interval.

The samples have been stored at the Department of Mines. Drilling and Mechanical Branch, Dalgleish Street, Thebarton, South Australia and are available for inspection.

Notes on Rotary Air Drill Log Sheets

The logs are plotted on a vertical scale of one centimetre - 1 metre (1:100).

Classification of rock substance in terms of its porosity and hardness is based on qualitative estimation only. Penetration rates were not recorded being inappropriate to the project.

	DEPARTMENT OF MINES—SOUTH AUSTRALIA LOG OF ROTARY AIR DRILL HOLE PROJECT MURRAY LANDS RAILWAY—BALLAST PLAN REFERENCE .74-314 FEATURE TAILEM BEND AMPHIBOLITE DEPOSIT COORDINATES 400E/GOON HOLE NO.MT 1 SERIAL NO.953/73									
PROJE	CT . N	MURKAY LANDS RAILWAY	- BALLAST PL SUPPLIES	an reference . ordinates . 40 9	74-314 DE/GOON					
	jre . • Tion .	SEC.68, Hd Seymour	PEROZII CO	ORDINATES .40:	90° . DIRECTI					
		DESCRIPTION OF CHIPS	LOG DEPTH POROS	HARDNESS	STRUCTURES	PENETRATION TIME DEPTH. (MINS.)				
RECENT	MOLINEAUX SAND	<u>Sand</u> – pale yellow, fine grained	1—							
ENECENE DESTOCENE	Calcrost of 1	Calorete - buff; hard and nodular at top, soft and friable at bottom	0-00 10-00 -01 -01 3-1			- 10-				
pue	1 20 F.	<u>Clay</u> -red-brown, slightly sondy, plastic.								
PL10- CENE	LOXTON	Sand-pale yellow, fine grained.								
CAMBRIAN	KANMANTOO	Schist-bluish-grey and brown, siliceous, partly weathered, minor amphibolite schist	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \			- 20-				
	EN	ID OF HOLE 9.0m	=			- 30-				
						& RESOURCES DIVISION				
		POROSITY TERM HP – Highly Porous	HARDNESS TERM VS – Very Soft		DRILL NO.D M	67. LOGGED				
		P — Porous MP — Moderately Porous SP — Slightly Porous	S – Soft MH – Moderately Hard H – Hard		TYPE .MAYH	D. NICHOL. DATE 2 July:73 TRACEDG:M. CHECKED.A.F.				
I		NP – Non Porous	VH – Very Hard		SHEET. 1. OF.1 .	DRG. NO. S10832				

LOG OF ROTARY AIR DRILL HOLE SERIAL NO. 953/73 PROJECT MURRAY LANDS RAILWAY - BALLAST PLAN REFERENCE 74-314 FEATURE TAILEM BEND AMPHIBOLITE DEPOSIT COORDINATES 700 E/600N LOCATION SEC. 68, HP SEY MOUR ANGLE FROM HORIZ. 90. . DIRECTION -PENETRATION TIME (MINS.) POROSITY HARDNESS DEPTH DEPTH **STRUCTURES** DESCRIPTION OF CHIPS LOG Calcrete - buff, friable, and silty with occasional hard nodules (m) ₹858 ¥ 0/0 0 0-1 Clay-red-brown, PLEISTOCEN slightly sandy to sandy, highly BLANCHETOWN plastic. 10-Schist-bluish grey and 5 5 KANMANTOO brown, micaceous, partly 5 CAMBRIAN 5 weathered S S 5 5 S 5 5 30-END OF HOLE 9m 10 ENVIRONMENT & RESOURCES DIVISION POROSITY TERM HARDNESS TERM DRILL NO. **DM 67** TYPE **MAYHEW 1000** HP - Highly Porous VS - Very Soft LOGGED D.NICHOL S - Soft P-PorousDRILLER D. LUKER DATE 3 JULY: 73 TRACED G.M. START 3 . July \73 FINISH 3 . July \73 MH - Moderately Hard MP - Moderately Porous CHECKED . A. F. SP - Slightly Porous H-HardSHEET. 1. OF.1 DRG. NO. 510833 VH - Very Hard NP - Non Porous

DEPARTMENT OF MINES - SOUTH AUSTRALIA

HOLE NO. MTZ

DEPARTMENT OF MINES - SOUTH AUSTRALIA HOLE NO. MT3 PROJECT MURRAY LANDS RAILWAY BALLAST SUP SERIAL NO. **953/73** PLAN REFERENCE FEATURE TAILEM BEND AMPHIBOLITE DEPOSIT COORDINATES 300E/500E LOCATION. SEC. 68. HO SEYMOUR ANGLE FROM HORIZ. 9.0° . DIRECTION :-PENETRATION TIME DEPTH POROSITY HARDNESS DEPTH DESCRIPTION OF CHIPS LOG STRUCTURES Sand: pale yellow fine grained MOLINEAUX SAND RECENT <u>Calcrete</u> - buff, friable, 0,1 silty with hard nodules at top, slightly clayey at bottom ī of the i PLEISTOCENE Calcrata BAKARA 20 Clay-red-brown, slightly BLANCHETOWN CLAY sandy to sandy, very plastic. 30-<u>Sand</u> : orange, yellow, brown and pinkish brown 40 fine grained Q Z 14 PLIOCENE 50 ZOLXO END OF HOLE 19m. POROSITY TERM HARDNESS TERM ENVIRONMENT & RESOURCES DIVISION HP - Highly Porous VS - Very Soft DRILL NO. D.M 67. TYPE MAYHEW 1000 LOGGED DINICHOL P - Porous S - Soft DRILLER D.LUKER DATE 2 July '73 MP - Moderately Porous MH - Moderately Hard START 2 July '73
FINISH 2 July '73 TRACED G.M. CHECKED . A.F. SP - Slightly Porous H – Hard SHEET, 1. OF, 1. DRG. NO. \$ 10834 NP - Non Porous VH - Very Hard

DEPARTMENT OF MINES - SOUTH AUSTRALIA HOLE NO. MT4 PROJECT MURRAY LANDS RAILWAY BALLAST SUPPLIES PL HOLE SERIAL NO.**953/73** PLAN REFERENCE 74-314 FEATURE TAILEM BEND AMPHIBOLITE DEPOSIT COORDINATES . 400E/500N LOCATION SEC. 68, HP SEYMOUR ANGLE FROM HORIZ. 90 . DIRECTION -POROSITY HARDNESS PENETRATION TIME DEPTH DESCRIPTION OF CHIPS LOG STRUCTURES A S S S I I I Sand: pale yellow, fine grained, slightly clayey at MOLINEALX SAND bottom **ECENT** -601 20 Calcrete: buff, hard nodules Calcrete of the Bakaka in soft clayey and sandy 1 _ PLEISTOCENE matrix. 0 ï BLANCHETOWN Clay: red-brown slightly sondy, highly plastic CLAY 30 PLIOCENE Sand: red-brown at top. pale brown at bottom, LOXTON clayey, fine grained. Schist, gneiss and quartzite brown and grey, weathered ۶۵۶۰۶۰ ۲۵۶۰۶۰ at top. 14 END OF HOLE 14.3m 15 50-POROSITY TERM HARDNESS TERM ENVIRONMENT & RESOURCES DIVISION VS - Very Soft $HP-Highly\ Porous$ DRILL NO. **D.M.6.7** LOGGED D. NICHOL TYPE MAYHEW 1000 P - Porous $\mathsf{S}-\mathsf{Soft}$ DATE 2 July '73 DRILLER D.LUKER . MP - Moderately Porous MH - Moderately Hard START 2 July '73 TRACED G.M. FINISH 2 july 173 SP – Slightly Porous CHECKED H – Hard SHEET. 1. OF. 1. DRG. NO. 5 10835 NP - Non Porous VH – Very Hard

DEPARTMENT OF MINES - SOUTH AUSTRALIA HOLE NO. MT5 ROTARY LOG AIR HOLE DRILL SERIAL NO. 953/73 PROJECT MURRAY LANDS, RAILWAY- BALLAST PLAN REFERENCE 74-314.

FEATURE TAILEM BEND AMPHIBOLITE DEPOSIT COORDINATES 400E/400N LOCATION SEC. 68, HO SEYMOUR ANGLE FROM HORIZ. 30. . DIRECTION ---PENETRATION TIME POROSITY HARDNESS DEPTH DEPTH DESCRIPTION OF CHIPS LOG **STRUCTURES** (m) # 8 9 S 5 F T F Sand: pale yellow, fine grained Calcrete: buff, hard nodules ં ડે in soft clayey and sandy matrix PLEISTOCENE <u>Clay</u>:red-brown,slightly sandy, very plastic. Sand: orange-brown, fine grained φ φ φ Quartzite - pink φφ Ø Ø END OF HOLE 7m. ENVIRONMENT & RESOURCES DIVISION POROSITY TERM HARDNESS TERM DRILL NO. DM 67 . LOGGED
TYPE . MAYHEW . D.NICHOL
DRILLER D.LUKER
START 29 June 73
FINISH 29 June 73
CHECKED . A.F. . VS - Very Soft HP - Highly Porous $\mathsf{P}-\mathsf{Porous}$ MH – Moderately Hard MP – Moderately Porous SP - Slightly Porous H – Hard SHEET. 1. OF. 1. DRG. NO. \$10836 VH – Very Hard NP - Non Porous

LOG OF ROTARY AIR DRILL HOLE SERIAL NO. 953/33 PROJECT MURRAY LANDS RAILWAY - BAL PLAN REFERENCE COORDINATES 400E /300N FEATURE TAILEM BEND AMPHIBOLITE DEPOSIT LOCATIONSEC: 68, HP SEYMOUR ANGLE FROM HORIZ. 90 . DIRECTION -PENETRATION TIME POROSITY HARDNESS DEPTH LOG STRUCTURES DESCRIPTION OF CHIPS & 8 8 8 8 × 8 Sand: pale yellow, fine grained. RECENT 001 Calcrete: buff, hard nodules Calcrofe of the BAKARA Soil in soft clayey and silty につ matrix. Clay: red-brown, slightly PLEISTOCENE sandy, highly plastic Ю BLANCHE TOWN CLAY PLIO-Sandy yellow and brown, fragments of weath-ered schists at bottom fine grained CAM-BRIAN SROUP GROUP Gneiss: pale red-brown END OF HOLE 8m. 30-HARDNESS, TERM ENVIRONMENT & RESOURCES DIVISION POROSITY TERM VS - Very Soft DRILL NO.DM 67 HP - Highly Porous LOGGED TYPE MAYHEW 1000 P.NICHOL S - Soft P -- Porous DATE 29 JUNE 73 DRILLER D. LUKER TRACED G.M. CHECKED A.F. MH - Moderately Hard START 29 JUNE 73 MP – Moderately Porous FINISH 29 JUNE 73 SP - Slightly Porous SHEET, 1. OF. 1. DRG. NO. \$10837 VH – Very Hard NP - Non Porous

DEPARTMENT OF MINES - SOUTH AUSTRALIA

HOLE NO. MT6

DEPARTMENT OF MINES - SOUTH AUSTRALIA HOLE NO. MT7 LOG OF ROTARY AIR SERIAL NO **953/73** PROJECT MURRAY LANDS RAILWAY-BALLAST SUPPLIES PLAN REFERENCE 74-314 COORDINATES 600E/300N FEATURE TAILEM BEND AMPHIBOLITE DEPOSIT ANGLE FROM HORIZ. 90'. DIRECTION -LOCATION SEC. 68, HP SEYMOUR PENETRATION TIME DEPTH POROSITY HARDNESS DEPTH DESCRIPTION OF CHIPS LOG STRUCTURES 0/010 Calcrete: buff; hard nodules, PLEISTOCENE in a soft silty matrix. Clay: red-brown, slightly sandy, highly plastic. BLANCHE-TOWN 10 Schist and quartzite: brown and grey, weathered hard fragments of quartzite. `{ . Q KANMANTOO GROUD CAMBRIAN END OF HOLE 8m 30-ENVIRONMENT & RESOURCES DIVISION HARDNESS TERM POROSITY TERM DRILL NO. DM 6.7 . LOGGED VS - Very Soft HP - Highly Porous TYPE MAYHEW 1000 DATE 3 July 173 S – Soft $\mathsf{P}-\mathsf{Porous}$ DRILLER D.LUKER START 3 July '74 FINISH 3 July '74 TRACED G.M. CHECKED A.F. MP – Moderately Porous MH - Moderately Hard H – Hard SP - Slightly Porous 510838 Je4 SHEET. 1. OF.1 . DRG. NO. VH - Very Hard NP - Non Porous

ROTARY LOG AIR SERIAL NO. 953/73 PROJECT RAILWAY LANDS RAILWAY - BALLAST. SUPPLIESPLAN REFERENCE FEATURE TAILEM BEND AMPHIBOLITE DEPOSIT COORDINATES . 200E/200N LOCATION SEC. 68, HP SEYMOUR ANGLE FROM HORIZ. 90° . DIRECTION -POROSITY HARDNESS PENETRATION TIME (MINS.) DEPTH DEPTH DESCRIPTION OF CHIPS LOG STRUCTURES A S S S E I E Sand: pale yellow, fine grained • • • • 000-<u>Calcrete</u>: buff, hard and BLANCHETOWN Calerate of the CLAY RAVADA CO. nodular at top, soft and friable at bottom. 0 0 BAKARA 101 10 PLIOCENE 10-1-Clay: red-brown slightly sandy, plastic 20 Sand: yellow and brown slightly clayey to clayey, fine to medium grained. 30-10 40 SAND PLIOCENE 50-LOXTON 60 ENVIRONMENT & RESOURCES DIVISION POROSITY TERM HARDNESS TERM VS – Very Soft HP - Highly Porous DRILL NO. DM 67 LOGGED TYPE MAYHEW 1000 D. NICHOL S - Soft P - Porous DRILLER D.LUKER DATE 26 JUNE 73 TRACED G.M. $\mathsf{MP}-\mathsf{Moderately}\ \mathsf{Porous}$ MH – Moderately Hard START 25 JUNE '73 FINISH 26 JUNE '73 SP - Slightly Porous H - Hard 510839 SHEET. 1. OF 2 . DRG. NO. VH – Very Hard NP - Non Porous

DEPARTMENT OF MINES - SOUTH AUSTRALIA

HOLE NO. MT8

DEPARTMENT OF MINES - SOUTH AUSTRALIA HOLE NO. MTS LOG OF ROTARY AIR SERIAL NO.953/73 LLAST PLAN REFERENCE
SUPPLIES
COORDINATES 2005/200N PLAN REFERENCE 74-314 PROJECT MURRAY LANDS RAILWAY - BAI FEATURE TAILEM BEND AMPHIBOLITE SEPOSIT ANGLE FROM HORIZ. 90° , DIRECTION -LOCATION.SEC. 68, HP SEYMOUR PENETRATION TIME DEPTH POROSITY HARDNESS DEPTH DESCRIPTION OF CHIPS LOG **STRUCTURES** A S S S E I Z Sand: yellow and brown PLIOCENE SAND slightly clayey to clayey 21 fine to medium grained 22 LOXTON 23 เด-24 m END OF HOLE 20-ENVIRONMENT & RESOURCES DIVISION HARDNESS TERM POROSITY TERM VS - Very Soft HP - Highly Porous LOGGED D. N. IC. HOL DRILL NO. DM 67 . TYPE MAYHEW 1000 S-SoftP -- Porous DATE 26. Jun'73 DRILLER D.LUKER . START 25 Jun. 73 TRACED G.M. MH - Moderately Hard MP – Moderately Porous H - Hard $\mathsf{SP}-\mathsf{Slightly}\ \mathsf{Porous}$ SHEET, Z. OF 2 . DRG. NO. S108393 $VH-Very\ Hard$ NP - Non Porous

		DEPARTMI	ENT OF	MINES		OL F		ILE N			
PROJE	CT MU	LOG OF I	JABF1	ries Ies	DRIL N REFEREN	OLE 14-314	SE	RIAL	NO.	95	3/73
		ILEM BEND AMPHIBOLIT									
LOCAT	ION SE	C.68, HP SEYMOUR			 GLE FROM	 90° DIRECT	ON	.			
		description of chips	LOG	DEPTH (m)	TY HARDNE	STRUCTURES		w 4 ⊓ FLKYL	NS.)		DEPTH
NE	Calcrete of the BAKAKA SOIL	Calcrete: Buff hard and nodular at top, soft and friable at bottom.	0-10-01-01	2							
PLEISTOCENE	BLANCHETOWN Calcret CLAY BAKAKA	Clay: red-brown, slightly sandy, plastic	Hallighth	4 5						o and a	<u> </u>
PLIOCENE	LOXTON	Sand: yellow-brown, fine-grained		7							- 20 ⁻ - - -
CAMBRIAN		Hornblende schist:grey weathered, soft		8							40-
	<u>e</u> 1	NO OF HOLE 15M									50_
		POROSITY TERM HP — Highly Porous P — Porous MP — Moderately Porous SP — Slightly Porous NP — Non Porous	HARD VS - Ver S - Soft MH - M H - Hard VH - Ve	oderately d		DRILL NO.D.M. TYPE . MAYHE DRILLER D.LUKE START 21 JUNE FINISH 21 JUNE SHEET. 1. OF .1.	27 W 100 2 7	LO DA TR 3 CH	GGEI D. N TE ? ACEI	II CO	HOU ne'73 M. NF

LOG OF ROTARY AIR SERIAL NO. 953/73 DRILL HOLE AST PLAN REFERENCE 74-314 PROJECT MURRAY LANDS RAILWAY - BALI FEATURE TAILEM BEND AMPHIBOLITE DEPOSIT COORDINATES 300E/200N LOCATIONSEC. 68, HP SEYMOUR ANGLE FROM HORIZ. 900 . DIRECTION .-PENETRATION TIME POROSITY HARDNESS DEPTH DEPTH LOG **STRUCTURES** DESCRIPTION OF CHIPS A S S S X I Y Colorete: Buff, hard and 01010 1010 Colcrete of the Bakara so nodular at top, soft and friable at bottom 沙山 PLEISTOCENE BLANCHETOWN CLAY <u>Clay</u>: red-brown, slightly sandy, plastic. in Mica schist and hornblende: pale brown and yellow brown: . { 20weathered 5.5 ROUP . (. (5.5 .5.5 Ō 5.5 ٠, ١, CAMBRIAN KANMANTOO 30-5.5 ٠,,, 5.5 ٠ ٢ 5.5.5 5. 5 5 5 40-END OF HOLE 13m 50 ENVIRONMENT & RESOURCES DIVISION HARDNESS TERM POROSITY TERM VS - Very Soft DRILL NO. D. M. 67 LOGGED HP - Highly Porous P. NICHOL TYPE MAYHEW 1000 P – Porous DRILLER D.LUKER DATE 27 July '73 START 26 July '73 FINISH 27 July '73 MP – Moderately Porous MH - Moderately Hard TRACED G.M. CHECKED H – Hard SP - Slightly Porous DRG. NO. 310841 SHEET, T. OF.1 . NP - Non Porous VH – Very Hard

DEPARTMENT OF MINES - SOUTH AUSTRALIA

HOLE NO. MT 10

DEPARTMENT OF MINES - SOUTH AUSTRALIA HOLE NO. MTIL LOG OF HOLE AIR SERIAL NO **953/73** PROJECT MURRAY LANDS RAILWAY - BALLAST SUPPLIES PLAN REFERENCE FEATURE TAILEM BEND, AMPHIBOLITE, DEPOSIT. 400 E /200 N COORDINATES . LOCATION, SEC. 68, HD . SEY MOUR 9Ò° ANGLE FROM HORIZ. . DIRECTION HARDNESS PENETRATION TIME DEPTH DEPTH DESCRIPTION OF CHIPS LOG **STRUCTURES** Sand: pale yellow MOLI-NEAX SAND fine grained. CALCRETE OF THE BAKARA SON Calcrete: buff hard and nodular at top, soft l and friable at bottom. PLEIST OCENE Clay: red brown, slightly sandy, plastic. CLAY **BLANCHE TOWN** Quartzite: pale brown with KANMATOO GROUP Q CAMBRIAN minor weathered S Q schist. ς S Q S S Q END OF HOLE II m. 40 HARDNESS TERM POROSITY TERM ENVIRONMENT & RESOURCES DIVISION HP - Highly Porous VS Very Soft DRILL NO. DM 67. TYPE MAYHEW 1000. D. NICHOL S – Soft P - Porous DATE .29/6/7.3 TRACED L.R. DRILLER D.LUKER MP - Moderately Porous MH - Moderately Hard START 29/6/73. FINISH 29/6/73 CHECKED . A.F. H – Hard SP - Slightly Porous S10842 VH - Very Hard SHEET. I. OF. I. DRG. NO. NP - Non Porous

DEPARTMENT OF MINES - SOUTH AUSTRALIA HOLE NO. MT 12 LOG OF ROTARY HOLE DRILL SERIAL NO. 953/73 PROJECT MURRAY LANDS RAILWAY - BALLAST SUPPLIES PLAN REFERENCE 74-314 COORDINATES . 200 /175 N . FEATURE TAILEM BEND AMPHIBOLITE DEPOSIT LOCATION, SEC. 68, HD SEYMOUR . DIRECTION ANGLE FROM HORIZ. 90° POROSITY HARDNESS PENETRATION TIME DEPTH DEPTH DESCRIPTION OF CHIPS LOG **STRUCTURES** A S S S E I S Sand: pale yellow, fine grained <u>Calcrete</u>: buff hand and nodular of #e 501L at top, soft and friable at bottom. PL EISTOCENE Colorete ABAKARA 10 BLANCHETOWN CL AY Clay: red, brown, slightly sandy, plastic Sand: yellow - brown, fine 20 grained SAND PLIOCENE OXTON - 30 Mica - schist - grey brown 10 highly weathered CAMBRIAN KANMANTOO 50 18 60 END OF HOLE 20m POROSITY TERM HARDNESS TERM ENVIRONMENT & RESOURCES DIVISION HP - Highly Porous VS - Very Soft DRILL NO. DM 67. LOGGED DATE . 28/6/73 TRACED . L.R. TYPE MIAYHEW 1,000. P - Porous DRILLER D. LUKER. START 27/6/73. MH - Moderately Hard MP - Moderately Porous CHECKED . A.F. FINISH 27./6/73 SP - Slightly Porous H-HardSHEET, 1. OF.1 DRG. NO. \$10843 VH – Very Hard NP - Non Porous

DEPARTMENT OF MINES - SOUTH AUSTRALIA HOLE NO. MT 13 ROTARY LOG AIR HOLE SERIAL NO 953/73 PLAN REFERENCE 74-314 PROJECT MURRAY LANDS RAILWAY - BALLAST SUPPLIES FEATURE TAILEM BEND AMPHIBOLITE . DEPOSIT. COORDINATES . 250E/175 N . LOCATION SEC. 68, HD SEYMOUR. ANGLE FROM HORIZ. 99° . DIRECTION POROSITY HARDNESS PENETRATION TIME DEPTH (m) DESCRIPTION OF CHIPS LOG **STRUCTURES** Calcrete: buff, hard and nadular 0,0,0 SSHIZ A 8 ₽ 님 Colorete of the BAKARA SOIL at top, soft and friable at bottom. PLEISTOCENE Ğ₽¥ Clay : red, brown, slightly sandy plastic. BL ANCHETOWN 10-S Mica - schist - grey-brown with minor hornblende schist S ς - weathered. Possibly some GROUP fragments of amphibalite. S 20-CAMBRIAN S KANMANTOO ς S S S . S 30-END OF HOLE IOm. ENVIRONMENT & RESOURCES DIVISION HARDNESS TERM POROSITY TERM DRILL NO. DM 67 .
TYPE . MAYHEW 1000 HP - Highly Porous VS - Very Soft LOGGED D. NICHOL DATE . 4/7/73 TRACED . L.R. CHECKED . A.F. S – Soft P - Porous DRILLER D. LUKER MH - Moderately Hard MP - Moderately Porous 4/7/73 4/7/73 SP - Slightly Porous _ H – Hard SHEET. 1. OF. 1. DRG. NO. \$10844 VH – Very Hard NP - Non Porous

	LOG OF	ROTARY AIR D		0LE	HOLE NO. MT 14 SERIAL NO. 953/73
PROJEC	CT MURRAY LANDS RAILWAY - BALLAST SUPPL			4 - 314	
	RE TAILEM BEND AMPHIBOLITE . DEPOSIT.	COORDI	INATES . 275	5E/175N.	
LOCAT	TON SEC. 68, HD SEYMOUR.	· · · ANGLE	FROM HORIZ.	90° . DIRECT	ION
	description of chips	LOG DEPTH POROSITY H	i	STRUCTURES	PENETRATION TIME DEPTH (MINS.) - 2 m 4 5 9 7 8 6
PLEISTOCENE	Calcrete: buff hard and nodular of top, soft and frieble at bottom.	0 0			
00	¿ Clay: red, brown, slightly				
IST	z Clay: red, brown, slightly sandy plastic.				
L E	STANC	<u></u> ^ =			
		7 3			
CAMBRIAN	Quartzite, pink.	<u></u>			
_₹	Quartzite, pink.	0000 4 -			
	END OF HOLE 4m.				
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	POROSITY TERM	HARDNESS TERM		ENVIRONMENT	& RESOURCES DIVISION
	HP – Highly Porous	VS – Very Soft		DRILL NO. DM 67	7. , LOGGED
,	P – Porous	S – Soft		TYPE . MAYHEW DRILLER D. LUKE	P DATE 4/7/73
	MP – Moderately Porous	MH - Moderately Hard		START 4/7/73	TRACED .L.R.
	SP – Slightly Porous	H – Hard		FINISH 4/7/73	DRG. NO. 104
1	NP – Non Porous	VH – Very Hard		SHEE1.1.04.1.	UKG. NU. Je4

HOLE NO. MT 15 DEPARTMENT OF MINES - SOUTH AUSTRALIA LOG OF ROTARY HOLE SERIAL NO. **953/73** PROJECT MURRAY LANDS RAILWAY - BALLAST SUPPLIES PLAN REFERENCE FEATURE TAILEM BEND AMPHIBOLITE DEPOSIT COORDINATES . 200E/150 N . LOCATION SEC. 68, HD SEYMOUR. ANGLE FROM HORIZ. 90° . DIRECTION POROSITY HARDNESS PENETRATION TIME DEPTH DEPTH **STRUCTURES** DESCRIPTION OF CHIPS LOG Calcrete: buff, hard and nodular on top, soft م and friable on bottom PLEISTOCENE Colcrete BLANCHETOWN CLAY Clay: red, brown, slightly sandy plastic. 20 PLIOCENE Sand: yellow-brown, fine grained. CAMBRIAN Quartzite: pink, minor weath S Q Q . S . Q . S ered mica schist. 30 END OF HOLE 9m. ENVIRONMENT & RESOURCES DIVISION HARDNESS TERM POROSITY TERM DRILL NO. DM 67. HP – Highly Porous VS - Very Soft LOGGED TYPE MAYHEW 1000 D. NICHOL S - Soft P – Porous DRILLER D. LUKER START 27/6/73 FINISH 27/6/73 DATE 27/6/73 TRACED L.R. MH - Moderately Hard MP – Moderately Porous CHECKED . A.F. H - Hard SP - Slightly Porous SHEET. I . OF . I . DRG. NO. SJO846 VH – Very Hard NP - Non Porous

					MINES — S				=			MT I	
			LOG OF F	ROTA	RY All	R	DRILL	HO	OLE	SER	IAL NO	953	/73
			RAY LANDS RAILWAY - BALLAST SUPPLI	ES .			REFERENC		4-314				Į
			M BEND AMPHIBOLITE DEPOSIT				rdinates						
LOCATI	ION.	SEC	C. 68, HD SEYMOUR.	 1	· · · · · · · · · · · · · · · · · · ·		E FROM H		90° . DIRECT	1			
		[DESCRIPTION OF CHIPS	LOG	DEPTH		/ HARDNESS	9	STRUCTURES	PENET	ration (mins.)	1 TIME	DEPTH
				10-2	Ιd	. ≱ & ;	Z S S Z Z	ļ		- N m	4 10 0	<u> </u>	(m)
	Calcrete of the BAWARA		Colcrete: buff, hard and nodular			*	*						E
끸	Pe et	ğ	at top, soft and friable	ゴナゴ	1								⊨ I
PLEISTOCENE	ਤੁੱ ₹		at battom.	<u> </u>	<u> </u>			ļ		\sqcup		+++	Е
Ď	z		Clay: red-brown, slightly		2-		, 1						<u> </u>
.SI	ğ	إ	sandy plastic.	===	. =								ΕI
PLI	BLANCHETOWN	გ	way pizerie.	===	3								L10-
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PIO CENE	Oxto	QMes	Sand: orange-brown, slightly clovey, medium grained.					ľ	-				-
CAMBRIAN		_	Amphibolite: dark green.	A A	5	and a							E
AMB	AMMA	GROUP	Amphibolite . dork greet	A A									
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			POROSITY TERM	HAD	RDNESS TERA	<u> </u>			ENVIRONMENT	& RES	OURC	ES D	VISION
1			HP – Highly Porous		ery Soft	,,			DRILL NO. DM	67 .	LOG	GED	
			P – Porous	S – Sof	t				TYPE . MAYHEV DRILLER .D. LU	v 1000	, l	D.,NIQ F.,28,	HOL. /6/73
			MP – Moderately Porous	MH	Moderately H	lard			START 28/6/	73 .	TRA	CED .	L.R.
			SP – Slightly Porous	H – H	ard				FINISH 28/6		CHE	CKED.	47
I			NP - Non Porous	VH - Y	Very Hard				SHEET. I.OF. I	. DRG.	NO.	Je4	• •

DEPARTMENT OF MINES - SOUTH AUSTRALIA HOLE NO. MT 17 LOG OF ROTARY AIR DRILL HOLE SERIAL NO 953/73 PLAN REFERENCE 74-314 PROJECT MURRAY LANDS RAILWAY - BALLAST SUPPLIES FEATURE TAILEM BEND AMPHIBOLITE DEPOSIT COORDINATES .250E/150N . LOCATION SEC. 68, HD. SEYMOUR. ANGLE FROM HORIZ. 90. . DIRECTION .-POROSITY HARDNESS PENETRATION TIME DEPTH DEPTH DESCRIPTION OF CHIPS LOG **STRUCTURES** H A S S S S T I Y Sand: pale yellow fine grained BLANCHETOWN CLAY Clay: red-brown, sandy PLEISTOCENE plastic CAMBRIAN KANMANTOO 6 ROUP Amphibolite - dark green Α Α Α END OF HOLE 5M POROSITY TERM HARDNESS TERM ENVIRONMENT & RESOURCES DIVISION DRILL NO. DM 67.
TYPE MAYHEW 1000 VS – Very Soft HP - Highly Porous LOGGED D. NICHOL P – Porous DATE 27/6/73 TRACED L.R. DRILLER D. LUKER . START 27/6/73 FINISH 27/6/73 $MH-Moderately\ Hard$ $\mathsf{MP}-\mathsf{Moderately}\ \mathsf{Porous}$ CHECKED A.F. SP - Slightly Porous H - Hard SHEET. 1. OF. 1. DRG. NO. 5 10848 VH – Very Hard NP - Non Porous

DEPARTMENT OF MINES - SOUTH AUSTRALIA HOLE NO. MT 18 LOG OF ROTARY AIR DRILL HOLE SERIAL NO 953/73 PROJECT MURRAY LANDS RAILWAY - BALLAST SUPPLIES PLAN REFERENCE 74-314 FEATURE TAILEM SEND AMPHIBOLITE DEPOSIT COORDINATES . 300E/150N LOCATION SEC. 68, HD. SEYMOUR ANGLE FROM HORIZ. 90° . DIRECTION PENETRATION TIME DEPTH DEPTH DESCRIPTION OF CHIPS LOG **STRUCTURES** A S S S S E E E 000 Calcrete: buff, hard and nodular PLEI STOCENE on top, soft and friable on bottom, BLANCHETOWN Clay: red-brown, slightly sandy, plastic. \$. \$. \$. \$. \$. \$. S GROUP CAMBRIAN Mica-schist: dark grey K ANM ANTOO END OF HOLE 6M POROSITY TERM hardness term ENVIRONMENT & RESOURCES DIVISION VS - Very Soft HP - Highly Porous DRILL NO. DM 67 LOGGED DATE 27/6/73
TRACED L.R.
CHECKED A.F. TYPE MAYHEW 1000 S-SoftP - Porous DRILLER D. LUKER START 27/6/73 MP – Moderately Porous MH – Moderately Hard FINISH 27 /6/73 SP - Slightly Porous H - Hard SHEET. 1. OF. 1. DRG. NO. 3049 VH - Very Hard $NP-Non\ Porous$

DEPARTMENT OF MINES - SOUTH AUSTRALIA HOLE NO. MT 19 LOG OF ROTARY HOLE AIR DRILL SERIAL NO. **953/73** PROJECT MURRAY LANDS RAILWAY - BALLAST SUPPLIES PLAN REFERENCE FEATURE TAILEM BEND AMPHIBOLITE . DEPOSIT. COORDINATES , 200E/125N LOCATION SEC . 68, HD SEYMOUR. angle from Horiz. 90.° . DIRECTION PENETRATION TIME DEPTH POROSITY HARDNESS DEPTH DESCRIPTION OF CHIPS LOG STRUCTURES **°°°** Calcrete: buff, hand and nadular BLANCHETOWN Coloredes of the CLAY BAKARA SOIL on top, soft and friable on bottom PLEI STOCENE Clax: red-brown, slightly sandy, plastic CAMBRIAN PLIOCENE Sand: orange-brown, clayey medium grained. KANMANTOO Q Quartzite: pink Q GROUP Q Q Q 20 END OF HOLE 6M ENVIRONMENT & RESOURCES DIVISION hardness term POROSITY TERM VS - Very Soft HP - Highly Porous LOGGED D. NICHOL DRILL NO. DM 67. TYPE MAYHEW 1000 P – Porous S - SoftDATE . 4 /7/73 TRACED L.R. DRILLER D. LUKER MH – Moderately Hard MP – Moderately Porous 4/7/73 START 4/7/73 CHECKED . A.F. FINISH $H\stackrel{\cdot}{=} Hard$ SP - Slightly Porous DRG. NO. 510850 SHEET. 1 . OF .1 . VH – Very Hard NP - Non Porous

DEPARTMENT OF MINES - SOUTH AUSTRALIA HOLE NO. MT 20 LOG OF ROTARY AIR HOLE SERIAL NO 953/73 PROJECT MURRAY LANDS RAILWAY - BALLAST SUPPLIES PLAN REFERENCE 74-314 COORDINATES . 225E/125 N. FEATURE TAILEM BEND AMPHIBOLITE . DEPOSIT. LOCATION SEC. 68, HD SEYMOUR. ANGLE FROM HORIZ. SO. . DIRECTION PENETRATION TIME DEPTH DESCRIPTION OF CHIPS LOG STRUCTURES (m) S S T I X 1-1-1 1-0-0 PLEISTOCENE Colcrete: buff, hard and nodular on top, soft and friable on bottom. Clay: red-brown, slightly sandy, plastic. CAMBRIAN Amphibolite: dark green. Α END OF HOLE 3M ENVIRONMENT & RESOURCES DIVISION HARDNESS TERM POROSITY TERM DRILL NO. DM 67.
TYPE MAYHEW 1000.
DRILLER D. LUKER . VS - Very Soft LOGGED HP - Highly Porous D. NICHOL.

DATE 28/6/73

TRACED L. R.

CHECKED A.F. P - Porous S - SoftSTART 28/6/73 FINISH 28/6/73 MH - Moderately Hard MP – Moderately Porous SP - Slightly Porous H ∸ Hard SHEET. 1. OF. 1. DRG. NO. \$10851 VH – Very Hard NP - Non Porous

DEPARTMENT OF MINES - SOUTH AUSTRALIA HOLE NO. MY 21 LOG OF ROTARY AIR HOLE DRILL SER!AL NO. **953/73** PROJECT MURRAY' LANDS RAILWAY - BALLAST SUPPLIES PLAN REFERENCE FEATURE TAILEM BEND AMPHIBOLITE DEPOSIT. COORDINATES .250E/125 N LOCATION, SEC. 68, HD SEYMOUR. ANGLE FROM HORIZ. 90° . DIRECTION POROSITY HARDNESS PENETRATION TIME DEPTH DEPTH DESCRIPTION OF CHIPS LOG STRUCTURES Ê 10,00 PLEI STOCENE Calcrete: buff, hard and nodular on top, soft and friable on bottom Clax: red-brown, slightly eardy, plastic S . Q Hornblende schist with minor Q . 5 mica schist - dark brown 10 S Q with minor quartzite. Q.S .S .Q GROUP CAMBRIAN Q S KANMANTOO S. Q Q S 20-S Q ์ร Q S Q S Q S Q 30 END OF HOLE 9M. HARDNESS TERM ENVIRONMENT & RESOURCES DIVISION POROSITY TERM HP - Highly Porous VS – Very Soft LOGGED
D. NICHOL
DATE .4/7/73
TRACED L.R. DRILL NO. DM 67. TYPE . MAYHEW 1000 . S-SoftP – Porous DRILLER D. LUKER MP – Moderately Porous MH - Moderately Hard START 4/7/73 CHECKED . A F. FINISH 4/7/73 H - Hard SP - Slightly Porous DRG. NO. SIO852 SHEET, I. OF. VH - Very Hard NP - Non Porous

	LOG OF ROTARY AIR DRILL HOLE HOLE NO. MT 22 SERIAL NO. 953/73												
PROJE	ECT AALIC	LUG UF LANDS RAILWAY - BALLAST SUPPLI	KU I A	IKY.			HOLE E 74-314	SI	ERIA	L N	953	3/73	
		EM BEND AMPHIBOLITE DEPOSIT.	ES			referenci Dinates .:	275E/125 N		٠				
		EC. 68, HO SEYMOUR.	· 				DRIZ. 90 ° . DIRECT	FION	· ;—				
		DESCRIPTION OF CHIPS	LOG	DEPTH	POROSITY			PEN	IETRA	ATION NINS. I	1 TIME	DEPTH	
<u></u>	1. , ,			(m)	를 ^주 줬 광 출	> ~ ∑ I >	STRUCTURES	- 2			1-86	(m)	
EE	Colorete of the BAKARA SOIL	<u>Calcrete</u> : buff, hard and nodular on top, soft and friable on bottom	1-1	:│								F	
STO			<u> </u>	<u></u>				$\perp \downarrow \downarrow$		11		£_	
PLEISTOGENE	BLANCH ETOWN CLAY	Clay: red-brown, slightly sandy, plastic		<u>:</u>]								Ē	
<u> </u>		, , , , , , , , , , , , , , , , , , , ,	Q	-2-	ti y			+++	+	+	+++	+	
z			Q									Ė.	
CAMBRIAN	0 kg	Quartzite: pink and grey.	Q Q**	. 3								F 10-	
A MB	KANMANTOO		Q	4_			† 					E	
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		POROSITY TERM	HARI	DNESS TE	PAA		ENVIRONMENT	8 PE		DC E	יות פי	L VISION	
		HP – Highly Porous	VS – Ve				DRILL NO. DM 6		_	OGGE		7131014	
,		P – Porous	S – Soft				TYPE . MAYHEW DRILLER D. LUK		. lo.	ATE	NICHO	7/73	
		MP – Moderately Porous		Noderately	Hord		START 4/7/7 FINISH 4/7/7	7 3 .	. [TI	RACE	ED . • KED . •	. K	
		SP – Slightly Porous NP – Non Porous	H - Har VH - Ve	ra erv Hard			SHEET. I. OF. I.	DRG.			085		

LOG OF ROTARY AIR DRILL HOLE SERIAL NO 953/73 PROJECT MURRAY LANDS RAILWAY - BALLAST SUPPLIES PLAN REFERENCE 74-314 FEATURE TAILEM BEND AMPHIBOLITE DEPOSIT. COORDINATES . 100E/100 N LOCATION SEC. 68, HD SEYMOUR ANGLE FROM HORIZ. 90°. DIRECTION .-POROSITY HARDNESS PENETRATION TIME DEPTH DESCRIPTION OF CHIPS LOG STRUCTURES AS S S E H H MOLIN ENAK SAND Sand: pale yellow fine grained Colonete of the 8 Calcrete: buff, hard and nodular at top, soft BAKARA and friable at bottom. PLE ISTOCENE 8 L ANCHETOWN CLAY Clay: red-brown, slightly eandy, plaetic. 20 Sand: orange and yellowbrown, slightly clayey 30 to very clayey, fine to medium grained. fragments of schist and gneiss. PLICCENE 10X00 END OF HOLE 14-8m. 50 environment & resources division POROSITY TERM hardness term HP - Highly Porous VS - Very Soft DRILL NO. DM 67. LOGGED D. NICHOL DATE . 3/7/73 TRACED TYPE MAYHEW 1000. DRILLER D. LUKER P -- Porous S - Soft MH - Moderately Hard MP - Moderately Porous CHECKED A.F. $H \stackrel{\cdot}{=} Hard$ SP - Slightly Porous DRG. NO. S10854 SHEET. 1. OF. VH - Very Hard NP - Non Porous

DEPARTMENT OF MINES — SOUTH AUSTRALIA

HOLE NO. MT 23

DEPARTMENT OF MINES - SOUTH AUSTRALIA HOLE NO. MT 24 LOG OF ROTARY HOLE AIR SERIAL NO **953/73** PLAN REFERENCE 74-314 PROJECT MURRAY LANDS RAILWAY - BALLAST SUPPLIES FEATURE TAILEM BEND AMPHIBOLITE DEPOSIT COORDINATES . 200E/100 N . LOCATION SEC . 68, HD. SEY MOUR ANGLE FROM HORIZ. 90.° . DIRECTION .-PENETRATION TIME IMINS. DEPTH PÓROSITY HARDNESS DEPTH DESCRIPTION OF CHIPS LOG STRUCTURES 000 1111 PLEISTOCENE <u>Calcrete</u>:buff, hard and nodular an top, soft and fridale on bottom <u>Clay</u>: red-brown, slightly sandy, plastic. Amphibolite: dark green. 10 -KANMANTOO GROUP Α CAMBRIAN Α Α Α Α 20. Α Α END OF HOLE 7M 30 HARDNESS TERM ENVIRONMENT & RESOURCES DIVISION POROSITY TERM VS - Very Soft DRILL NO. DM 67 HP - Highly Porous LOGGED DATE 26/6/73
TRACED L. R. CHECKED A.F. TYPE MAYHEW 1000 S - Soft P - Porous DRILLER D. LUKER
START 26/6/73 $\mathsf{MP}-\mathsf{Moderately}\ \mathsf{Porous}$ MH - Moderately Hard FINISH 26/6/73 H - Hard SP - Slightly Porous SHEET. 1. OF. 1. DRG. NO. 30855 VH - Very Hard NP - Non Porous

DEPARTMENT OF MINES — SOUTH AUSTRALIA HOLE NO. MT 25 LOG OF ROTARY AIR DRILL HOLE SERIAL NO **953/73** PROJECT MURRAY LANDS RAILWAY - BALLAST SUPPLIES .. PLAN REFERENCE 74-314 FEATURE TAILEM BEND AMPHIBOLITE . DEPOSIT. COORDINATES . 225E/100N . LOCATION SEC. 68, HD. SEYMOUR ANGLE FROM HORIZ. 90.° . DIRECTION .-POROSITY HARDNESS PENETRATION TIME DEPTH DEPTH DESCRIPTION OF CHIPS LOG **STRUCTURES** (m) A S S S H H 000 1-1-1 PLEISTOCENE Calcrete: buff, hard and nodular on top, soft and friable on bottom. BLANCH ETOWN CLAY Clay: red-brown, slightly sandy, plastic. ٨ Amphibolite: dark green. Α **CAMBRIAN** KANMANTOO GROUP A 10 Α Α Α Α Α END OF HOLE 5 M 20 ENVIRONMENT & RESOURCES DIVISION POROSITY TERM HARDNESS TERM $\mathsf{VS}-\mathsf{Very}\ \mathsf{Soft}$ $HP-Highly\ Porous$ DRILL NO. DM 67. LOGGED D NICHOL S-SoftTYPE . MAYHEW 1000. P - Porous DATE 28/6/73 TRACED LR. DRILLER D. LUKER . MP – Moderately Porous MH – Moderately Hard START 28/6/73 CHECKED . A.F. FINISH 28/6/73 H - Hard SP - Slightly Porous DRG. NO. 510856 NP - Non Porous VH – Verv Hard SHEET. 1 . OF .1

		LOG OF	ROTAI	MINES -	۱R	h austra DRILL	HOLE	HOLE NO. MT 26 SERIAL NO 953/73
i e		RAY LANDS RAILWAY-BALLAST SUPPLI M BEND AMPHIBOLITE DEPOSIT.			PLA	REFERENCE		
		C 68, HD SEYMOUR					.250 1/ 100 N . Oriz. 90° . directi	 ION
		description of chips	1200	DEFLIH		Y HARDNESS	STRUCTURES	PENETRATION TIME DEPTH
PLEISTOCENE	Calcrete of the BAKARA SOIL	and friable at bottom.	1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-	2			abundantamphibolite fragments.	
	<u> </u>	<u>Amphibolite</u> : dark green.	A A	_3_				
CAMBRIAN	KANMANTOO GROUP	END OF HOLE 3M.						
		POROSITY TERM	HARD	NESS TER			FNVIRONMENT	& RESOURCES DIVISION
		HP – Highly Porous P – Porous MP – Moderately Porous SP – Slightly Porous NP – Non Porous	VS – Very S – Soft MH – Ma H – Hard VH – Ver	y Soft oderately			DRILL NO. DM 67 TYPE . MAYHEW DRILLER D. LUKE START 27/6/7 FINISH 27/6/7	LOGGED D. NICHOL DATE 27/6/73 TRACED L.R.

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			ent of mines				HOLE NO. MT27
	_	LOG OF I			DRILL	HOLE	SERIAL NO. 953/78
		ray lands railway-ballast süppli M bend amphibolite deposit	FS		n reference Prdinates . 2		
		68, HD. SEYMOUR.				RIZ. 90° . DIRECT	
200/(1	•			POPOSIT	Y HARDNESS	VIZ. •• . BIRECT	PENETRATION TIME DEPTH
		DESCRIPTION OF CHIPS	LOG DEPTH	l	Z > S X I >	STRUCTURES	(MINS.)
	808	Colorete: buff, hard and nodular	0000	11120	2 201 2 ± 21		- 4 4 7 0 L 8 9 2 F
ENE	Colorede of the BAKARA	on top, soft and friable on bottom					
PL EIS TOCENE							
EIS	BLANCH ETOWN CLAY	Clax: red-brown, slightly					
٦	18	sandy, plastic.					
Z	8	Quartzite: pink	QQQ 3				
CAMBRIAN	KAHMANTOS	END OF HOLE 3M					10-
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		POROSITY TERM	HARDNESS T	T		ENVIRONMENT	& RESOURCES DIVISION
		HP – Highly Porous	VS – Very Soft	-, *1		DRILL NO. DM 6	37 . LOGGED
		P – Porous	S – Soft			TYPE . MAY HEW DRILLER D LUK	1000 D NICHOL .
		MP – Moderately Porous	MH – Moderatel	ly Hard		START 4/7/	73 . TRACED !R: .
		SP – Slightly Porous	H – Hard			FINISH 4/7/	73 . CHECKED A.F
1		NP – Non Porous	VH – Very Hard	I		SHEET. 1 . OF. 1	DRG. NO. 510858

DEPARTMENT OF MINES - SOUTH AUSTRALIA 85 TM.ON BLOCK LOG OF ROTARY AIR DRILL HOLE

PROJECT MURRAY LANDS RAILWAY - BALLAST PLAN REFERENCE 74-314

FEATURE TAILEM BEND AMPHIBOLITE DEPOSIT COORDINATES 300 E/100 N SERIAL NO.953/73 LOCATION SEC. 68 HP SEYMOUR ANGLE FROM HORIZ. 90 . DIRECTION .-MOLIN EAUX SAND POROSITY HARDNESS PENETRATION TIME DEPTH DEPTH DESCRIPTION OF CHIPS LOG **STRUCTURES** (m) A S S S T I Y SAND:pale yellow, fine grained REC SCHIST gray-brown weathered CAMBRIAN KANMANGROUP 10-END OF HOLE 6 metres HARDNESS TERM ENVIRONMENT & RESOURCES DIVISION POROSITY TERM VS - Very Sof: HP – Highly Porous DRILL NO.DM 6.7 . LOGGED D. NICHOL DATE 26/6/73 TRACED R.B TYPE MAYHEW 100 $\mathsf{P}-\mathsf{Porous}$ $\mathsf{S}-\mathsf{Soft}$ DRILLERD LUKER . $\mathsf{MP}-\mathsf{Moderately}\ \mathsf{Porous}$ MH - Moderately Hard START 26/8173. FINISH 26/6/73 CHECKED A.F. SP - Slightly Porous SHEET. 1. OF. 1. DRG. NO. 510859 VH – Very Hard NP - Non Porous

DEPARTMENT OF MINES - SOUTH AUSTRALIA HOLE NO.MT 29 PROJECT MURRAY LANDS RAILWAY- SUPPLIES
FEATURE TAILEM BEND AMPHIBOUTE DEPOSIT AIR DRILL HOLE SERIAL NO.953/73 PLAN REFERENCE 74-314 COORDINATES 400 E/100 N LOCATION SEC 68 HP SEYMOUR ANGLE FROM HORIZ. 90° . DIRECTION POROSITY HARDNESS PENETRATION TIME DEPTH DEPTH DESCRIPTION OF CHIPS LOG STRUCTURES A S S S E I E GALCR-ETE OF BAKAR CALCRETE: buff hard a nodular at top, soft a friable at bottom 00 PLEISTOCENE 01-711 CLAY: red-brown, slightly sandy, plastic 3 SAND: orange eyellow PLIOCENE brown, clayey, fina SAND grained 6 SCHIST: pale brown fresh ്ര്മ് END OF HOLE 74 metres 30-ENVIRONMENT & RESOURCES DIVISION POROSITY TERM HARDNESS TERM VS - Very Soft DRILL NO. DM 67 TYPE MAY HEW 1000 $HP-Highly\ Porous$ LOGGED

D. NICHOL P - Porous DATE 29/6/73 DRILLER D. LUKER. MH - Moderately Hard MP – Moderately Porous START 20/6/73 TRACED R.B. FINISH 29/6/73 CHECKED . A.F. $H \stackrel{.}{=} Hord$ SP - Slightly Porous SHEET. 1 . OF . 1 . DRG. NO. \$10860 VH – Verv Hard NP - Non Porous

DEPARTMENT OF MINES - SOUTH AUSTRALIA HOLE NO. MT 30 LOG OF ROTARY AIR
PROJECT MURRAY LANDS RAILWAY BALLAST PL DRILL HOLE SERIAL NO 953/73 PLAN REFERENCE 74-314 FEATURE TAILEM BEND AMPHIBOLITE DEPOSIT COORDINATES BOON/100 N LOCATION SEC. 68 HP SEYMOUR ANGLE FROM HORIZ. 900 . DIRECTION POROSITY HARDNESS PENETRATION TIME DEPTH **STRUCTURES** DESCRIPTION OF CHIPS LOG IMINS (m) MOLINEAUX ·. : · SAND: pale yellow, RECENT fine grained. CALCRETE: buff, hard a light top, soft a subject friable at bottom. 0,00 ISTO CLAY: red-brown, slightly sandy plastic 10 PLEI SAND DEIO SAND: orange e yellow brown clayey, fine KANMAN TOO GROUP スイン SCHIST: grey-brown weathered CAMBRI 20. END OF HOLE 7metres 30-ENVIRONMENT & RESOURCES DIVISION POROSITY TERM HARDNESS TERM DRILL NO. DM 67 . LOGGED TYPE MAY HEW 1000 D. NICHOL VS - Very Soft HP - Highly Porous S - Soft P - Porous DATE 3/7./73 DRILLER D. LUKER. TRACED R.B. START 3/7/73 FINISH 3/7/73 MP – Moderately Porous MH – Moderately Hard H - Hard SP - Slightly Porous SHEET, 1. OF, 1. DRG, NO. \$10861 VH – Very Hard NP - Non Porous

DEPARTMENT OF MINES - SOUTH AUSTRALIA HOLE NOMT 31 PROJECT MURRAY LANDS RAILWAY - SUPPLIES PLA HOLE DRILL SERIAL NÖ**953/73** PLAN REFERENCE 74-314 FEATURE TAILEM BEND AMPHIBOLITE DEPOSIT COORDINATES . 700 . E/100 9 N LOCATION SEC. 68 HP SEYMOUR ANGLE FROM HORIZ. 90 . DIRECTION -POROSITY HARDNESS PENETRATION TIME DEPTH DEPTH DESCRIPTION OF CHIPS LOG STRUCTURES A S S S E H Z SAND: pale yellow. RECEN fine grained CALCRETE: buff hard anodular at top, soft afriable at bottom PLEISTOCEN CLAY: red-brown, 2×0+ slightly sandy, plastic 10 ANCHE BL LOXTON PLIOCENE SAND: oranga-brown, clayey fine grained QUARTZITE-pink & 8 grey. Fresh. 9 END OF HOLE 9metres 30 POROSITY TERM HARDNESS TERM ENVIRONMENT & RESOURCES DIVISION VS - Very Sof: HP – Highly Porous DRILL NO. DM 67 . LOGGED
TYPE MAYHEW 1000 D. NICHOL P - Porous S - Soft DATE 3/7/73 TRACED R.B DRILLERDILLUKER MP – Moderately Porous MH – Moderately Hard START 3/7/3 CHECKED A.F FINISH 3/7/73 SP - Slightly Porous $H \stackrel{\cdot}{=} Hard$ SHEET, 1. OF .1 DRG. NO. 5 10862 VH - Verv Hord NP - Non Porous

PROJECT MURRAY LANDS BALL REFERENCE HOLE SERIAL NO **953/73** PLAN REFERENCE 74 -314 FEATURETAILEM BEND AMPHIBOLITE DEPOSIT COORDINATES 275 E/150 N LOCATION SEC 68 HPSEYMOUR ANGLE FROM HORIZ. 9.00. DIRECTION -POROSITY HARDNESS PENETRATION TIME DESCRIPTION OF CHIPS LOG STRUCTURES A S S S S E E E SAND: pale yellow-brown. Fine grained BLANCHE-HOWN CLAY CLAY: red-brown, slightly PLEIS OCENI sandy, plastic QUARTZITE grey, fresh minor amphibolite schist CAMBRIAN Ŏ KANMALT 20-END OF HOLE 7matres 30-HARDNESS TERM POROSITY TERM ENVIRONMENT & RESOURCES DIVISION HP - Highly Porous VS – Very Soft DRILL NO. DM 67. LOGGED TYPE MAYHENSO. D. NICHOL S-SoftP - Porous DATE 4/7/73 TRACED RB. DRILLERD, LUKER. MP – Moderately Porous MH - Moderately Hard START 4/.7/73 . FINISH 4/.7/.73 CHECKED .AF SP - Slightly Porous H - Hard SHEET. 1. OF .1 DRG. NO. S. 10863 VH – Very Hord $NP-Non\ Porous$

DEPARTMENT OF MINES — SOUTH AUSTRALIA

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DEPARTMENT OF MINES - SOUTH AUSTRALIA HOLE NO.MT 33 PROJECT MURRAY LANDS RAILWAY- BALLAST SUPPLIES PLAST SUPPLIES PLAST SUPPLIES CO DRILL HOLE SERIAL NO.953/73 PLAN REFERENCE 74-314 COORDINATES 200 E /075. N. LOCATION. SEC. 68 HP SEYMOUR ANGLE FROM HORIZ. 90°. DIRECTION -POROSITY HARDNESS PENETRATION TIME (MINS.) DEPTH DEPTH DESCRIPTION OF CHIPS LOG STRUCTURES ~ \$ 3 5 5 5 5 ± ± ± CALTE SAL SOIL CALCRETE: buff, hard anodular attop, soft afriable at bottom 200 'nŹ CLAY: red-brown slightly sandy plastic AMPHIBOLITE: 2₹ Α A 3 END OF HOLE 3 Imetres POROSITY TERM HARDNESS TERM ENVIRONMENT & RESOURCES DIVISION HP – Highly Porous VS – Very Soft DRILL NO. D.M 67 LOGGED
TYPEMAYHEW 1000 D. NICHOL P – Porous S-SoftDATE **5/7/73**TRACED **R.B** DRILLERD, LUKER. MP – Moderately Porous MH – Moderately Hard START 5/7/73. CHECKED . A.F. FINISH 5171.73. SP - Slightly Porous H - Hard S10864 NP - Non Porous VH – Very Hard SHEET. I . OF. I . DRG. NO.

LOG OF ROTARY AIR DRILL HOLE													34
		LOG OF				AIR	DRILL	HOLE	Ş	SERL	AL N	.95	3/73
PROJEC	TMUR	RAY LANDS RAILWAY	- S	UPP	LIES		n reference						
FEATUR	KE IAI	LEM BEND AMPHIBOI	Ļ™Ę ∕∖∖∕	O L	ÞÓSI7 D								
LOCAT	ا <u>ن این ا</u> ام	2000.11 221	. , ,	<u> </u>			Y HARDNESS	RIZ. 90° . DIRECT	\top			1 TIME	DEDTU
	ե ∢	description of chips		LOG	(m)		T S S X I S	STRUCTURES		- 0	MINS.	1-000	DEPTH
PLEIS 10- CENE	CALCI THE BOIL	CALCRETE: buff had an advisor at top, so exfriable at bottom	nard f†	0001	, -								
		SCHIST: black, weathered.		٠).									E
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CAMBRIAN	Ŏ			`)				•					
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B	KANMAN GROUP			5	_ =								F 10-1
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		POROSITY TERM HP = Highly Porous		HARD VS – Ve	NESS TEI	κM		DRILL NO.DM			LOGG		v 15 ION
		P – Porous		S – Soft	,			TYPE MAYHEY	NiO C	0,0	D, N	liCH	
		MP – Moderately Porous			oderately	Hard		DRILLER D. LUK START 5/7/7/3			DATE TRAC	5/7 ED R	/73 .B
		SP – Slightly Porous		H ∸ Har	d ,			FINISH 5/7/73			CHEC	KED.	A.I.
		NP – Non Porous		VH - Ve	ery Hard			SHEET. 1. OF. 1	.DR	G. N	o.S	1089 108	65

HOLE NO.MT35 DEPARTMENT OF MINES - SOUTH AUSTRALIA PROJECT MURRAY LANDS RAILWAY - BOLLAST. HOLE 74-314 AIR DRILL SERIAL NO **953/73** PLAN REFERENCE FEATURE TAILEM BEND AMPHIBOLITE DEPOSIT COORDINATES 250 E/075 N LOCATION SEC. 68 HP SEYMOUR ANGLE FROM HORIZ, 900 . DIRECTION PENETRATION TIME DEPTH DESCRIPTION OF CHIPS **STRUCTURES** CALCRETE OF THE BAKARA SOIL LOG A S S S E I S CALCRETE: buff, har Exnodularat top, soft Afriable at bottom CIBY: pale brown sandy plastic 900 NET. PLEI SCHIST: grey-brown 2 CANMANTO weathered CAM-BRIAN 3 - lo END OF HOLE 4 metres 20 ENVIRONMENT & RESOURCES DIVISION HARDNESS TERM POROSITY TERM DRILL NO.DM 6.7 TYPE MAYHEW 1000 VS - Very Soft HP - Highly Porous LOGGED D.NICHOL S-SoftDATE 5/7/73
TRACED R.B
CHECKED.A.F. P - Porous DRILLER D. LUKER. MH – Moderately Hard MP – Moderately Porous START 5/7/73 FINISH 5.17173 SP - Slightly Porous H - Hord SHEET. 1. OF. 1. DRG. NO. 510866 VH – Verv Hard NP - Non Porous

DEPARTMENT OF MINES - SOUTH AUSTRALIA HOLE NO.MT 36 PROJECT MURRAY LANDS RAILWAY - BALLAST SUPPLIES FEATURE TAILEM BEND AMPHIBOLITE DEPOSIT DRILL HOLE AIR SERIAL NO.953/73 PLAN REFERENCE 74 - 314 COORDINATES 1.75 E /075 N LOCATION SEC 68 HP SEYMOUR ANGLE FROM HORIZ. 90° . DIRECTION .-POROSITY HARDNESS PENETRATION TIME DEPTH DESCRIPTION OF CHIPS LOG **STRUCTURES** (MINS.) 101 CALCRETE: buff, hard anodular at top, soft a friable at bottom. PLEISTOCENE -1 2 CLAY: rod-brown, slightly sandy, plastic 3 PLIO SAND: orange-brown, clayey, fine grained.
QUARTZITE: grey fresh 4 KANMANTOO GROUP END OF HOLE CAMBRIAN 4metres 20-ENVIRONMENT & RESOURCES DIVISION HARDNESS TERM POROSITY TERM VS - Very Soft HP - Highly Porous DRILL NO.DM 67 . LOGGED D.NICHOL TYPE MAYHEW 1000 P - Porous S -- Soft DRILLERD LUKER . START 5/7/73 . . DATE 5/7/73
TRACED R.B.
CHECKED A.F. MH – Moderately Hard $\mathsf{MP}-\mathsf{Moderately}\ \mathsf{Porous}$ FINISH 5/71.73 SP - Slightly Porous SHEET, 1. OF. 1. DRG. NO. 310867 $NP-Non\ Porous$ VH – Very Hard

	NT OF MINES — S			HOLE NO. MT 37
LOG OF R	OTARY Ali	R DRILL I	HOLE	SERIAL NO 953/73
PROJECT MURRAY LANDS RAILWAY - BAI			74-314	
FEATURE TAILEM, BEND AMPHIBOLITE DI		COORDINATES 20		
LOCATION.SEC.68 HP.SEYMOU			z. 90°. directi	
DESCRIPTION OF CHIPS	LOG DEPTH	OSITY HARDNESS	STRUCTURES	PENETRATION TIME DEPTH
CALCRETE: buff hard enodular at top soft a friable at bottom. CLAY: red-brown, slightly sandy, plastic	1-1			
217 CLAY: red-brown, slightly				
DO CONTROL QUARTZITE: DO DINK CA gray, fresh DO V V V V V V V V V V V V V V V V V V V				
R C A	3-3			
END OF HOLE 3 Gmetres	7 -			
POROSITY TERM	HARDNESS TERM			& RESOURCES DIVISION
· · · · · · · · · · · · · · · · · · ·	VS – Very Soft S – Soft		DRILL NO.DM &	1000 D. MICHOL
P — Porous MP — Moderately Porous	S = Soft MH = Moderately Ho	ard	DRILLER D. LUK	ER . DATE 5/7/73
MP - Moderately Porous SP - Slightly Porous	H - Hard	ar van	START 51, 11 / 3	3. CHECKED A.F.
SP – Slightly Porous NP – Non Porous	VH - Verv Hard		SHEET. 1. OF.1.	DRG. NO. S 19868

		DEPART	LIA	HOLE NO. MT 38				
		RRAY LANDS RAILWAY BALLAST	ROTA	KRY	AIR	DRILL	HOLE	SERIAL NO. 953/73
PROJE	IDE TAIL	EM BEND AMPHIBOLITE DEPOSIT	SOPPLIE	5 .		n referenc		
		C. 68 HD SEYMOUR		•			250E/050N	
100/11	11014.02	C. CO. NO DETINOON	i ·	· ·	T	LE FROM HO Y HARDNESS	driz. 90° direc	· · · · · · · · · · · · · · · · · · ·
		DESCRIPTION OF CHIPS	LOG	DEPTH (m)	!		STRUCTURES	PENETRATION TIME DEPTH
) 발	ر کے ن بد	Calcrete: buff, hard and nodule	ar 000	 	Ī a ₹ %	Z S S Z I S		- 0 w 4 r 0 r x 0 E
PLEISTOCENE	Colorete of the Bakara Soil	at top, soft and friable at botto						
IST(T Z	Clay: red-brown, slightly		<u> </u>				
P.E.	BLANCH FTOWN CLAY	sandy, plastic.	====	. =				
Z	1		5: 3	2-				
CAMBRIAN	KANMANTOO	Schist: black, fresh.	s. 5.	: 3				
MB	NMANT	<u></u>	g . 5	3				1
5	X X		S. S.	=				
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		POROSITY TERM	1 HARD	ness ter	RM	<u> </u>	ENVIRONMENT	& RESOURCES DIVISION
		HP – Highly Porous	VS – Ver				DRILL NO. DM 6	
		P – Porous	S – Soft				TYPE . MAYHEW	1000 D. NICHOL
		MP – Moderately Porous	MH – Mo	oderately	Hord		DRILLER D. LUKE START .28/6/7	TRACED L.R.
		SP – Slightly Porous	H – Harc				FINISH 28/6/7	3 . CHECKED A.F
		NP – Non Porous	VH – Ve	nv Hord			SHEET. 1. OF.1.	DRG NO Je4

DEPARTMENT OF MINES - SOUTH AUSTRALIA HOLE NO. MT 39 PROJECT MURRAY LANDS RAILWAY - BALLAST SUPPLIES HOLE SERIAL NO 953/73 PLAN REFERENCE . 74-314 FEATURE TAILEM BEND AMPHIBOLITE DEPOSIT COORDINATES . 300E/050N LOCATION SEC. 68, HD. SEYMOUR ANGLE FROM HORIZ. 90° . DIRECTION .-POROSITY HARDNESS PENETRATION TIME DEPTH DEPTH DESCRIPTION OF CHIPS LOG STRUCTURES A S S S S I I Y 000 calcrete of the **PLEISTOCENE** Calcrete: buff, hard and nodular large fragments of ot top, soft and friable at bottom. amphibalite. . 5. 5. 5. 5. 5 S Schist: grey-brown, CAMBRIAN KANMANTOO 10-5 S 5 weathered. END OF HOLE 5M 20-ENVIRONMENT & RESOURCES DIVISION POROSITY TERM hardness term VS - Very Soft HP - Highly Porous LOGGED DRILL NO. DM 67 TYPE MAYHEW 1000 D. NICHOL P – Porous DATE . 3/7/23 TRACED L.R. CHECKED . A.F. DRILLER D. LUKER MH – Moderately Hard MP – Moderately Porous START 3/7/73 3/7/73 H - Hard FINISH SP-Slightly PorousSHEET. 1. OF. 1. DRG. NO. 30870 VH – Very Hard NP - Non Porous

DEPARTMENT OF MINES - SOUTH AUSTRALIA HOLE NO. MT 40 LOG OF ROTARY AIR HOLE SERIAL NO.953/73 PROJECT MURRAY LANDS RAILWAY - BALLAST SUPPLIES PLAN REFERENCE 74-314 FEATURE TAILEM BEND AMPHIBOLITE DEPOSIT COORDINATES . 150E / 000 N SEC 68, HD, SEYMOUR ANGLE FROM HORIZ. 90° LOCATION. . DIRECTION .-PENETRATION TIME POROSITY HARDNESS DEPTH DEPTH DESCRIPTION OF CHIPS LOG STRUCTURES A S S S E E E RECENT Sand: pale yellow-brown, MOLIN-EAUX SAND Calcrete: buff, hard and nodular Colcrete of the Bakaba at top, soft and friable at bottom. Clay: red-brown slightly 10sandy, plastic. SLAY. PLEISTOCENE BLANCHETOWN 20-S Schist: grey-brown, weathered. S END OF HOLE 8M. 30-ENVIRONMENT & RESOURCES DIVISION POROSITY TERM HARDNESS TERM VS – Very Soft HP - Highly Porous LOGGED DRILL NO. DM 67 D. NICHOL TYPE . MAYHEW . 1000 S – Soft $\mathsf{P}-\mathsf{Porous}$ DATE . 5/7/73 TRACED L.R. CHECKED . A.F. DRILLER D. LUKER MH - Moderately Hard MP – Moderately Porous 5/7/73 START 5/7/73 FINISH $H\stackrel{.}{=} Hard$ SP - Slightly Porous 5 10871 Je4 VH – Very Hard SHEET. I.OF. DRG. NO. NP - Non Porous

		DEPARTME							NO.MT 4	
		LOG OF F	KUIA	KY <i>I</i>		DRILL	HOLE	SER!	ML NO 953	/73
		RAY LANDS RAILWAY-BALLAST SU	PPLIES	•		REFERENCE				i
		EM BEND AMPHIBOLITE DEPOSIT. C. 68, HD SEYMOUR	. ,				250E/000N		•	
LOCAT	ION. SEC	S. 66, HU SETIMOUN		·		FROM HO	riz. 90° direct	1	ATION TIME	DEPTH
	!	description of chips	LOG	DEPTH		S S X I Y	STRUCTURES	'	4 10 0 1 2 0 WINZ:	(m)
RECENT	NOLIN- EAUX SAND	Sand: pole yellow brown, fine grained								
	13 X X 01	Calcrete: buff, hard and nodular		, 						
N.		on top, soft and friable on bottom.	= +	2			n.			<u> </u>
PLEISTOCENE	BLANCHETOWN CEAY	<u>Clay</u> : red-brown, slightly sandy, plastic.		3						- - - - -
CAMBRIAN	KANMANTOO	Schist: black, slightly weathered.	S S S S S	5—						
	1 2			6-				 		20-
		END OF HOLE 6M								
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		POROSITY TERM		DNESS TI	ERM		environmen.			IVISION
		HP – H ig hly Porous	VS – Ve				DRILL NO. DM TYPE . MAYHEY		LOGGED	NCHOL .
1		P – Porous	S – Soft	: Aoderately	Hard		DRILLER .D. LI	JKER .	DATE 28/6	5/73 .
		MP - Moderately Porous	MH – M		, i luitu		START 28/6/ FINISH 28/6/		TRACED CHECKED	,A.F
		SP — Slightly Porous NP — Non Porous		ery Hard			SHEET OF.		5 108	72

DEPARTMENT OF MINES - SOUTH AUSTRALIA HOLE NO. MT 42 LOG 0F ROTARY DRILL HOLE SERIAL NO 953/73 PROJECT MURRAY LANDS RAILWAY - BALLAST SUPPLIES PLAN REFERENCE 74-314 FEATURE TAILEM BEND AMPHIBOLITE DEPOSIT COORDINATES 400E/000N LOCATION. SEC. 68, HD. SEYMOUR ANGLE FROM HORIZ. 90° . DIRECTION -PENETRATION TIME POROSITY HARDNESS DESCRIPTION OF CHIPS STRUCTURES LOG # 4 # 8 # 5 S S # + £ 0000 Colorete of the Bakaba Soil Calcrete: buff, hard and nodular **PLEISTOCENE** at top, soft and friable at bottom. Clay: red-brown slightly sandy, plastic. S · S · S · CAMBRIAN S S Schist: grey-brown, slightly weathered. Ś END OF HOLE 5M. 20-ENVIRONMENT & RESOURCES DIVISION HARDNESS TERM POROSITY TERM VS - Very Soft HP - Highly Porous DRILL NO. DM 67. LOGGED D. NICHOL TYPE . MAYHEW .1000 P – Porous DATE . 28/6/73 TRACED L.R. DRILLER D. LUKER MH - Moderately Hard $\mathsf{MP}-\mathsf{Moderately}\ \mathsf{Porous}$ START 28/6/73 CHECKED A.F. FINISH 28/6/73 H - Hard SP - Slightly Porous SHEET. 1. OF. 1. DRG. NO. S 10873 VH – Very Hard NP - Non Porous

FEATUR	RE TAILE	LOG OF I RAY LANDS RAILWAY-BALLAST SU EM BEND AMPHIBOLITE DEPOSIT		. PL	DRI DRI AN REFEI	LL rence	HOLE	SER · ·	NO. MX1
LOCAT		68(30) HD. SEYMOUR			IGLE FRO			PENET	RATION TIME DEPTH
		DESCRIPTION OF CHIPS			8 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	E I F	STRUCTURES		4 N O L 8 O
RECENT	MOLINEAUX	Sand: pale yellow-fine grained.		1					
PLEISTOCENE		Calcrete: buff, hard and nadular at top, soft and friable at bottom.		3					- 10
PLEIST	BLANCHE TOWN CLAY	<u>Clay</u> : red-brown slightly sondy, plastic.		- 5					
PLIOCENE	LOXTON SAND	Sand: orange-brown, yellaw- brown and pale yellow, slightly clayey, fine grained.		8					34
		END OF HOLE ISM							מין
		POROSITY TERM HP — Highly Porous P — Porous MP — Moderately Porous SP — Slightly Porous NP — Non Porous	VS — Very S — Soft	oderately Hard	1	<u> </u>	DRILL NO. DN TYPE . MAYHEY DRILLER .D. LI	1 67 / 1000 JKER //73	DATE 5/7/73 TRACED L.R. CHECKED A.F. NO. 510874

APPENDIX D

Explanatory notes and logs of diamond drillholes

APPENDIX D

EXPLANATORY NOTES AND LOGS OF DIAMOND DRILLHOLES

Explanatory Notes on Drilling Procedures

Equipment

A Mindrill type F20 diamond frilling machine was used.

Core was drilled with sizes NBLC, BMLC and BX core barrels. For size NMLC, "M" type stationary inner tube core barrels were used fitted with bottom discharge bits and split inner tubes.

Storing and marking of core

Cores were stored in wooden trays each compartment of which has been designed to contain one metre of core. The boxes were marked with consecutive compartment numbers at one end and the drilled depths from the surface in metres at the other.

The core was boxed in this manner at the drill site, being placed in its appropriate place in the box as soon as it was extracted from the core barrel. Aluminium depth markers were placed at the end of each run. The measured depth of the hole in metres from the surface was painted on the side of the core box and on the core. Timber blocks of appropriate length indicate core not recovered (red blocks) and core removed for testing (yellow blocks).

The core has been stored at the Department of Mines, Drilling and Mechanical Branch, Dalgleksh Street, Thebarton, South Australia and is available for inspection.

Notes on Diamond Drill Log Sheets

The logs have been plotted on a vertical scale of one centimetre = 1 metre (1:100).

The description given on the log sheet refers only to materials recovered as core. Core may be lost by being ground away during the drilling process; it may usually be inferred that such material was relatively weak but this cannot be assumed necessarily the case since even solid rock can be ground away and lost under some conditions.

To the left of the graphic log is a geological description of the materials sampled. This includes:-

Geological age) Printed vertically Rock Unit name)

Nature and type of material

Classification of the rock substance in terms of its porosity, its condition and its hardness has been shown graphically in the appropriate column. Such classification has been based on a qualitative estimate only.

PROJEC	CT_MUR	DEPART RAYLANDSRAILWAYS LOG OF	. D	IAMO	NES · SOU	RILL	HOL		HOLE NO SERIAL N		OT I 62/74
FEATUR	RE TAIL	EM_BEND_AMPHIBOLITE DEPOSIT ction_68_HD_Seymour	PL	AN REF	ERENCE L TES	74 - 3 208E	314 100N	ON_ 27L°(true)	<u>.</u>		
LUCATA	UN_OSC	andr vo. na. oeginudi		1	OROSITY			ON LEIL LELEBY	1088	9	DEPTH
		DESCRIPTION OF CORE	LOG	DEPTH (m.)	AND CONDITION 오 오 오 오 달	\$°₹±₹	\$ 5	TRUCTURES	CORE LOSS	CASING	(FT.)
CENE				-							
ST0		No core recovered		1 _	- +	- +					į
PLE ISTOCENE				2_							-5
		Quartzite — grey and pink		3			foliati	on at 45° to core axis			
		Quartzite — grey and pink,	• :								-10
		banded. Hornblende schist 2cm thick at 3.30m		4							
		Weathered mica schist 2cm thick at 3:60 m		5							-15
+		Schist - green Quartzite - grey		_							
		Schist – green	-	6_				al la lated			-20
		Quartzite – grey Weathered mica schist		, -				ngly jointed tion at 50° t	-0		
		3 cm thick at 6.20 m						core axis			25
		Amphibolite — dark green	+ +	~-							
	о С	20% hard bands	+ +	9							
	0	No core recovered									-30
	Q K	Amphibolite - dark green	+ +	10							
		No core recovered		11							-35
Z											
4	0	Amphibolite – dark green	+++	12_							-40
BR) -	No core recovered]							
Σ	Z	Amphibolite – dark green	+ +	.							-45
4	4	Amphibolite - unik green	++	1					!		43
U	M	No core recovered	+++	15							
	- Z	Quartzite — grey No core recovered	1	٦.							-50
	- X -	No core recovered	+ -	16	1111						
		Amphibolite - dark green	+ +	17							-55
		 	+++	+							
		Quartzite - grey with minor amphibolite	:+								_60
		No core recovered	-tr1	19							
		Amphibolite -dark green		_			C 11	4501		_	05
Dr	70061	Schistose amphibolite glark TY TERM CONDITION T			HARDN	דפפ דדו	L	on at 45° to core)(IBC	FS DIV
B.		Porous Fresh		٧S	Yery so		NIVI	DRILL Nº 9	LO	3G E.D)
l p	Porou	s IIII Decompos	k X	S MH	Soft Moderat		d.	TYPE _ MINDRILL DRILLER J. JENSI	 DA	D. N TE	UCHOL 5-12-73_
SP	Slight	ly Porous Man Altered		Н	Hard	V		START 30-11-73 FINISH 5-12-7	3 CHI	CKE	D.J.M. D_A.F.
אף	non P	orous Not applic	MUR	, YH	Very Ha	iu		SHEET_LOF_Z_	DRG Nº	<u>\$1</u> 0	282 8/5 e4

PROJEC	DEPARTMENT OF MINES SOUTH AUSTRALIA ROJECT_MURRAY_LANDS_RAILWAYS_LOG_OF_DIAMOND_DRILL_HOLE PLAN REFERENCE 74-314 COORDINATES 208E JOON															
		EM BEND AMPH ction 68 HD S			CO	OZDINA	TFS		208 F	100 N	ON.	271° (true	22			
LUCATI		DESCRIPTION				DEPTH	POROS AND CONDIT	HON YTY	IARDNES	 \$ 		CTURES	<i>y</i> .	CORE LOSS	CASING	DEPTH (FT.)
		Schistose amp	phibolita	- dark	+++		<u>z e z</u>	20 Z >	. 2 ≥ ± >		at	45° to core	z axis			
		No core				21_										- 70
					4 +	22	<u> </u>			-:						
Z	ROUP	Quartzite	•		+ +	23			111							-75
Z	Ø -	- -				, 24 25										-80
മ	00_	No core	recov	vered		-										
C A	KANMANTO	Quartzite		graen graen gceous		26							-			-85
	KANI	Schistos — dark	e amp	phibolite zn	+++	27_	11									-90
		No core res	mphibo gree	plite-	+++	28	XX				-					<u> </u>
			END	OF HO	LE_	28.31	m						٠.			-95
						ļ									-	
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P	OROSI	TY TERM	CON	DITION T	ERM	 (HAR	DNE	SS TE	rm	EN	/IRONMEN	ΓĘR	ESC	DUR	CES DIV.
HP P MP	Highly Porou Moder	Porous		Fresh Decompos Weathere Altered	d d	VS S MH H	Yery Soft Mode Hare	sof erati	t ely Har		DRIL TYP	L Nº 9 . E . MINDRII LER J. JEN RT 30-11- SH 5-12-	L SEN	LOI DA'	SGET D. TE.	NICHOL 5-12-73 D.J.M. D A.F
NP	Non P	ŏrous		Not appli	cable	, YH	Very	Har	g			ET_20F_2.				

DEPARTMENT OF MINES SOUTH AUSTRALIA PROJECT_MURRAY_LANDS_RAILWAYS LOG OF DIAMOND DRILL HOLE SERIAL Nº 664/74											
FEATURE TAILEM BEND AMPHIBOUTE DEPOSIT LOCATION Section 68 HD. Seymour	CO PL	ORDINA	OM HORIZ 90°_	E 100N							
DESCRIPTION OF CORE	LOG	DEPTH	POROSITY AND HARDNESS CONDITION 물 요 물 등 달 당 50 풀 포 뜻	s structures	CORELOSS	CASING	DEPTH (FT.)				
No core recovered											
Amphibolite - dark green	+++	2		foliation at 5° to cor	e axis		- 5				
END OF HOLE 2.00m		_					- 10				
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		<u>-</u>					-				
POROSITY TERM CONDITION T	T.RM		HARDNESS TER	ZM ENVIRONMEN	T & RESC	L DUR(ES DIV				
HP Highly Porous P Porous MP Moderately Porous SP Slightly Porous NP Non Porous Not applie	ed d	VS S MH H	Yery soft Soft Moderately Hard Hard Yery Hard	DRILL Nº 9 TYPE MINDRILL	LOC 15en DA 13 TRI 13 CHE	SGEC TE_ CEC CKE) _ NICHOL _				

FEATU	re Tail	DEPAR RAY LANDS RAILWAYSLOG OF EM. BEND AMPHIBUTE DEPOSIT action 68 Hd. Seymour	D	AM(DND	DRI DRI 7 23:	LL	ALIA HOLE -314 -100N -DIRECTION 274°(+r)			OT 3 65/74
	[DESCRIPTION OF CORE	LOG	DEPTH	POROSI AND CONDITI 을 느 을 끊	FY │HARDI ON 말I옷∽풀	NESS = =	STRUCTURES	CORE LOSS	CASING	DEPTH (FT.)
PLEIS TOCENE		No core recovered		2							- 5
		Schistose amphibolite — dark green	* + + + + + + + + + + + + + + + + + + +	3_ · 4_							- 10
		Mica schist - green	+++	5							15
		Schistose amphibolite - dark green No core recovered	++		XX						
		Mica schist - green with minor hornblende schist		- 6_ 7_				foliation at 50° to core axis	the		-20 25
		Schistose amphibolite — dark green	+ +	. 8_							20
	0 U P	No core recovered Schistose amphibolite—dark		9	XXX						- 30
Z	6 R	No core recovered		10	XXXI						
RIA	. 0	Schistose amphibolite— dark green with minor— bands of mica schist	+ + + + + + + + + + + + + + + + + + +	11_						-	-35
- B	0	No core recovered	#-"-4 #-	1							-40
C A M	KANMANT	Mica schist-green)4 15	\bigotimes			·			- 4 5
		Schistose amphibolite — dark green	+++	16	M						-50
		No core recovered	+ +	1							-55
9		Schistose amphibolite —dark green	† + + + + + + +	1 <u>0</u>						-	- 60
		Schistose amphibolite —dark green	+ + + + + +								- 65
		TY TERM CONDITION T	ERM		HARD	NESS	TERN				
P MP SP	Porou Moder	ately Porous 💥 Weathered y Porous 原語 Altered	X.	VS S MH H YH	Very s Soft Moder Hard Very H	ately H	ard	DRILL Nº 9 TYPEMINDRILI DRILLER _J. JEN START G - 12 - FINISH _ 12 - 12 - SHEET _L OF _2	52n DA 73 TR	TE_ ACED ECKE	NICHOL 12-12-73 D.J.M D-A.F. 0830 Je4

PROJECT MURRAY LANDS RAILWAYS LOG OF DIAMOND DRILL HOLE PLAN REFERENCE 74-314									HOLE NO SERIAL M		OT3 65/74	
		EM BEND AMPHIBOLITE DEPOSIT ction 68 Hd. Seymour	CC	ORDINA		233 E	100 N	274° (tru	<u>. </u>			
DESCRIPTION OF CORE LOG				DEPTH	CONDITION) SIK	UCTURES	CORELOSS	CASING	DEPTH (FT.)	
CAMBRIAN	NMANTOO GROUP	Schistose amphibolite — dark green	+ + + + + + + + + + + + + + + + + + + +	21							- 70	
		Mica schist – green	+1+	23						-	- 75	
		Schistose amphibolite-	+ + + + + +	24							- 80	
		dark green Mica schist interlayers 3 cms thick at 25.60 m and 5 cms thick at	1 1 1 1 1 1	27			1	n at 45° to	0		- 85	
		26·25 m	+ + + + + + + + + + + + + + + + + + + +	28							-90	
	X	Breccia – vein quartz fragments in a clay matrix Quartzite – grey and pink	AAA AAA	29							- 95	
	<u> </u> <u>-</u>	END_OF_HOLE_30.40 m	••								-100	
					-						_	
											-	
<i>b</i>				_								
POROSITY TERM CONDITION TER HP Highly Porous P Porous MP Moderately Porous SP Slightly Porous NP Non Porous NP Non Porous NP Non Porous NP Non Porous				VS S MH H	HARDNESS TERM Very soft Soft Moderately Hard Hard Very Hard			ENVIRONMENT & RESOURCES DIV. DRILL Nº 9 LOGGED TYPE MINDRILL D. NICHOL DRILLER J. JENSEN DATE 12-12-73 START G-12-73 TRACED D.J.M. FINISH 12-12-73 CHECKED A.F. SHEET Z OF Z. DRG Nº SLOB3OA JE4				

DEPARTMENT OF MINES SOUTH AUSTRALIA PROJECT MURRAY LANDS RAILWAYS LOG OF DIAMOND DRILL HOLE FEATURE TAILEM BEND AMPHIBOLITE DEPOSIT LOCATION Section 68 Hd. Seymour DEPARTMENT OF MINES SOUTH AUSTRALIA HOLE Nº DT 4 SERIAL Nº 667/74 PLAN REFERENCE 74-314 COORDINATES 258 E 100 N ANGLE FROM HORIZ. 45° DIRECTION 267° (frue)													
		DESCRIPTION OF CO			DEPTH	POROS AND CONDIT	TY H TION	ARDNE? ∽₹±₹	SS S	TRUCTU		1 (2)	ONISS (FT.)
PLEISTOCENE	-	No core recovered			2_							-	- 5
	KANMANHOO GROUP	Schistose amphibo green; minor mica Amphibolite – dark Amphibolite-dark green	green	+ + + + + + + + + + + + + + + + + + + 	4_				foliati	on at 45	5° to core o	ixis	- 15
		No core recovered Schistose amphiboli No core recover Schistose amphi	te red	+ +	7	×××1							- 20
CAMBRIAN		No core recove	red bolite	+ +	8_ 9_					-			730
		Amphibolite - dar Amphibolite - dar		*	<u>10</u>						· <u></u> · ·		-35
		No core recor Schistose amphil dark green	oolite –	† † † † † † † † † † † † † † † † † † †		XX							-40
		with minor m schist and am	ica	+ + + + + + +	14_							-	-45
				+ + + - + + + + +				4. 4					-50
		END OF HOLE	<u>15·60 m</u>										<u>-</u>
POROSITY TERM CONDITION TERM HP Highly Porous P Porous MP Moderately Porous SP Slightly Porous NP Non Porous NP Non Porous NP Non Porous						Very soft Soft Moderately Hard Hard Very Hard Very Hard DRILLE START FINISH				DRILL Nº_ TYPE_M DRILLER	AINDRILL D. NICHOL J. Jensen Date 14-12-73 12-12-73 TRACED D.J.M. 14-12-73 CHECKED A.F.		









