DEPARTMENT OF MINES
SOUTH AUSTRALIA

GEOLOGICAL SURVEY
ENVIRONMENT AND RESOURCE
DIVISION

BALLAST SUPPLIES FOR MURRAY LANDS RAILWAYS
SITE INVESTIGATIONS AT TAILEM BEND

County of Russel, Hundred of Seymour, Section 68

CLIENT: SOUTH AUSTRALIAN RAILWAYS

by

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Geologist
Industrial Minerals Section

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

9th May, 1974

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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 site 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 plagioclase 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 were performed on a representative surface sample 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 (per cent loss)	Sodium Sulphate Soundness (per cent loss)
Amphibolite	12	0.5

All testing was conducted on minus 1½ inch plus ¾ 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

Unit	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 Loxton 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.	Inclination	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 (metres)		Description
	from	to	
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 schist
	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.S10065a).

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 perccent 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 andaaverages 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.

Douglas Nichol
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Industrial Minerals Section

DN:JL
9th May, 1974

REFERENCES

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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:

	%
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 andtthe grains have a sieved aspect. The margins of the "primary" grains are now highly irregular with many signs of corrosion by the feldspar. 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 0.1-0.2 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 %	Sodium Sulphate Soundness	Specific Gravity			
			S.G. (APPT)	S.G. (SSD)	S.G. (BULK)	WATER ABSORPTION %
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

HOLE NO. MT 1

SERIAL NO 953/73

PROJECT . MURRAY LANDS RAILWAY — BALLAST SUPPLIES . PLAN REFERENCE . 74-314 .

FEATURE . TAILEM BEND AMPHIBOLITE DEPOSIT . COORDINATES . 400E/600N .

LOCATION . SEC. 68, Hd Seymour . . . ANGLE FROM HORIZ. 90° . DIRECTION —

		DESCRIPTION OF CHIPS	LOG	DEPTH (m)	POROSITY (HP P MP SP NP)	HARDNESS (VS S MH H VH)	STRUCTURES	PENETRATION TIME (MINS.) 1 2 3 4 5 6 7 8 9	DEPTH (m) (FT.)
RECENT	MOLINEAUX SAND	Sand — pale yellow, fine grained		1					
PLEISTOCENE	Calcrete of the BAKARA SOIL	Calcrete — buff; hard and nodular at top, soft and friable at bottom		2 3					10
	BLANCHE TOWN CLAY	Clay — red-brown, slightly sandy, plastic.		4					
PLIO-CENE	LOXTON SAND	Sand — pale yellow, fine grained.		5					
CAMBRIAN	KANMANTOO GROUP	Schist — bluish-grey and brown, siliceous, partly weathered, minor amphibolite schist		6 7 8					20
		END OF HOLE 9.0m		9					30

POROSITY TERM

HP — Highly Porous
P — Porous
MP — Moderately Porous
SP — Slightly Porous
NP — Non Porous

HARDNESS TERM

VS — Very Soft
S — Soft
MH — Moderately Hard
H — Hard
VH — Very Hard

ENVIRONMENT & RESOURCES DIVISION

DRILL NO. DM 67	LOGGED D. NICHOL
TYPE . MAYHEW .	DATE 2 July '73
DRILLER . 1000 .	TRACED G.M.
START 2 July '73	CHECKED . A.F.
FINISH 2 July '73	

SHEET. 1 . OF. 1 . DRG. NO. S10832 Je4

DEPARTMENT OF MINES — SOUTH AUSTRALIA

LOG OF ROTARY AIR DRILL HOLE

HOLE NO. MT 2
SERIAL NO 953/73

PROJECT MURRAY LANDS RAILWAY - BALLAST SUPPLIES PLAN REFERENCE 74-314

FEATURE TAILEM BEND AMPHIBOLITE DEPOSIT COORDINATES 700E/600N

LOCATION SEC. 68, HD SEYMOUR ANGLE FROM HORIZ. 90 DIRECTION —

		DESCRIPTION OF CHIPS	LOG	DEPTH (m)	POROSITY (HP P MP SP NP)	HARDNESS (VS S MH H VH)	STRUCTURES	PENETRATION TIME (MINS.) 1 2 3 4 5 6 7 8 9	DEPTH (m) (FT.)
PLEISTOCENE	Calcrete of the BAKARA SOIL	Calcrete — buff, friable, and silty with occasional hard nodules		1					
PLEISTOCENE	BLANCHETOWN CLAY	Clay — red-brown, slightly sandy to sandy, highly plastic.		2 3 4 5 6					10
CAMBRIAN	KANMANTOO GROUP	Schist — bluish grey and brown, micaceous, partly weathered		6 7 8 9					20
		END OF HOLE 9m		9 10 11 12 13 14					30

POROSITY TERM

HP — Highly Porous
P — Porous
MP — Moderately Porous
SP — Slightly Porous
NP — Non Porous

HARDNESS TERM

VS — Very Soft
S — Soft
MH — Moderately Hard
H — Hard
VH — Very Hard

ENVIRONMENT & RESOURCES DIVISION

DRILL NO. DM 67
TYPE MAYHEW 1000
DRILLER D. LUKER
START 3 July '73
FINISH 3 July '73

LOGGED D. NICHOL
DATE 3 July '73
TRACED G.M.
CHECKED A.F.

SHEET 1 OF 1 DRG. NO. 510833 Je4

DEPARTMENT OF MINES — SOUTH AUSTRALIA

LOG OF ROTARY AIR DRILL HOLE

HOLE NO. MT 3
SERIAL NO. 953/73

PROJECT MURRAY LANDS RAILWAY - BALLAST SUPPLIES PLAN REFERENCE 74 - 314
FEATURE TAILEM BEND AMPHIBOLITE DEPOSIT COORDINATES 300E/500E
LOCATION. SEC. 68. HD SEYMOUR ANGLE FROM HORIZ. 90° . DIRECTION —

		DESCRIPTION OF CHIPS	LOG	DEPTH (m)	POROSITY (HP P MP SP NP)	HARDNESS (VS S MH H VH)	STRUCTURES	PENETRATION TIME (MINS.) 1 2 3 4 5 6 7 8 9	DEPTH (m) (FT.)
RECENT	MOLINEAUX SAND	Sand : pale yellow fine grained		1 2 3					
PLEISTOCENE	Calcrete of the BAKARA SOIL	Calcrete – buff, friable, silty with hard nodules at top, slightly clayey at bottom		4 5 6 7 8					10 20
	BLANCHETOWN CLAY	Clay – red-brown, slightly sandy to sandy, very plastic.		9 10 11 12					30
PLIOCENE	LOXTON SAND	Sand : orange, yellow, brown and pinkish brown, fine grained		13 14 15 16 17 18 19					40 50 60
		END OF HOLE 19m.							

POROSITY TERM
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HARDNESS TERM
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ENVIRONMENT & RESOURCES DIVISION

DRILL NO. D.M 67.	LOGGED D.NICHOL.
TYPE MAYHEW 1000	DATE 2 July '73
DRILLER D.LUKER	TRACED G.M.
START 2 July '73	CHECKED A.F.
FINISH 2 July '73	
SHEET 1 OF 1	DRG. NO. S10834 Je4

DEPARTMENT OF MINES — SOUTH AUSTRALIA

LOG OF ROTARY AIR DRILL HOLE

HOLE NO. MT4

SERIAL NO. 953/73

PROJECT MURRAY LANDS RAILWAY BALLAST SUPPLIES PLAN REFERENCE 74-314

FEATURE TAILEM BEND AMPHIBOLITE DEPOSIT COORDINATES 400E/500N

LOCATION SEC. 68, HD SEYMOUR ANGLE FROM HORIZ. 90 DIRECTION —

		DESCRIPTION OF CHIPS	LOG	DEPTH (m)
RECENT	MOLINEAUX SAND	Sand: pale yellow, fine grained, slightly clayey at bottom		0–6
PLEISTOCENE	Calcrete of the BAKARA SOIL	Calcrete: buff, hard nodules in soft clayey and sandy matrix.		6–8
	BLANCHETOWN CLAY	Clay: red-brown slightly sandy, highly plastic		8–11
PLIOCENE	LOXTON SAND	Sand: red-brown at top, pale brown at bottom, clayey, fine grained.		11–13
CAMBRIAN	KANMANTOO GROUP	Schist, gneiss and quartzite, brown and grey, weathered at top.		13–14
		END OF HOLE 14.3m		14–15

POROSITY: HP, P, MP, SP, NP

HARDNESS: VS, S, MH, H, VH

STRUCTURES

PENETRATION TIME (MINS.): 1 2 3 4 5 6 7 8 9

DEPTH (m) / (FT.)

POROSITY TERM

HP – Highly Porous
P – Porous
MP – Moderately Porous
SP – Slightly Porous
NP – Non Porous

HARDNESS TERM

VS – Very Soft
S – Soft
MH – Moderately Hard
H – Hard
VH – Very Hard

ENVIRONMENT & RESOURCES DIVISION

DRILL NO. D.M.67	LOGGED D. NICHOL
TYPE MAYHEW 1000	DATE 2 July '73
DRILLER D. LUKER	TRACED G.M.
START 2 July '73	CHECKED
FINISH 2 July '73	

SHEET 1 OF 1 DRG. NO. S10835 Je4

DEPARTMENT OF MINES — SOUTH AUSTRALIA

LOG OF ROTARY AIR DRILL HOLE

HOLE NO. MT5
SERIAL NO. 953/73

PROJECT MURRAY LANDS, RAILWAY- BALLAST SUPPLIES PLAN REFERENCE 74-314
FEATURE TAILEM BEND AMPHIBOLITE DEPOSIT COORDINATES 400E/400N
LOCATION SEC. 68, Hd SEYMOUR ANGLE FROM HORIZ. 90 DIRECTION —

		DESCRIPTION OF CHIPS	DEPTH (m)	DEPTH (FT.)
RECENT	MOLINEAUX SAND	Sand: pale yellow, fine grained		
PLEISTOCENE	Calcrete of the BAKARA SOIL	Calcrete: buff, hard nodules in soft clayey and sandy matrix	1–3	
PLEISTOCENE	BLANCHETOWN CLAY	Clay: red-brown, slightly sandy, very plastic.	3–5	
PLIOCENE	LOXTON SANDS	Sand: orange-brown, fine grained	5–6	
CAMBRIAN	KANMANTOO GROUP	Quartzite – pink	6–7	

END OF HOLE 7m.

POROSITY: HP | P | MP | SP | NP
HARDNESS: VS | S | MH | H | VH
STRUCTURES
PENETRATION TIME (MINS.) 1 2 3 4 5 6 7 8 9
DEPTH (m) (FT.)

POROSITY TERM
HP – Highly Porous
P – Porous
MP – Moderately Porous
SP – Slightly Porous
NP – Non Porous

HARDNESS TERM
VS – Very Soft
S – Soft
MH – Moderately Hard
H – Hard
VH – Very Hard

ENVIRONMENT & RESOURCES DIVISION

DRILL NO. DM 67
TYPE. MAYHEW 1000
DRILLER D.LUKER
START 29 June '73
FINISH 29 June '73
LOGGED D.NICHOL
DATE 29 Jun.'73
TRACED G.M.
CHECKED A.F.
SHEET. 1. OF. 1.
DRG. NO. S10836 Je4

DEPARTMENT OF MINES — SOUTH AUSTRALIA

LOG OF ROTARY AIR DRILL HOLE

HOLE NO. MT6

SERIAL NO 953/33

PROJECT MURRAY LANDS RAILWAY — BALLAST SUPPLIES PLAN REFERENCE 74-314

FEATURE TAILEM BEND AMPHIBOLITE DEPOSIT COORDINATES 400E/300N

LOCATION SEC. 68, HD. SEYMOUR ANGLE FROM HORIZ. 90 DIRECTION —

		DESCRIPTION OF CHIPS	DEPTH (m)	STRUCTURES
RECENT	MOLINEUX SAND	Sand: pale yellow, fine grained.		
PLEISTOCENE	Calcrete of the BAKARA SOIL	Calcrete: buff, hard nodules in soft clayey and silty matrix.	1	
PLEISTOCENE	BLANCHETOWN CLAY	Clay: red-brown, slightly sandy, highly plastic	2–6	
PLIOCENE	LOXTON SAND	Sandy yellow and brown, fine grained	6–7	fragments of weathered schists at bottom
CAMBRIAN	KANMANTOO GROUP	Gneiss: pale red-brown	7–8	

END OF HOLE 8 m.

POROSITY: HP P MP SP NP HARDNESS: VS S MH H VH

PENETRATION TIME (MINS.): 1 2 3 4 5 6 7 8 9

DEPTH (m) 10 20 30 (FT.)

POROSITY TERM	HARDNESS TERM
HP – Highly Porous	VS – Very Soft
P – Porous	S – Soft
MP – Moderately Porous	MH – Moderately Hard
SP – Slightly Porous	H – Hard
NP – Non Porous	VH – Very Hard

ENVIRONMENT & RESOURCES DIVISION

DRILL NO. DM 67
TYPE MAYHEW 1000
DRILLER D. LUKER
START 29 JUNE '73
FINISH 29 JUNE '73

LOGGED D. NICHOL
DATE 29 JUNE '73
TRACED G.M.
CHECKED A.F.

SHEET 1 OF 1 DRG. NO. S10837 Je4

DEPARTMENT OF MINES — SOUTH AUSTRALIA

LOG OF ROTARY AIR DRILL HOLE

HOLE NO. MT7

SERIAL NO 953/73

PROJECT MURRAY LANDS RAILWAY–BALLAST SUPPLIES

PLAN REFERENCE 74-314

FEATURE TAILEM BEND AMPHIBOLITE DEPOSIT

COORDINATES 600E/300N

LOCATION SEC.68, HD SEYMOUR

ANGLE FROM HORIZ. 90° DIRECTION —

		DESCRIPTION OF CHIPS	LOG	DEPTH (m)	POROSITY (HP P MP SP NP)	HARDNESS (VS S MH H VH)	STRUCTURES	PENETRATION TIME (MINS.) 1 2 3 4 5 6 7 8 9	DEPTH (m) (FT)
PLEISTOCENE	Calcrete of the BAKARA SOIL	Calcrete: buff; hard nodules in a soft silty matrix.		0					
PLEISTOCENE	BLANCHE-TOWN CLAY	Clay: red-brown, slightly sandy, highly plastic.		1					10
CAMBRIAN	KANMANTOO GROUP	Schist and quartzite: brown and grey weathered hard fragments of quartzite.		4					20
		END OF HOLE 8m		8					30

POROSITY TERM

HP – Highly Porous

P – Porous

MP – Moderately Porous

SP – Slightly Porous

NP – Non Porous

HARDNESS TERM

VS – Very Soft

S – Soft

MH – Moderately Hard

H – Hard

VH – Very Hard

ENVIRONMENT & RESOURCES DIVISION

DRILL NO. DM 67

TYPE MAYHEW 1000

DRILLER D. LUKER

START 3 July '74

FINISH 3 July '74

LOGGED D. NICHOL

DATE 3 July '73

TRACED G.M

CHECKED A.F.

SHEET 1 OF 1

DRG. NO. S10838 Je4

DEPARTMENT OF MINES — SOUTH AUSTRALIA

LOG OF ROTARY AIR DRILL HOLE

HOLE NO. MT 8

SERIAL NO. 953/73

PROJECT RAILWAY LANDS RAILWAY - BALLAST SUPPLIES PLAN REFERENCE 74-314

FEATURE TAILEM BEND AMPHIBOLITE DEPOSIT COORDINATES 200E/200N

LOCATION SEC. 68, HP SEYMOUR ANGLE FROM HORIZ. 90° DIRECTION —

		DESCRIPTION OF CHIPS	DEPTH (m)	DEPTH (FT.)
RECENT	MOLINEAUX	Sand: pale yellow, fine grained		
PLIOCENE	Calcrete of the BAKARA SOIL	Calcrete: buff, hard and nodular at top, soft and friable at bottom.	1–4	10
PLIOCENE	BLANCHETOWN CLAY	Clay: red-brown slightly sandy, plastic	4–6	20
PLIOCENE	LOXTON SAND	Sand: yellow and brown slightly clayey to clayey, fine to medium grained.	7–20	30–60

POROSITY: HP, P, MP, SP, NP

HARDNESS: VS, S, MH, H, VH

STRUCTURES

PENETRATION TIME (MINS.): 1 2 3 4 5 6 7 8 9

POROSITY TERM

HP – Highly Porous
P – Porous
MP – Moderately Porous
SP – Slightly Porous
NP – Non Porous

HARDNESS TERM

VS – Very Soft
S – Soft
MH – Moderately Hard
H – Hard
VH – Very Hard

ENVIRONMENT & RESOURCES DIVISION

DRILL NO. DM 67
TYPE MAYHEW 1000
DRILLER D. LUKER
START 25 JUNE '73
FINISH 26 JUNE '73

LOGGED D. NICHOL
DATE 26 JUNE 73
TRACED G.M.
CHECKED A.F.

SHEET 1 OF 2

DRG. NO. S10839 J64

DEPARTMENT OF MINES — SOUTH AUSTRALIA

LOG OF ROTARY AIR DRILL HOLE

HOLE NO. MT8
SERIAL NO 953/73

PROJECT MURRAY LANDS RAILWAY — BALLAST SUPPLIES PLAN REFERENCE 74-314
FEATURE TAILEM BEND AMPHIBOLITE DEPOSIT COORDINATES 200E/200N
LOCATION SEC. 68, HD SEYMOUR ANGLE FROM HORIZ. 90° DIRECTION —

DESCRIPTION OF CHIPS		LOG	DEPTH (m)	POROSITY (HP P MP SP NP)	HARDNESS (VS S MH H VH)	STRUCTURES	PENETRATION TIME (MINS.) 1 2 3 4 5 6 7 8 9	DEPTH (m) (FT.)
PLIOCENE	LOXTON SAND	Sand: yellow and brown slightly clayey to clayey fine to medium grained	21 22 23 24					10
		END OF HOLE 24m						20

POROSITY TERM
HP – Highly Porous
P – Porous
MP – Moderately Porous
SP – Slightly Porous
NP – Non Porous

HARDNESS TERM
VS – Very Soft
S – Soft
MH – Moderately Hard
H – Hard
VH – Very Hard

ENVIRONMENT & RESOURCES DIVISION

DRILL NO. DM 67
TYPE MAYHEW 1000
DRILLER D. LUKER
START 25 Jun. '73
FINISH 26 Jun. '73
LOGGED D. NICHOL
DATE 26 Jun '73
TRACED G.M.
CHECKED A.F.
SHEET 2 OF 2
DRG. NO. S10839a J64

DEPARTMENT OF MINES — SOUTH AUSTRALIA

LOG OF ROTARY AIR DRILL HOLE

HOLE NO. MT9
SERIAL NO. 953/73

PROJECT MURRAY LANDS - BALLAST SUPPLIES PLAN REFERENCE 74-314
FEATURE TAILEM BEND AMPHIBOLITE DEPOSIT COORDINATES 250E/200N
LOCATION SEC. 68, Hd SEYMOUR ANGLE FROM HORIZ. 90° DIRECTION —

		DESCRIPTION OF CHIPS	DEPTH (m)	DEPTH (FT.)
PLEISTOCENE	Calcrete of the BAKARA SOIL	Calcrete: Buff hard and nodular at top, soft and friable at bottom.	0 – 3	0 – 10
PLEISTOCENE	BLANCHETOWN CLAY	Clay: red-brown, slightly sandy, plastic	3 – 6	10 – 20
PLIOCENE	LOXTON SAND	Sand: yellow-brown, fine-grained	6 – 7	20 – 30
CAMBRIAN	KANMANTOO GROUP	Hornblende schist: grey, weathered, soft	7 – 15	30 – 50
		END OF HOLE 15m	15	50

POROSITY: HP, P, MP, SP, NP
HARDNESS: VS, S, MH, H, VH
STRUCTURES
PENETRATION TIME (MINS.): 1 2 3 4 5 6 7 8 9

POROSITY TERM
HP – Highly Porous
P – Porous
MP – Moderately Porous
SP – Slightly Porous
NP – Non Porous

HARDNESS TERM
VS – Very Soft
S – Soft
MH – Moderately Hard
H – Hard
VH – Very Hard

ENVIRONMENT & RESOURCES DIVISION

DRILL NO. D.M 67
TYPE MAYHEW 1000
DRILLER D. LUKER
START 21 June '73
FINISH 21 June '73
LOGGED D. NICHOL
DATE 21 June '73
TRACED G.M.
CHECKED A.F.
SHEET 1 OF 1
DRG. NO. S10840 JE4

DEPARTMENT OF MINES — SOUTH AUSTRALIA

LOG OF ROTARY AIR DRILL HOLE

HOLE NO. MT 10
SERIAL NO 953/73

PROJECT MURRAY LANDS RAILWAY - BALLAST SUPPLIES PLAN REFERENCE 74-314
FEATURE TAILEM BEND AMPHIBOLITE DEPOSIT COORDINATES 300E/200N
LOCATION SEC. 68, HD SEYMOUR ANGLE FROM HORIZ. 90° DIRECTION —

		DESCRIPTION OF CHIPS	LOG	DEPTH (m)	POROSITY (HP P MP SP NP)	HARDNESS (VS S MH H VH)	STRUCTURES	PENETRATION TIME (MINS.)	DEPTH (m) (FT.)
PLEISTOCENE	Calcrete of the BAKARA SOIL	Calcrete: Buff, hard and nodular at top, soft and friable at bottom		0 – 2					
PLEISTOCENE	BLANCHETOWN CLAY	Clay: red-brown, slightly sandy, plastic.		2 – 5					
CAMBRIAN	KANMANTOO GROUP	Mica schist and hornblende: pale brown and yellow brown: weathered		5 – 13					
		END OF HOLE 13m		13					

POROSITY TERM
HP – Highly Porous
P – Porous
MP – Moderately Porous
SP – Slightly Porous
NP – Non Porous

HARDNESS TERM
VS – Very Soft
S – Soft
MH – Moderately Hard
H – Hard
VH – Very Hard

ENVIRONMENT & RESOURCES DIVISION

DRILL NO. D.M.67
TYPE MAYHEW 1000
DRILLER D. LUKER
START 26 July '73
FINISH 27 July '73
LOGGED D. NICHOL
DATE 27 July '73
TRACED G.M.
CHECKED

SHEET 1 OF 1
DRG. NO. S10841 Je4

DEPARTMENT OF MINES — SOUTH AUSTRALIA

LOG OF ROTARY AIR DRILL HOLE

HOLE NO. MT 11

SERIAL NO 953/73

PROJECT MURRAY LANDS RAILWAY - BALLAST SUPPLIES . . PLAN REFERENCE 74 – 314

FEATURE TAILEM BEND AMPHIBOLITE DEPOSIT . . . . COORDINATES . . 400 E / 200 N

LOCATION SEC. 68, HD SEYMOUR . . . . . ANGLE FROM HORIZ. 90° . DIRECTION –

		DESCRIPTION OF CHIPS	LOG	DEPTH (m)	POROSITY (HP P MP SP NP)	HARDNESS (VS S MH H VH)	STRUCTURES	PENETRATION TIME (MINS.) 1 2 3 4 5 6 7 8 9+	DEPTH (m) / (FT.)
RECENT	WOLI-NEAK SAND	Sand : pale yellow fine grained.		1					
PLEISTOCENE	CALCRETE OF THE BAKARA SOIL	Calcrete: buff hard and nodular at top, soft and friable at bottom.		2					
	BLANCHETOWN CLAY	Clay: red brown, slightly sandy, plastic.		3 4 5 6 7 8					10 20
CAMBRIAN	KANMATOO GROUP	Quartzite : pale brown with minor weathered schist.	Q S Q S Q S Q S S Q Q S S Q S Q	9 10 11					30 40
		END OF HOLE 11 m.							

POROSITY TERM

HP – Highly Porous

P – Porous

MP – Moderately Porous

SP – Slightly Porous

NP – Non Porous

HARDNESS TERM

VS – Very Soft

S – Soft

MH – Moderately Hard

H – Hard

VH – Very Hard

ENVIRONMENT & RESOURCES DIVISION

DRILL NO. DM67 . LOGGED D. NICHOL

TYPE MAYHEW 1000 . DATE 29/6/73

DRILLER D. LUKER . TRACED L.R.

START 29/6/73 . CHECKED A.F.

FINISH 29/6/73 . SHEET 1 OF 1 . DRG. NO. S10842 JE4

DEPARTMENT OF MINES — SOUTH AUSTRALIA

LOG OF ROTARY AIR DRILL HOLE

HOLE NO. MT 12

SERIAL NO. 953/73

PROJECT MURRAY LANDS RAILWAY - BALLAST SUPPLIES . PLAN REFERENCE 74-314

FEATURE TAILEM BEND AMPHIBOLITE DEPOSIT . COORDINATES . 200E/175 N

LOCATION SEC. 68, HD SEYMOUR . ANGLE FROM HORIZ. 90° . DIRECTION —

		DESCRIPTION OF CHIPS	DEPTH (m)
RECENT	MOLINEAUX SAND	Sand : pale yellow, fine grained	
PLEISTOCENE	Calcrete of the BAKARA SOIL	Calcrete : buff hard and nodular at top, soft and friable at bottom.	1 – 4
	BLANCHETOWN CLAY	Clay : red, brown, slightly sandy, plastic	4 – 6
PLIOCENE	LOXTON SAND	Sand : yellow - brown, fine grained	6 – 10
CAMBRIAN	KANMANTOO GROUP	Mica - schist — grey brown highly weathered	10 – 20

END OF HOLE 20m

POROSITY (HP, P, MP, SP, NP) · HARDNESS (VS, S, MH, H, VH) · STRUCTURES · PENETRATION TIME (MINS.) 1 2 3 4 5 6 7 8 9 · DEPTH (m) (FT.) 10 20 30 40 50 60

POROSITY TERM	HARDNESS TERM
HP – Highly Porous	VS – Very Soft
P – Porous	S – Soft
MP – Moderately Porous	MH – Moderately Hard
SP – Slightly Porous	H – Hard
NP – Non Porous	VH – Very Hard

ENVIRONMENT & RESOURCES DIVISION

DRILL NO. DM 67	LOGGED D. NICHOL
TYPE MAYHEW 1000	DATE 28/6/73
DRILLER D. LUKER	TRACED LR
START 27/6/73	CHECKED A.F.
FINISH 27/6/73	
SHEET 1 OF 1	DRG. NO. S10843 Je4

DEPARTMENT OF MINES — SOUTH AUSTRALIA

LOG OF ROTARY AIR DRILL HOLE

HOLE NO. MT 13

SERIAL NO 953/73

PROJECT MURRAY LANDS RAILWAY - BALLAST SUPPLIES . . PLAN REFERENCE 74-314

FEATURE TAILEM BEND AMPHIBOLITE . DEPOSIT. . . . COORDINATES . 250E/175 N

LOCATION. SEC. 68, HD SEYMOUR. . . . . ANGLE FROM HORIZ. 90° . DIRECTION —

		DESCRIPTION OF CHIPS	LOG	DEPTH (m)	POROSITY (HP P MP SP NP)	HARDNESS (VS S MH H VH)	STRUCTURES	PENETRATION TIME (MINS)	DEPTH (m) (FT.)
PLEISTOCENE	Calcrete of the BAKARA SOIL	Calcrete: buff, hard and nodular at top, soft and friable at bottom.		0					
	BLANCHETOWN CLAY	Clay: red, brown, slightly sandy plastic.		1 2 3					10
CAMBRIAN	KANMANTOO GROUP	Mica-schist - grey-brown with minor hornblende schist - weathered. Possibly some fragments of amphibolite.		4 5 6 7 8 9					20 30
		END OF HOLE 10m.		10					40

POROSITY TERM

HP – Highly Porous

P – Porous

MP – Moderately Porous

SP – Slightly Porous

NP – Non Porous

HARDNESS TERM

VS – Very Soft

S – Soft

MH – Moderately Hard

H – Hard

VH – Very Hard

ENVIRONMENT & RESOURCES DIVISION

DRILL NO. DM 67 . LOGGED . D. NICHOL

TYPE . MAYHEW 1000 . DATE . 4/7/73

DRILLER D. LUKER . TRACED . L.R.

START 4/7/73 . CHECKED . A.F.

FINISH 4/7/73 .

SHEET. 1. OF. 1. DRG. NO. S10844 Je4

DEPARTMENT OF MINES — SOUTH AUSTRALIA

LOG OF ROTARY AIR DRILL HOLE

HOLE NO. MT 14
SERIAL NO. 953/73

PROJECT MURRAY LANDS RAILWAY - BALLAST SUPPLIES . . PLAN REFERENCE 74 - 314 . . . . .
FEATURE TAILEM BEND AMPHIBOLITE . DEPOSIT. . . . COORDINATES . 275E/175N. . . . .
LOCATION. SEC. 68, HD SEYMOUR. . . . . ANGLE FROM HORIZ. 90° . DIRECTION — .

		DESCRIPTION OF CHIPS	LOG	DEPTH (m)	POROSITY (HP P MP SP NP)	HARDNESS (VS S MH H VH)	STRUCTURES	PENETRATION TIME (MINS.) 1 2 3 4 5 6 7 8 9	DEPTH (m) (FT.)
PLEISTOCENE	Calcrete of the BAKARA SOIL	Calcrete: buff hard and nodular at top, soft and friable at bottom.		1					
	BLANCHETOWN CLAY	Clay: red, brown, slightly sandy plastic.		2					
				3					10
CAMBRIAN	KANMANTOO GROUP	Quartzite, pink.		4					
		END OF HOLE 4m.							20

POROSITY TERM	HARDNESS TERM
HP – Highly Porous	VS – Very Soft
P – Porous	S – Soft
MP – Moderately Porous	MH – Moderately Hard
SP – Slightly Porous	H – Hard
NP – Non Porous	VH – Very Hard

ENVIRONMENT & RESOURCES DIVISION

DRILL NO. DM 67.	LOGGED . D. NICHOL.
TYPE . MAYHEW 1000.	DATE . 4/7/73
DRILLER D. LUKER	TRACED . L.R.
START 4/7/73.	CHECKED . A.F.
FINISH 4/7/73.	
SHEET. 1 . OF . 1 .	DRG. NO. S10845 Je4

DEPARTMENT OF MINES — SOUTH AUSTRALIA

LOG OF ROTARY AIR DRILL HOLE

HOLE NO. MT 15

SERIAL NO. 953/73

PROJECT MURRAY LANDS RAILWAY - BALLAST SUPPLIES . . PLAN REFERENCE 74-314

FEATURE TAILEM BEND AMPHIBOLITE DEPOSIT. . . . COORDINATES . 200E/150 N . . . . .

LOCATION. SEC. 68, HD SEYMOUR. . . . . ANGLE FROM HORIZ. 90° . DIRECTION . —

		DESCRIPTION OF CHIPS	LOG	DEPTH (m)	POROSITY (HP P MP SP NP)	HARDNESS (VS S MH H VH)	STRUCTURES	PENETRATION TIME (MINS.) 1 2 3 4 5 6 7 8 9	DEPTH (m) (FT.)
PLEISTOCENE	Calcrete of the BAKARA SOIL	Calcrete: buff, hard and nodular on top, soft and friable on bottom		1 2 3					10
	BLANCHETOWN CLAY	Clay: red, brown, slightly sandy plastic.		4 5 6					20
PLIOCENE	LOXTON SAND	Sand: yellow-brown, fine grained.		7					
CAMBRIAN	KANMANTOO GROUP	Quartzite: pink, minor weathered mica schist.	Q S Q S Q S	8 9					30

END OF HOLE 9m.

POROSITY TERM

HP – Highly Porous

P – Porous

MP – Moderately Porous

SP – Slightly Porous

NP – Non Porous

HARDNESS TERM

VS – Very Soft

S – Soft

MH – Moderately Hard

H – Hard

VH – Very Hard

ENVIRONMENT & RESOURCES DIVISION

DRILL NO. DM 67.	LOGGED D. NICHOL.
TYPE. MAYHEW 1000.	DATE 27/6/73
DRILLER D. LUKER	TRACED L.R.
START 27/6/73	CHECKED A.F.
FINISH 27/6/73	
SHEET. 1 . OF. 1	DRG. NO. S10846 Je4

DEPARTMENT OF MINES — SOUTH AUSTRALIA

LOG OF ROTARY AIR DRILL HOLE

HOLE NO. MT 16

SERIAL NO. 953/73

PROJECT MURRAY LANDS RAILWAY - BALLAST SUPPLIES . . PLAN REFERENCE 74-314

FEATURE TAILEM BEND AMPHIBOLITE DEPOSIT. . . . COORDINATES 225E/150N

LOCATION. SEC. 68, HD SEYMOUR. . . . . ANGLE FROM HORIZ. 90° . DIRECTION —

		DESCRIPTION OF CHIPS	LOG	DEPTH (m)	POROSITY (HP P MP SP NP)	HARDNESS (VS S MH H VH)	STRUCTURES	PENETRATION TIME (MINS.) 1–9	DEPTH (m) (FT.)
PLEISTOCENE	Calcrete of the BAKARA SOIL	Calcrete: buff, hard and nodular at top, soft and friable at bottom.		1					
PLEISTOCENE	BLANCHETOWN CLAY	Clay: red-brown, slightly sandy plastic.		2 3 4					10
PLIO-CENE	LOXTON SAND	Sand: orange-brown, slightly clayey, medium grained.		4					
CAMBRIAN	KANMANTOO GROUP	Amphibolite: dark green.		5					
		END OF HOLE 5·7m.		6					20

POROSITY TERM

HP – Highly Porous

P – Porous

MP – Moderately Porous

SP – Slightly Porous

NP – Non Porous

HARDNESS TERM

VS – Very Soft

S – Soft

MH – Moderately Hard

H – Hard

VH – Very Hard

ENVIRONMENT & RESOURCES DIVISION

DRILL NO. DM 67 . LOGGED D. NICHOL

TYPE . MAYHEW 1000 . DATE 28/6/73

DRILLER D. LUKER . TRACED L.R.

START 28/6/73 . CHECKED A.F.

FINISH 28/6/73 .

SHEET 1 OF 1 . DRG. NO. S10847 Je4

DEPARTMENT OF MINES — SOUTH AUSTRALIA

LOG OF ROTARY AIR DRILL HOLE

HOLE NO. MT 17

SERIAL NO 953/73

PROJECT MURRAY LANDS RAILWAY - BALLAST SUPPLIES . . PLAN REFERENCE 74-314 . . . . .

FEATURE TAILEM BEND AMPHIBOLITE DEPOSIT. . . . COORDINATES 250E/150N . . . . .

LOCATION SEC. 68, HD. SEYMOUR. . . . . ANGLE FROM HORIZ. 90° . DIRECTION —

REGIENT		DESCRIPTION OF CHIPS	LOG	DEPTH (m)	POROSITY (HP P MP SP NP)	HARDNESS (VS S MH H VH)	STRUCTURES	PENETRATION TIME (MINS.) 1 2 3 4 5 6 7 8 9	DEPTH (m) (FT.)
	MOUNT BARKER SAND	Sand: pale yellow fine grained							
PLEISTOCENE	BLANCHETOWN CLAY	Clay: red-brown, sandy plastic		1, 2					
CAMBRIAN	KANMANTOO GROUP	Amphibolite - dark green	A A A A A	3, 4, 5					10, 20

END OF HOLE 5M

POROSITY TERM

HP – Highly Porous
P – Porous
MP – Moderately Porous
SP – Slightly Porous
NP – Non Porous

HARDNESS TERM

VS – Very Soft
S – Soft
MH – Moderately Hard
H – Hard
VH – Very Hard

ENVIRONMENT & RESOURCES DIVISION

DRILL NO. DM 67 . LOGGED . D. NICHOL .
TYPE . MAYHEW 1000 .
DRILLER D. LUKER . DATE 27/6/73 .
START 27/6/73 . TRACED L.R. .
FINISH 27/6/73 . CHECKED A.F. .

SHEET 1 . OF 1 . DRG NO. S10848 Jet

DEPARTMENT OF MINES — SOUTH AUSTRALIA

LOG OF ROTARY AIR DRILL HOLE

HOLE NO. MT 18

SERIAL NO 953/73

PROJECT MURRAY LANDS RAILWAY - BALLAST SUPPLIES . . PLAN REFERENCE 74-314 . . . . . .

FEATURE TAILEM BEND AMPHIBOLITE DEPOSIT. . . . COORDINATES 300E/150N . . . . . .

LOCATION SEC. 68, HD. SEYMOUR. . . . . ANGLE FROM HORIZ. 90° . DIRECTION —

		DESCRIPTION OF CHIPS	LOG	DEPTH (m)	POROSITY (HP, P, MP, SP, NP)	HARDNESS (VS, S, MH, H, VH)	STRUCTURES	PENETRATION TIME (MINS)	DEPTH (m) (FT.)
PLEISTOCENE	Calcrete of the BAKARA SOIL	Calcrete: buff, hard and nodular on top, soft and friable on bottom.		0					
	BLANCHETOWN CLAY	Clay: red-brown, slightly sandy, plastic.		1					
				2					
CAMBRIAN	KANMANTOO GROUP	Mica-schist: dark grey		3					10
				4					
				5					
				6					20
		END OF HOLE 6M							

POROSITY TERM

HP – Highly Porous

P – Porous

MP – Moderately Porous

SP – Slightly Porous

NP – Non Porous

HARDNESS TERM

VS – Very Soft

S – Soft

MH – Moderately Hard

H – Hard

VH – Very Hard

ENVIRONMENT & RESOURCES DIVISION

DRILL NO. DM 67	LOGGED D. NICHOL
TYPE MAYHEW 1000	DATE 27/6/73
DRILLER D. LUKER	TRACED L.R.
START 27/6/73	CHECKED A.F.
FINISH 27/6/73	

SHEET 1 OF 1 DRG. NO S10849 Je4

DEPARTMENT OF MINES — SOUTH AUSTRALIA

LOG OF ROTARY AIR DRILL HOLE

HOLE NO. MT 19

SERIAL NO. 953/73

PROJECT MURRAY LANDS RAILWAY - BALLAST SUPPLIES . . PLAN REFERENCE 74-314 . . . . .

FEATURE TAILEM BEND AMPHIBOLITE . DEPOSIT. . . . COORDINATES 200E/125N . . . . .

LOCATION SEC. 68, HD SEYMOUR. . . . . ANGLE FROM HORIZ. 90° . DIRECTION — .

		DESCRIPTION OF CHIPS	LOG	DEPTH (m)	POROSITY (HP P MP SP NP)	HARDNESS (VS S MH H VH)	STRUCTURES	PENETRATION TIME (MINS.) 1 2 3 4 5 6 7 8 9	DEPTH (m) (FT.)
PLEISTOCENE	Calcrete of the BAKARA SOIL	Calcrete: buff, hard and nodular on top, soft and friable on bottom.		1					
	BLANCHETOWN CLAY	Clay: red-brown, slightly sandy, plastic		2					
				3					10
PLIOCENE	LOXTON SAND	Sand: orange-brown, clayey medium grained.		4					
CAMBRIAN	KANMANTOO GROUP	Quartzite: pink	Q Q Q Q Q	5					
				6					20

END OF HOLE 6M

POROSITY TERM

HP – Highly Porous

P – Porous

MP – Moderately Porous

SP – Slightly Porous

NP – Non Porous

HARDNESS TERM

VS – Very Soft

S – Soft

MH – Moderately Hard

H – Hard

VH – Very Hard

ENVIRONMENT & RESOURCES DIVISION

DRILL NO. DM 67 . LOGGED D. NICHOL .

TYPE . MAYHEW 1000 .

DRILLER D. LUKER . DATE . 4/7/73 .

START 4/7/73 . TRACED L.R. .

FINISH 4/7/73 . CHECKED . A.F. .

SHEET . 1 . OF . 1 . DRG. NO. S10850 Je4

DEPARTMENT OF MINES — SOUTH AUSTRALIA

LOG OF ROTARY AIR DRILL HOLE

HOLE NO. MT 20

SERIAL NO 953/73

PROJECT MURRAY LANDS RAILWAY - BALLAST SUPPLIES . . PLAN REFERENCE 74-314 . . . . . .

FEATURE TAILEM BEND AMPHIBOLITE . DEPOSIT. . . . COORDINATES . 225E/125N. . . . . .

LOCATION. SEC. 68, HD SEYMOUR. . . . . ANGLE FROM HORIZ. 90° . DIRECTION . — .

		DESCRIPTION OF CHIPS	LOG	DEPTH (m)	POROSITY (HP P MP SP NP)	HARDNESS (VS S MH H VH)	STRUCTURES	PENETRATION TIME (MINS) 1 2 3 4 5 6 7 8 9	DEPTH (m) (FT.)
PLEISTOCENE	Calcrete of the BAKARA SOIL	Calcrete: buff, hard and nodular on top, soft and friable on bottom.		0					
PLEISTOCENE	BLANCHETOWN CLAY	Clay: red-brown, slightly sandy, plastic.		1					
CAMBRIAN	KANMANTOO GROUP	Amphibolite: dark green.		2					
				3					10

END OF HOLE 3M

POROSITY TERM	HARDNESS TERM
HP – Highly Porous	VS – Very Soft
P – Porous	S – Soft
MP – Moderately Porous	MH – Moderately Hard
SP – Slightly Porous	H – Hard
NP – Non Porous	VH – Very Hard

ENVIRONMENT & RESOURCES DIVISION

DRILL NO. DM 67	LOGGED D. NICHOL
TYPE . MAYHEW 1000.	DATE 28/6/73
DRILLER D. LUKER	TRACED L.R.
START 28/6/73	CHECKED A.F.
FINISH 28/6/73	
SHEET 1 OF 1	DRG. NO. S10851 Je4

DEPARTMENT OF MINES — SOUTH AUSTRALIA

LOG OF ROTARY AIR DRILL HOLE

HOLE NO. MT 21

SERIAL NO. 953/73

PROJECT MURRAY'S LANDS RAILWAY - BALLAST SUPPLIES . . PLAN REFERENCE 74-314

FEATURE TAILEM BEND AMPHIBOLITE DEPOSIT. . . . COORDINATES 250E/125N

LOCATION. SEC. 68, HD. SEYMOUR. . . . . ANGLE FROM HORIZ. 90° . DIRECTION →

		DESCRIPTION OF CHIPS	LOG	DEPTH (m)	POROSITY (HP P MP SP NP)	HARDNESS (VS S MH H VH)	STRUCTURES	PENETRATION TIME (MINS.)	DEPTH (m) (FT.)
PLEISTOCENE	Calcrete of the BAKARA SOIL	Calcrete: buff, hard and nodular on top, soft and friable on bottom		0					
	BLANCHETOWN CLAY	Clay: red-brown, slightly sandy, plastic		1					
CAMBRIAN	KANMANTOO GROUP	Hornblende schist with minor mica schist - dark brown with minor quartzite.	S Q / Q S / S Q / Q S / S Q / Q S / S Q / Q S / S Q / Q S / S Q	2 3 4 5 6 7 8 9					10 20 30
		END OF HOLE 9M.							

POROSITY TERM

HP – Highly Porous

P – Porous

MP – Moderately Porous

SP – Slightly Porous

NP – Non Porous

HARDNESS TERM

VS – Very Soft

S – Soft

MH – Moderately Hard

H – Hard

VH – Very Hard

ENVIRONMENT & RESOURCES DIVISION

DRILL NO. DM 67.

TYPE MAYHEW 1000.

DRILLER D. LUKER

START 4/7/73

FINISH 4/7/73

LOGGED D. NICHOL

DATE 4/7/73

TRACED L.R.

CHECKED A.F.

SHEET 1 OF 1

DRG. NO. S10852 Je4

DEPARTMENT OF MINES — SOUTH AUSTRALIA

LOG OF ROTARY AIR DRILL HOLE

HOLE NO. MT 22

SERIAL NO 953/73

PROJECT MURRAY LANDS RAILWAY - BALLAST SUPPLIES . . PLAN REFERENCE 74-314

FEATURE TAILEM BEND AMPHIBOLITE DEPOSIT . . . COORDINATES 275E/125N

LOCATION. SEC. 68, HD ~~SEYMOUR~~ . . . ANGLE FROM HORIZ. 90° . DIRECTION —

		DESCRIPTION OF CHIPS	LOG	DEPTH (m)
PLEISTOCENE	Calcrete of the BAKARA SOIL	Calcrete: buff, hard and nodular on top, soft and friable on bottom		0
	BLANCHETOWN CLAY	Clay: red-brown, slightly sandy, plastic.		1
CAMBRIAN	KANMANTOO GROUP	Quartzite: pink and grey.		2
				3
				4
		END OF HOLE 5M		5

POROSITY (HP, P, MP, SP, NP) — HARDNESS (VS, S, MH, H, VH) — STRUCTURES — PENETRATION TIME (MINS.) 1 2 3 4 5 6 7 8 9 — DEPTH (m) 10 20 (FT.)

POROSITY TERM	HARDNESS TERM
HP – Highly Porous	VS – Very Soft
P – Porous	S – Soft
MP – Moderately Porous	MH – Moderately Hard
SP – Slightly Porous	H – Hard
NP – Non Porous	VH – Very Hard

ENVIRONMENT & RESOURCES DIVISION

DRILL NO. DM 67	LOGGED D. NICHOL
TYPE. MAYHEW 1000	DATE 4/7/73
DRILLER D. LUKER	TRACED L.R.
START 4/7/73	CHECKED A.F.
FINISH 4/7/73	
SHEET 1 OF 1	DRG NO S10853 Je4

DEPARTMENT OF MINES — SOUTH AUSTRALIA

LOG OF ROTARY AIR DRILL HOLE

HOLE NO. MT 23

SERIAL NO 953/73

PROJECT MURRAY LANDS RAILWAY - BALLAST SUPPLIES . . PLAN REFERENCE 74-314 . . . . . .

FEATURE TAILEM BEND AMPHIBOLITE DEPOSIT. . . . COORDINATES 100E/100N . . . . . .

LOCATION SEC. 68, HD SEYMOUR. . . . . ANGLE FROM HORIZ. 90° . DIRECTION — .

		DESCRIPTION OF CHIPS	LOG	DEPTH (m)	POROSITY (HP P MP SP NP)	HARDNESS (VS S MH H VH)	STRUCTURES	PENETRATION TIME (MINS)	DEPTH (m) (FT)
RECENT	MOUNT BRAE SAND	Sand: pale yellow fine grained		0					
PLEISTOCENE	Calcrete of the BAKARA SOIL	Calcrete: buff, hard and nodular at top, soft and friable at bottom.		1–3					
	BLANCHETOWN CLAY	Clay: red-brown, slightly sandy, plastic.		3–8					10–20
PLIOCENE	LORTON SAND	Sand: orange and yellow-brown, slightly clayey to very clayey, fine to medium grained.		8–15			fragments of schist and gneiss.		30–40
		END OF HOLE 14·8m.		15					50

POROSITY TERM

HP – Highly Porous

P – Porous

MP – Moderately Porous

SP – Slightly Porous

NP – Non Porous

HARDNESS TERM

VS – Very Soft

S – Soft

MH – Moderately Hard

H – Hard

VH – Very Hard

ENVIRONMENT & RESOURCES DIVISION

DRILL NO. DM 67. LOGGED D. NICHOL.

TYPE MAYHEW 1000. DATE 3/7/73

DRILLER D. LUKER TRACED L.R.

START 2/7/73 CHECKED A.F.

FINISH 3/7/73

SHEET 1 OF 1 DRG. NO. S10854 Je4

DEPARTMENT OF MINES — SOUTH AUSTRALIA

LOG OF ROTARY AIR DRILL HOLE

HOLE NO. MT 24
SERIAL NO 953/73

PROJECT MURRAY LANDS RAILWAY - BALLAST SUPPLIES . . . PLAN REFERENCE 74-314 . . . . . .
FEATURE TAILEM BEND AMPHIBOLITE DEPOSIT. . . . . COORDINATES 200E/100N . . . . . .
LOCATION SEC. 68, HD. SEYMOUR . . . . . ANGLE FROM HORIZ. 90° . DIRECTION —

		DESCRIPTION OF CHIPS	LOG	DEPTH (m)	POROSITY (HP P MP SP NP)	HARDNESS (VS S MH H VH)	STRUCTURES	PENETRATION TIME (MINS.) 1 2 3 4 5 6 7 8 9	DEPTH (m) (FT)
PLEISTOCENE	Calcrete of the BAKARA SOIL	Calcrete: buff, hard and nodular on top, soft and friable on bottom.		1					
	BLANCHETOWN CLAY	Clay: red-brown, slightly sandy, plastic.		2					
CAMBRIAN	KANMANTOO GROUP	Amphibolite: dark green.		3 4 5 6 7					10 20
		END OF HOLE 7M							30

POROSITY TERM
HP – Highly Porous
P – Porous
MP – Moderately Porous
SP – Slightly Porous
NP – Non Porous

HARDNESS TERM
VS – Very Soft
S – Soft
MH – Moderately Hard
H – Hard
VH – Very Hard

ENVIRONMENT & RESOURCES DIVISION

DRILL NO. DM 67
TYPE MAYHEW 1000.
DRILLER D. LUKER
START 26/6/73
FINISH 26/6/73
LOGGED D. NICHOL.
DATE 26/6/73
TRACED L.R.
CHECKED A.F.

SHEET 1 OF 1
DRG. NO. S10855 Je4

DEPARTMENT OF MINES — SOUTH AUSTRALIA

LOG OF ROTARY AIR DRILL HOLE

HOLE NO. MT 25

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 —

		DESCRIPTION OF CHIPS	LOG	DEPTH (m)
PLEISTOCENE	Calcrete of the BAKARA SOIL	Calcrete: buff, hard and nodular on top, soft and friable on bottom.		0
	BLANCH ETOWN CLAY	Clay: red-brown, slightly sandy, plastic.		1
CAMBRIAN	KANMANTOO GROUP	Amphibolite: dark green.		2
				3
				4
		END OF HOLE 5M		5

POROSITY: HP | P | MP | SP | NP

HARDNESS: VS | S | MH | H | VH

STRUCTURES

PENETRATION TIME (MINS.): 1 2 3 4 5 6 7 8 9

DEPTH (m) / (FT.): 10, 20

POROSITY TERM

HP – Highly Porous
P – Porous
MP – Moderately Porous
SP – Slightly Porous
NP – Non Porous

HARDNESS TERM

VS – Very Soft
S – Soft
MH – Moderately Hard
H – Hard
VH – Very Hard

ENVIRONMENT & RESOURCES DIVISION

DRILL NO. DM 67.	LOGGED D. NICHOL.
TYPE . MAYHEW 1000.	DATE 28/6/73
DRILLER D. LUKER	TRACED L.R.
START 28/6/73	CHECKED A.F.
FINISH 28/6/73	
SHEET 1 OF 1	DRG. NO. S10856 Je4

DEPARTMENT OF MINES — SOUTH AUSTRALIA

LOG OF ROTARY AIR DRILL HOLE

HOLE NO. MT 26

SERIAL NO 953/73

PROJECT MURRAY LANDS RAILWAY - BALLAST SUPPLIES . . PLAN REFERENCE 74 - 314

FEATURE TAILEM BEND AMPHIBOLITE DEPOSIT. . . . COORDINATES 250E/100N

LOCATION. SEC. 68, HD SEYMOUR. . . . . ANGLE FROM HORIZ. 90° . DIRECTION —

		DESCRIPTION OF CHIPS	LOG	DEPTH (m)	POROSITY (HP P MP SP NP)	HARDNESS (VS S MH H VH)	STRUCTURES	PENETRATION TIME (MINS)	DEPTH (m) (FT)
PLEISTOCENE	Calcrete of the BAKARA SOIL	Calcrete: buff, hard and nodular at top, soft and friable at bottom.		1					
				2			abundant amphibolite fragments.		
		Amphibolite: dark green.	A A	3					10
CAMBRIAN	KANMANTOO GROUP	END OF HOLE 3M.							

POROSITY TERM	HARDNESS TERM
HP – Highly Porous	VS – Very Soft
P – Porous	S – Soft
MP – Moderately Porous	MH – Moderately Hard
SP – Slightly Porous	H – Hard
NP – Non Porous	VH – Very Hard

ENVIRONMENT & RESOURCES DIVISION

DRILL NO. DM 67.	LOGGED D. NICHOL.
TYPE. MAYHEW 1000.	
DRILLER D. LUKER	DATE 27/6/73
START 27/6/73	TRACED L.R.
FINISH 27/6/73	CHECKED A.F.
SHEET. 1 . OF. 1	DRG. NO. S10857 Je4

DEPARTMENT OF MINES — SOUTH AUSTRALIA

LOG OF ROTARY AIR DRILL HOLE

HOLE NO. MT 27

SERIAL NO. 953/73

PROJECT MURRAY LANDS RAILWAY - BALLAST SUPPLIES

PLAN REFERENCE 74-314

FEATURE TAILEM BEND AMPHIBOLITE DEPOSIT

COORDINATES 275E/100N

LOCATION. SEC. 68, HD. SEYMOUR.

ANGLE FROM HORIZ. 90° . DIRECTION —

		DESCRIPTION OF CHIPS	LOG	DEPTH (m)
PLEISTOCENE	Calcrete of the Bakara Soil	Calcrete: buff, hard and nodular on top, soft and friable on bottom		
	Blanchetown Clay	Clay: red-brown, slightly sandy, plastic.		1 2
CAMBRIAN	Kanmantoo Group	Quartzite: pink	Q Q Q	3
		END OF HOLE 3M		

POROSITY: HP | P | MP | SP | NP

HARDNESS: VS | S | MH | H | VH

STRUCTURES

PENETRATION TIME (MINS.): 1 2 3 4 5 6 7 8 9

DEPTH (m) (FT.) 10

POROSITY TERM	HARDNESS TERM
HP – Highly Porous	VS – Very Soft
P – Porous	S – Soft
MP – Moderately Porous	MH – Moderately Hard
SP – Slightly Porous	H – Hard
NP – Non Porous	VH – Very Hard

ENVIRONMENT & RESOURCES DIVISION

DRILL NO. DM 67

TYPE. MAYHEW 1000.

DRILLER D LUKER

START 4/7/73

FINISH 4/7/73

LOGGED D NICHOL.

DATE 4/7/73

TRACED L.R.

CHECKED A.F.

SHEET. 1 . OF. 1

DRG. NO. S10858 Je4

DEPARTMENT OF MINES — SOUTH AUSTRALIA

LOG OF ROTARY AIR DRILL HOLE

HOLE NO. MT 28

SERIAL NO 953/73

PROJECT MURRAY LANDS RAILWAY – BALLAST SUPPLIES PLAN REFERENCE 74-314

FEATURE TAILEM BEND AMPHIBOLITE DEPOSIT COORDINATES 300 E/100 N

LOCATION SEC. 68 Hd. SEYMOUR ANGLE FROM HORIZ. 90° DIRECTION —

	MOLINEAUX SAND	DESCRIPTION OF CHIPS	LOG	DEPTH (m)	POROSITY (HP P MP SP NP)	HARDNESS (VS S MH H VH)	STRUCTURES	PENETRATION TIME (MINS.) 1 2 3 4 5 6 7 8 9	DEPTH (m) (FT.)
RECENT		SAND: pale yellow, fine grained							
CAMBRIAN	KANMANTOO GROUP	SCHIST: grey-brown weathered		1 2 3 4 5 6					10 20

END OF HOLE 6 metres

POROSITY TERM	HARDNESS TERM
HP – Highly Porous	VS – Very Soft
P – Porous	S – Soft
MP – Moderately Porous	MH – Moderately Hard
SP – Slightly Porous	H – Hard
NP – Non Porous	VH – Very Hard

ENVIRONMENT & RESOURCES DIVISION

DRILL NO. DM 67	LOGGED D. NICHOL
TYPE MAYHEW 100	DATE 26/6/73
DRILLER D. LUKER	TRACED R.B
START 26/6/73	CHECKED A.F.
FINISH 26/6/73	

SHEET 1 OF 1 DRG. NO. S10859 Jc4

DEPARTMENT OF MINES — SOUTH AUSTRALIA

LOG OF ROTARY AIR DRILL HOLE

HOLE NO. MT 29

SERIAL NO. 953/73

PROJECT MURRAY LANDS RAILWAY — BALLAST SUPPLIES PLAN REFERENCE 74-314

FEATURE TAILEM BEND AMPHIBOLITE DEPOSIT COORDINATES 400 E/100 N

LOCATION SEC. 68 HD. SEYMOUR ANGLE FROM HORIZ. 90° DIRECTION —

		DESCRIPTION OF CHIPS	LOG	DEPTH (m)	POROSITY (HP P MP SP NP)	HARDNESS (VS S MH H VH)	STRUCTURES	PENETRATION TIME (MINS)	DEPTH (m) (FT)
PLEISTOCENE	CALCRETE OF THE BAKARA SOIL	CALCRETE: buff hard & nodular at top, soft & friable at bottom		0					
PLEISTOCENE	BLANCHETOWN CLAY	CLAY: red-brown, slightly sandy, plastic		1 2 3					
PLIOCENE	LOXTON SAND	SAND: orange & yellow brown, clayey, fine grained		4 5 6					10
CAMBRIAN	KANMANTOO GROUP	SCHIST: pale brown fresh		7					20
		END OF HOLE 74 metres							30

POROSITY TERM

HP – Highly Porous
P – Porous
MP – Moderately Porous
SP – Slightly Porous
NP – Non Porous

HARDNESS TERM

VS – Very Soft
S – Soft
MH – Moderately Hard
H – Hard
VH – Very Hard

ENVIRONMENT & RESOURCES DIVISION

DRILL NO. DM 67
TYPE MAYHEW 1000
DRILLER D. LUKER
START 28/6/73
FINISH 29/6/73

LOGGED D. NICHOL
DATE 29/6/73
TRACED R.B.
CHECKED A.F.

SHEET 1 OF 1 DRG. NO. S10860 Je4

DEPARTMENT OF MINES — SOUTH AUSTRALIA

LOG OF ROTARY AIR DRILL HOLE

HOLE NO. MT 30

SERIAL NO 953/73

PROJECT MURRAY LANDS RAILWAY- BALLAST SUPPLIES PLAN REFERENCE 74-314

FEATURE TAILEM BEND AMPHIBOLITE DEPOSIT COORDINATES 500 N/100 N

LOCATION SEC. 68 HD SEYMOUR ANGLE FROM HORIZ. 90° DIRECTION -

		DESCRIPTION OF CHIPS	LOG
RECENT	MOLINEAUX SAND	SAND : pale yellow, fine grained.	
PLEISTOCENE	CALCRETE OF THE BAKARA SOIL	CALCRETE : buff, hard & nodular at top, soft & friable at bottom.	
PLEISTOCENE	BLANCHETOWN CLAY	CLAY : red-brown, slightly sandy plastic	
PLIOCENE	LOXTON SAND	SAND : orange & yellow brown clayey, fine grained	
CAMBRIAN	KANMANTOO GROUP	SCHIST: grey-brown weathered	

END OF HOLE 7metres

DEPTH (m): 1, 2, 3, 4, 5, 6, 7

POROSITY: HP | P | MP | SP | NP

HARDNESS: VS | S | MH | H | VH

STRUCTURES

PENETRATION TIME (MINS): 1 2 3 4 5 6 7 8 9

DEPTH (m) / (FT.): 10, 20, 30

POROSITY TERM

HP – Highly Porous

P – Porous

MP – Moderately Porous

SP – Slightly Porous

NP – Non Porous

HARDNESS TERM

VS – Very Soft

S – Soft

MH – Moderately Hard

H – Hard

VH – Very Hard

ENVIRONMENT & RESOURCES DIVISION

DRILL NO. DM 67
TYPE MAYHEW 1000
DRILLER D. LUKER
START 3/7/73
FINISH 3/7/73

LOGGED D. NICHOL
DATE 3/7/73
TRACED R.B.
CHECKED A.F.

SHEET 1 OF 1

DRG. NO. S10861 Je4

DEPARTMENT OF MINES — SOUTH AUSTRALIA

LOG OF ROTARY AIR DRILL HOLE

HOLE NO. MT 31

SERIAL NO 953/73

PROJECT MURRAY LANDS RAILWAY — BALLAST SUPPLIES PLAN REFERENCE 74-314

FEATURE TAILEM BEND AMPHIBOLITE DEPOSIT COORDINATES 700°E/100°N

LOCATION SEC. 68 HD. SEYMOUR ANGLE FROM HORIZ. 90° DIRECTION —

		DESCRIPTION OF CHIPS	LOG	DEPTH (m)	POROSITY (HP P MP SP NP)	HARDNESS (VS S MH H VH)	STRUCTURES	PENETRATION TIME (MINS.) 1 2 3 4 5 6 7 8 9	DEPTH (m) (FT.)
RECENT	MOUNT-EAUX SAND	SAND: pale yellow, fine grained		1					
PLEISTOCENE	CALCRETE OF THE BAKARA SOIL	CALCRETE: buff, hard & nodular at top, soft & friable at bottom		2					
	BLANCHE TOWN CLAY	CLAY: red-brown, slightly sandy, plastic		3 4 5 6					10
PLIOCENE	LOXTON SAND	SAND: orange-brown, clayey fine grained		7					20
CAMBRIAN	KANMANTOO GROUP	QUARTZITE - pink & grey. Fresh.		8					
		END OF HOLE 9 metres		9					30

POROSITY TERM

HP – Highly Porous
P – Porous
MP – Moderately Porous
SP – Slightly Porous
NP – Non Porous

HARDNESS TERM

VS – Very Soft
S – Soft
MH – Moderately Hard
H – Hard
VH – Very Hard

ENVIRONMENT & RESOURCES DIVISION

DRILL NO. DM 67	LOGGED D. NICHOL
TYPE MAYHEW 1000	DATE 3/7/73
DRILLER D. LUKER	TRACED R.B.
START 3/7/73	CHECKED A.F.
FINISH 3/7/73	
SHEET 1 OF 1	DRG. NO S10862 Je4

DEPARTMENT OF MINES — SOUTH AUSTRALIA

LOG OF ROTARY AIR DRILL HOLE

HOLE NO. MT 32

SERIAL NO 953/73

PROJECT MURRAY LANDS RAILWAY — PLAN REFERENCE 74-314

FEATURE TAILEM BEND AMPHIBOLITE DEPOSIT — COORDINATES 275E/150N

LOCATION SEC 68 HD SEYMOUR — ANGLE FROM HORIZ. 90° DIRECTION —

		DESCRIPTION OF CHIPS	LOG	DEPTH m	POROSITY (HP P MP SP NP)	HARDNESS (VS S MH H VH)	STRUCTURES	PENETRATION TIME (MINS)	DEPTH (m) (FT)
RECENT	MOLINEAUX SAND	SAND: pale yellow-brown. Fine grained		1					
PLEISTOCENE	BLANCHETOWN CLAY	CLAY: red-brown, slightly sandy, plastic		2					
				3					10
CAMBRIAN	KANMANTOO GROUP	QUARTZITE: grey, fresh minor amphibolite schist		4					
				5					
				6					20
		END OF HOLE 7 metres		7					
									30

POROSITY TERM	HARDNESS TERM
HP – Highly Porous	VS – Very Soft
P – Porous	S – Soft
MP – Moderately Porous	MH – Moderately Hard
SP – Slightly Porous	H – Hard
NP – Non Porous	VH – Very Hard

ENVIRONMENT & RESOURCES DIVISION

DRILL NO. DM 67	LOGGED D. NICHOL
TYPE MAYHEW 1000	DATE 4/7/73
DRILLER D. LUKER	TRACED R.B.
START 4/7/73	CHECKED A.F.
FINISH 4/7/73	
SHEET 1 OF 1	DRG. NO. S10863 JE4

DEPARTMENT OF MINES — SOUTH AUSTRALIA

LOG OF ROTARY AIR DRILL HOLE

HOLE NO. MT 33

SERIAL NO 953/73

PROJECT MURRAY LANDS RAILWAY - BALLAST SUPPLIES

FEATURE TAILEM BEND AMPHIBOLITE DEPOSIT

LOCATION SEC. 68 HD. SEYMOUR.

PLAN REFERENCE 74-314

COORDINATES 200 E/075 N.

ANGLE FROM HORIZ. 90° . DIRECTION —

		DESCRIPTION OF CHIPS	LOG	DEPTH (m)
PLEISTOCENE	CALCRETE OF THE BAKARA SOIL	CALCRETE: buff, hard & nodular at top, soft & friable at bottom		0
	BLANCHETOWN CLAY	CLAY: red-brown, slightly sandy plastic		1
CAMBRIAN	KANMANTOO GROUP	AMPHIBOLITE: black, fresh		2
				3

END OF HOLE 3·1 metres

POROSITY: HP | P | MP | SP | NP

HARDNESS: VS | S | MH | H | VH

STRUCTURES

PENETRATION TIME (MINS.) 1 2 3 4 5 6 7 8 9

DEPTH (m) (FT.) — 10

POROSITY TERM	HARDNESS TERM
HP – Highly Porous	VS – Very Soft
P – Porous	S – Soft
MP – Moderately Porous	MH – Moderately Hard
SP – Slightly Porous	H – Hard
NP – Non Porous	VH – Very Hard

ENVIRONMENT & RESOURCES DIVISION

DRILL NO. D.M 67	LOGGED D. NICHOL
TYPE MAYHEW 1000	
DRILLER D. LUKER	DATE 5/7/73
START 5/7/73	TRACED R.B.
FINISH 5/7/73	CHECKED A.F.
SHEET 1 OF 1	DRG. NO. S10864 Je4

DEPARTMENT OF MINES — SOUTH AUSTRALIA

LOG OF ROTARY AIR DRILL HOLE

HOLE NO. MT 34

SERIAL NO 953/73

PROJECT MURRAY LANDS RAILWAY — BALLAST SUPPLIES PLAN REFERENCE 74-314

FEATURE TAILEM BEND AMPHIBOLITE DEPOSIT COORDINATES 225 E/075 N

LOCATION SEC 68 HP SEYMOUR ANGLE FROM HORIZ. 90° DIRECTION —

		DESCRIPTION OF CHIPS	LOG	DEPTH (m)
PLEISTOCENE	CALCRETE OF THE BAKARA SOIL	CALCRETE: buff hard & nodular at top, soft & friable at bottom		0 – 1
CAMBRIAN	KANMANTOO GROUP	SCHIST: black, weathered.		1 – 5
		END OF HOLE 5 metres		

POROSITY: HP | P | MP | SP | NP

HARDNESS: VS | S | MH | H | VH

STRUCTURES

PENETRATION TIME (MINS.): 1 2 3 4 5 6 7 8 9

DEPTH (m) / (FT.): 1 2 3 4 5 — 10 — 20

POROSITY TERM	HARDNESS TERM
HP – Highly Porous	VS – Very Soft
P – Porous	S – Soft
MP – Moderately Porous	MH – Moderately Hard
SP – Slightly Porous	H – Hard
NP – Non Porous	VH – Very Hard

ENVIRONMENT & RESOURCES DIVISION

DRILL NO. DM 67	LOGGED D. NICHOL
TYPE MAYHEW 1000	DATE 5/7/73
DRILLER D. LUKER	TRACED R.B.
START 5/7/73	CHECKED A.F.
FINISH 5/7/73	
SHEET 1 OF 1	DRG. NO. S10865 Jd4

DEPARTMENT OF MINES — SOUTH AUSTRALIA

LOG OF ROTARY AIR DRILL HOLE

HOLE NO. MT 35
SERIAL NO 953/73

PROJECT MURRAY LANDS RAILWAY - BALLAST SUPPLIES
PLAN REFERENCE 74-314
FEATURE TAILEM BEND AMPHIBOLITE DEPOSIT
COORDINATES 250 E/075 N
LOCATION SEC. 68 HD. SEYMOUR
ANGLE FROM HORIZ. 90° DIRECTION —

		DESCRIPTION OF CHIPS	LOG	DEPTH (m)
PLEISTOCENE	CALCRETE OF THE BAKARA SOIL	CALCRETE: buff, hard & nodular at top, soft & friable at bottom		1
	BLANCHETOWN CLAY	clay: pale brown sandy plastic		
CAMBRIAN	KANMANTOO GROUP	SCHIST: grey-brown weathered		2 3 4

END OF HOLE 4 metres

POROSITY: HP | P | MP | SP | NP
HARDNESS: VS | S | MH | H | VH
STRUCTURES
PENETRATION TIME (MINS.): 1 2 3 4 5 6 7 8 9
DEPTH (m) / (FT.): 10 20

POROSITY TERM	HARDNESS TERM
HP – Highly Porous	VS – Very Soft
P – Porous	S – Soft
MP – Moderately Porous	MH – Moderately Hard
SP – Slightly Porous	H – Hard
NP – Non Porous	VH – Very Hard

ENVIRONMENT & RESOURCES DIVISION

DRILL NO. DM 67	LOGGED D. NICHOL
TYPE MAYHEW 1000	DATE 5/7/73
DRILLER D. LUKER	TRACED R.B
START 5/7/73	CHECKED A.F.
FINISH 5/7/73	
SHEET 1 OF 1	DRG. NO. S10866 J24

DEPARTMENT OF MINES — SOUTH AUSTRALIA

LOG OF ROTARY AIR DRILL HOLE

HOLE NO. MT 36

SERIAL NO 953/73

PROJECT MURRAY LANDS RAILWAY — BALLAST SUPPLIES

PLAN REFERENCE 74-314

FEATURE TAILEM BEND AMPHIBOLITE DEPOSIT

COORDINATES 175 E / 075 N

LOCATION SEC 68 HD SEYMOUR

ANGLE FROM HORIZ. 90° DIRECTION —

		DESCRIPTION OF CHIPS	LOG	DEPTH (m)
PLEISTOCENE	CALCRETE OF THE BAKARA SOIL	CALCRETE: buff, hard & nodular at top, soft & friable at bottom.		1
PLEISTOCENE	BLANCHETOWN CLAY	CLAY: red-brown, slightly sandy, plastic		2
PLIOCENE	LOXTON SAND	SAND: orange-brown, clayey, fine grained.		3
CAMBRIAN → KANMANTOO GROUP →		QUARTZITE: grey fresh		4
		END OF HOLE 4 metres.		

POROSITY: HP | P | MP | SP | NP

HARDNESS: VS | S | MH | H | VH

STRUCTURES

PENETRATION TIME (MINS.) 1 2 3 4 5 6 7 8 9

DEPTH (m) (FT.) 10 20

POROSITY TERM	HARDNESS TERM
HP – Highly Porous	VS – Very Soft
P – Porous	S – Soft
MP – Moderately Porous	MH – Moderately Hard
SP – Slightly Porous	H – Hard
NP – Non Porous	VH – Very Hard

ENVIRONMENT & RESOURCES DIVISION

DRILL NO. DM 67	LOGGED D. NICHOL
TYPE MAYHEW 1000	DATE 5/7/73
DRILLER D. LUKER	TRACED R.B.
START 5/7/73	CHECKED A.F.
FINISH 5/7/73	

SHEET 1 OF 1 DRG. NO. S10867 Je4

DEPARTMENT OF MINES — SOUTH AUSTRALIA

LOG OF ROTARY AIR DRILL HOLE

HOLE NO. MT 37

SERIAL NO 953/73

PROJECT MURRAY LANDS RAILWAY — BALLAST SUPPLIES

PLAN REFERENCE 74-314

FEATURE TAILEM BEND AMPHIBOLITE DEPOSIT

COORDINATES 200E/050N

LOCATION SEC 68 HD SEYMOUR.

ANGLE FROM HORIZ. 90°. DIRECTION —

		DESCRIPTION OF CHIPS	LOG	DEPTH (m)	POROSITY (HP P MP SP NP)	HARDNESS (VS S MH H VH)	STRUCTURES	PENETRATION TIME (MINS.) 1 2 3 4 5 6 7 8 9	DEPTH (m) (FT.)
PLEISTOCENE	CALCRETE OF THE BAKARA SOIL	CALCRETE: buff hard & nodular at top, soft & friable at bottom.		1					
	BLANCHETOWN CLAY	CLAY: red-brown, slightly sandy, plastic		2					
CAMBRIAN	KANMANTOO GROUP	QUARTZITE: pink & grey, fresh		3					10
END OF HOLE 3.6 metres				4					20

POROSITY TERM	HARDNESS TERM
HP – Highly Porous	VS – Very Soft
P – Porous	S – Soft
MP – Moderately Porous	MH – Moderately Hard
SP – Slightly Porous	H – Hard
NP – Non Porous	VH – Very Hard

ENVIRONMENT & RESOURCES DIVISION

DRILL NO. DM 67	LOGGED D. NICHOL
TYPE MAYHEW 1000	
DRILLER D. LUKER	DATE 5/7/73
START 5/7/73	TRACED R.B
FINISH 5/7/73	CHECKED A.F.
SHEET 1 OF 1	DRG. NO. S10868 Je4

DEPARTMENT OF MINES — SOUTH AUSTRALIA

LOG OF ROTARY AIR DRILL HOLE

HOLE NO. MT 38

SERIAL NO. 953/73

PROJECT MURRAY LANDS RAILWAY - BALLAST SUPPLIES

FEATURE TAILEM BEND AMPHIBOLITE DEPOSIT

LOCATION SEC 68 HD SEYMOUR

PLAN REFERENCE 74-314

COORDINATES 250E/050N

ANGLE FROM HORIZ. 90° DIRECTION —

		DESCRIPTION OF CHIPS	LOG	DEPTH (m)
PLEISTOCENE	Calcrete of the BAKARA SOIL	Calcrete: buff, hard and nodular at top, soft and friable at bottom.		0
PLEISTOCENE	BLANCHETOWN CLAY	Clay: red-brown, slightly sandy, plastic.		1
CAMBRIAN	KANMANTOO GROUP	Schist: black, fresh.		2
				3
		END OF HOLE 4M		4

POROSITY: HP | P | MP | SP | NP

HARDNESS: VS | S | MH | H | VH

STRUCTURES

PENETRATION TIME (MINS.) 1 2 3 4 5 6 7 8 9

DEPTH (m) 10 20 (FT.)

POROSITY TERM

HP – Highly Porous
P – Porous
MP – Moderately Porous
SP – Slightly Porous
NP – Non Porous

HARDNESS TERM

VS – Very Soft
S – Soft
MH – Moderately Hard
H – Hard
VH – Very Hard

ENVIRONMENT & RESOURCES DIVISION

DRILL NO. DM 67	LOGGED D. NICHOL
TYPE MAYHEW 1000	DATE 28/6/73
DRILLER D. LUKER	TRACED L.R.
START 28/6/73	CHECKED A.F.
FINISH 28/6/73	

SHEET 1 OF 1 DRG NO 510869 Je4

DEPARTMENT OF MINES — SOUTH AUSTRALIA

LOG OF ROTARY AIR DRILL HOLE

HOLE NO. MT 39

SERIAL NO 953/73

PROJECT MURRAY LANDS RAILWAY - BALLAST SUPPLIES . PLAN REFERENCE . 74-314 .

FEATURE TAILEM BEND AMPHIBOLITE DEPOSIT . . . COORDINATES . 300E/050N . . . .

LOCATION SEC. 68, HD. SEYMOUR . . . . . ANGLE FROM HORIZ. 90° . DIRECTION -

		DESCRIPTION OF CHIPS	LOG	DEPTH (m)	POROSITY (HP P MP SP NP)	HARDNESS (VS S MH H VH)	STRUCTURES	PENETRATION TIME (MINS.) 1 2 3 4 5 6 7 8 9	DEPTH (m) (FT.)
PLEISTOCENE	Calcrete of the BAKARA SOIL	Calcrete: buff, hard and nodular at top, soft and friable at bottom.		1			large fragments of amphibolite.		
CAMBRIAN	KANMANTOO GROUP	Schist: grey-brown, weathered.		2 3 4 5					10 20

END OF HOLE 5M.

POROSITY TERM

HP – Highly Porous
P – Porous
MP – Moderately Porous
SP – Slightly Porous
NP – Non Porous

HARDNESS TERM

VS – Very Soft
S – Soft
MH – Moderately Hard
H – Hard
VH – Very Hard

ENVIRONMENT & RESOURCES DIVISION

DRILL NO. DM 67 . LOGGED D. NICHOL .
TYPE . MAYHEW 1000 . DATE . 3/7/73 .
DRILLER D. LUKER . TRACED L.R. .
START . 3/7/73 . CHECKED . A.F. .
FINISH . 3/7/73 .

SHEET . 1 . OF . 1 . DRG. NO. S10870 Je4

DEPARTMENT OF MINES — SOUTH AUSTRALIA

LOG OF ROTARY AIR DRILL HOLE

HOLE NO. MT 40

SERIAL NO 953/73

PROJECT . MURRAY LANDS RAILWAY - BALLAST SUPPLIES. PLAN REFERENCE 74-314

FEATURE . TAILEM BEND AMPHIBOLITE DEPOSIT COORDINATES . 150E/000N

LOCATION . SEC 68, HD. SEYMOUR ANGLE FROM HORIZ. 90° . DIRECTION . —

		DESCRIPTION OF CHIPS	LOG	DEPTH (m)	POROSITY (HP P MP SP NP)	HARDNESS (VS S MH H VH)	STRUCTURES	PENETRATION TIME (MINS) 1 2 3 4 5 6 7 8 9	DEPTH (m) (FT)
RECENT	MOLINEAUX SAND	Sand: pale yellow-brown, fine grained.		1					
PLEISTOCENE	Calcrete of the BAKARA SOIL	Calcrete: buff, hard and nodular at top, soft and friable at bottom.		2					
	BLANCHETOWN CLAY	Clay: red-brown slightly sandy, plastic.		3 4 5 6 7					10 20
CAMBRIAN	KANMANTOO GROUP	Schist: grey-brown, weathered.	S S	8					30

END OF HOLE 8M.

POROSITY TERM

HP – Highly Porous
P – Porous
MP – Moderately Porous
SP – Slightly Porous
NP – Non Porous

HARDNESS TERM

VS – Very Soft
S – Soft
MH – Moderately Hard
H – Hard
VH – Very Hard

ENVIRONMENT & RESOURCES DIVISION

DRILL NO. DM 67	LOGGED D. NICHOL
TYPE . MAYHEW . 1000	DATE . 5/7/73
DRILLER D. LUKER	TRACED L.R.
START . 5/7/73	CHECKED . A.F.
FINISH . 5/7/73	
SHEET . 1 . OF . 1	DRG. NO. S 10871 Je4

DEPARTMENT OF MINES — SOUTH AUSTRALIA

LOG OF ROTARY AIR DRILL HOLE

HOLE NO. MT 41

SERIAL NO 953/73

PROJECT MURRAY LANDS RAILWAY – BALLAST SUPPLIES . PLAN REFERENCE 74-314

FEATURE TAILEM BEND AMPHIBOLITE DEPOSIT . COORDINATES . 250E/000N

LOCATION SEC. 68, HD SEYMOUR . ANGLE FROM HORIZ. 90° . DIRECTION –

		DESCRIPTION OF CHIPS	LOG	DEPTH (m)
RECENT	MOUNT-EAUX SAND	Sand: pale yellow brown, fine grained		0
PLEISTOCENE	Calcrete of the BAKARA SOIL	Calcrete: buff, hard and nodular on top, soft and friable on bottom.		1
PLEISTOCENE	BLANCHETOWN CLAY	Clay: red-brown, slightly sandy, plastic.		2
				3
				4
CAMBRIAN	KANMANTOO GROUP	Schist: black, slightly weathered.		5
				6

END OF HOLE 6M

POROSITY: HP | P | MP | SP | NP

HARDNESS: VS | S | MH | H | VH

STRUCTURES

PENETRATION TIME (MINS): 1 2 3 4 5 6 7 8 9

DEPTH (m) 0 10 20 — DEPTH (FT)

POROSITY TERM

HP – Highly Porous
P – Porous
MP – Moderately Porous
SP – Slightly Porous
NP – Non Porous

HARDNESS TERM

VS – Very Soft
S – Soft
MH – Moderately Hard
H – Hard
VH – Very Hard

ENVIRONMENT & RESOURCES DIVISION

DRILL NO. DM 67
TYPE . MAYHEW . 1000
DRILLER . D. LUKER
START 28/6/73
FINISH 28/6/73

LOGGED . D. NICHOL
DATE 28/6/73
TRACED L.P.
CHECKED A.F.

SHEET 1 OF 1

DRG NO S10872 Je4

DEPARTMENT OF MINES — SOUTH AUSTRALIA

LOG OF ROTARY AIR DRILL HOLE

HOLE NO. MT 42
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 —

		DESCRIPTION OF CHIPS	LOG	DEPTH (m)	POROSITY HP P MP SP NP	HARDNESS VS S MH H VH	STRUCTURES	PENETRATION TIME (MINS.) 1 2 3 4 5 6 7 8 9	DEPTH (m) (FT.)
PLEISTOCENE	Calcrete of the BAKARA SOIL	Calcrete: buff, hard and nodular at top, soft and friable at bottom.		1					
	BLANCHETOWN CLAY	Clay: red-brown slightly sandy, plastic.		2					
				3					10
CAMBRIAN	KANMANTOO GROUP	Schist: grey-brown, slightly weathered.	S S S S S S	4					
				5					
		END OF HOLE 5M.							20

POROSITY TERM
HP – Highly Porous
P – Porous
MP – Moderately Porous
SP – Slightly Porous
NP – Non Porous

HARDNESS TERM
VS – Very Soft
S – Soft
MH – Moderately Hard
H – Hard
VH – Very Hard

ENVIRONMENT & RESOURCES DIVISION

DRILL NO. DM 67.
TYPE MAYHEW 1000
DRILLER D. LUKER
START 28/6/73
FINISH 28/6/73

LOGGED D. NICHOL
DATE 28/6/73
TRACED L.R.
CHECKED A.F.

SHEET 1 OF 1
DRG. NO. S 10873 J24

DEPARTMENT OF MINES — SOUTH AUSTRALIA

LOG OF ROTARY AIR DRILL HOLE

HOLE NO. MX1

SERIAL NO 953/73

PROJECT MURRAY LANDS RAILWAY - BALLAST SUPPLIES . PLAN REFERENCE S10065a

FEATURE TAILEM BEND AMPHIBOLITE DEPOSIT . COORDINATES

LOCATION SEC 68(3c) HD. SEYMOUR . ANGLE FROM HORIZ. 90° . DIRECTION

		DESCRIPTION OF CHIPS	DEPTH (m)	DEPTH (FT.)
RECENT	MOLINEAUX SAND	Sand: pale yellow- fine grained.	0–2	
PLEISTOCENE	Calcrete of the BAKARA SOIL	Calcrete: buff, hard and nodular at top, soft and friable at bottom.	2–5	10
	BLANCHETOWN CLAY	Clay: red-brown slightly sandy, plastic.	5–7	20
PLIOCENE	LOXTON SAND	Sand: orange-brown, yellow-brown and pale yellow, slightly clayey, fine grained.	7–15	30, 40
		END OF HOLE 15M	15	50

POROSITY: HP | P | MP | SP | NP

HARDNESS: VS | S | MH | H | VH

STRUCTURES

PENETRATION TIME (MINS.): 1 2 3 4 5 6 7 8 9

POROSITY TERM

HP – Highly Porous

P – Porous

MP – Moderately Porous

SP – Slightly Porous

NP – Non Porous

HARDNESS TERM

VS – Very Soft

S – Soft

MH – Moderately Hard

H – Hard

VH – Very Hard

ENVIRONMENT & RESOURCES DIVISION

DRILL NO. DM 67

TYPE MAYHEW 1000

DRILLER D. LUKER

START 5/7/73

FINISH 5/7/73

LOGGED D. NICHOL

DATE 5/7/73

TRACED L.R.

CHECKED A.F.

SHEET 1 OF 1

DRG. NO. S10874 Jc4

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 drilling 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, Dalgleish 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.

DEPARTMENT OF MINES · SOUTH AUSTRALIA

LOG OF DIAMOND DRILL HOLE

HOLE Nº DT 1
SERIAL Nº 662/74

PROJECT MURRAY LANDS RAILWAYS
FEATURE JAILEM BEND AMPHIBOLITE DEPOSIT
LOCATION Section 68 HD. Seymour
PLAN REFERENCE 74-314
COORDINATES 208E 100N
ANGLE FROM HORIZ. 52° DIRECTION 271° (true).

DESCRIPTION OF CORE	LOG	DEPTH (m.)	POROSITY AND CONDITION (HP P MP SP NP) HARDNESS (VS S MH H VH)	STRUCTURES	CORE LOSS	CASING	DEPTH (FT.)
PLEISTOCENE							
No core recovered		1–2					5
Quartzite — grey and pink		3		foliation at 45° to the core axis			
Quartzite — grey and pink, banded. Hornblende schist 2cm thick at 3·30m Weathered mica schist 2cm thick at 3·60 m		4–5					10–15
Schist — green							
Quartzite — grey		6					20
Schist — green							
Quartzite — grey Weathered mica schist 3 cm thick at 6·20 m		7		strongly jointed foliation at 50° to the core axis			25
Amphibolite — dark green 20% hard bands		8–9					
No core recovered							30
Amphibolite — dark green		10					
No core recovered		11–12					35
Amphibolite — dark green							40
No core recovered							
Amphibolite — dark green		13–14					45
No core recovered		15					
Quartzite — grey							50
No core recovered		16					
Amphibolite — dark green		17					55
Quartzite — grey, with minor amphibolite		18					60
No core recovered							
Amphibolite — dark green		19					
Schistose amphibolite dark green		20		foliation at 45° to core axis			65

CAMBRIAN — KANMANTOO GROUP

POROSITY TERM
HP Highly Porous
P Porous
MP Moderately Porous
SP Slightly Porous
NP Non Porous

CONDITION TERM
Fresh
Decomposed
Weathered
Altered
Not applicable

HARDNESS TERM
VS Very soft
S Soft
MH Moderately Hard
H Hard
VH Very Hard

ENVIRONMENT & RESOURCES DIV.

DRILL Nº 9
TYPE MINDRILL
DRILLER J. JENSEN
START 30-11-73
FINISH 5-12-73
LOGGED D. NICHOL
DATE 5-12-73
TRACED D.J.M.
CHECKED A.F.

SHEET 1 OF 2
DRG Nº S10828/64

P.F. Nº S9411 MB

DEPARTMENT OF MINES · SOUTH AUSTRALIA

LOG OF DIAMOND DRILL HOLE

HOLE Nº DT 1
SERIAL Nº 662/74

PROJECT MURRAY LANDS RAILWAYS
FEATURE TAILEM BEND AMPHIBOLITE DEPOSIT
LOCATION Section 68 HD. Seymour

PLAN REFERENCE 74-314
COORDINATES 208E 100N
ANGLE FROM HORIZ. 52° DIRECTION 271° (true)

DESCRIPTION OF CORE	LOG	DEPTH (m.)	POROSITY AND CONDITION (HP P MP SP NP / Fresh, Decomposed, Weathered, Altered, Not applicable)	HARDNESS (VS S MH H VH)	STRUCTURES	CORE LOSS	CASING	DEPTH (FT.)
CAMBRIAN — KANMANTOO GROUP								
Schistose amphibolite – dark green	+ + +				foliation at 45° to core axis			
No core recovered		21						70
		22						
schistose amphibolite	+ +							
No core recovered								
schistose amphibolite	+ +							
Quartzite – grey		23						75
		24						
		25						80
No core recovered								
mica schist – green		26						
Quartzite – grey, micaceous								85
Schistose amphibolite – dark green	+ + +	27						
No core recovered								90
Schistose amphibolite – dark green	+ + +	28						
mica schist								
END OF HOLE		28·30m						95

POROSITY TERM
HP Highly Porous
P Porous
MP Moderately Porous
SP Slightly Porous
NP Non Porous

CONDITION TERM
Fresh
Decomposed
Weathered
Altered
Not applicable

HARDNESS TERM
VS Very soft
S Soft
MH Moderately Hard
H Hard
VH Very Hard

ENVIRONMENT & RESOURCES DIV.

DRILL Nº 9
TYPE MINDRILL
DRILLER J. JENSEN
START 30-11-73
FINISH 5-12-73

LOGGED D. NICHOL
DATE 5-12-73
TRACED D.J.M.
CHECKED A.F.

SHEET 2 OF 2
DRG Nº S10828a Ve4

P.F. Nº S9411 MB

DEPARTMENT OF MINES · SOUTH AUSTRALIA

HOLE Nº DT 2

SERIAL Nº 664/74

LOG OF DIAMOND DRILL HOLE

PROJECT MURRAY LANDS RAILWAYS

FEATURE TAILEM BEND AMPHIBOLITE DEPOSIT

LOCATION Section 68 HD. Seymour

PLAN REFERENCE 74-314

COORDINATES 233E 100N

ANGLE FROM HORIZ. 90° DIRECTION —

DESCRIPTION OF CORE	LOG	DEPTH (m.)	POROSITY AND CONDITION (HP P MP SP NP)	HARDNESS (VS S MH H VH)	STRUCTURES	CORE LOSS	CASING	DEPTH (FT.)
PLEIST-OCENE								
No core recovered		1						
CAM-BRIAN KANMANTOO GROUP								5
Amphibolite – dark green	+ + +	2			foliation at 5° to core axis			
END OF HOLE 2.00m								10

POROSITY TERM

HP Highly Porous
P Porous
MP Moderately Porous
SP Slightly Porous
NP Non Porous

CONDITION TERM

Fresh
Decomposed
Weathered
Altered
Not applicable

HARDNESS TERM

VS Very soft
S Soft
MH Moderately Hard
H Hard
VH Very Hard

ENVIRONMENT & RESOURCES DIV.

DRILL Nº 9
TYPE MINDRILL
DRILLER J. Jensen
START 6-12-73
FINISH 6-12-73

LOGGED D. NICHOL
DATE 6-12-73
TRACED D.J.M.
CHECKED A.F.

SHEET 1 OF 1

DRG Nº S10829 Je4

P.F. Nº S9411 MB

DEPARTMENT OF MINES · SOUTH AUSTRALIA

HOLE Nº DT 3
SERIAL Nº 665/74

PROJECT MURRAY LANDS RAILWAYS

LOG OF DIAMOND DRILL HOLE

FEATURE TAILEM BEND AMPHIBOLE DEPOSIT
LOCATION Section 68 Hd. Seymour
PLAN REFERENCE 74-314
COORDINATES 233E 100N
ANGLE FROM HORIZ. 45° DIRECTION 274° (true)

DESCRIPTION OF CORE	LOG	DEPTH (m.)	POROSITY AND CONDITION (HP P MP SP NP)	HARDNESS (VS S MH H VH)	STRUCTURES	CORE LOSS	CASING	DEPTH (FT.)
PLEISTOCENE								
No core recovered		1–2						5
CAMBRIAN — KANMANTOO GROUP								
Schistose amphibolite – dark green	+ + +	3						10
Mica schist – green		4						
Schistose amphibolite – dark green	+ + +	5						15
No core recovered								
Mica schist – green with minor hornblende schist		6–7			foliation at 50° to the core axis			20 25
Schistose amphibolite – dark green	+ + +	8						
No core recovered		9						30
Schistose amphibolite – dark green	+ + +							
No core recovered		10						
Schistose amphibolite – dark green with minor bands of mica schist	+ + +	11–12						35 40
No core recovered		13						
Mica schist – green		14–15						45
Schistose amphibolite – dark green	+ + +	16–17						50 55
No core recovered								
Schistose amphibolite – dark green	+ + +	18						60
Schistose amphibolite – dark green	+ + +	19–20						65

POROSITY TERM
HP Highly Porous
P Porous
MP Moderately Porous
SP Slightly Porous
NP Non Porous

CONDITION TERM
Fresh
Decomposed
Weathered
Altered
Not applicable

HARDNESS TERM
VS Very soft
S Soft
MH Moderately Hard
H Hard
VH Very Hard

ENVIRONMENT & RESOURCES DIV.

DRILL Nº 9
TYPE MINDRILL
DRILLER J. Jensen
START 6-12-73
FINISH 12-12-73

LOGGED D. NICHOL
DATE 12-12-73
TRACED D.J.M.
CHECKED A.F.

SHEET 1 OF 2 DRG Nº S10830 Je4

P.F. Nº S9411 MB

DEPARTMENT OF MINES · SOUTH AUSTRALIA

HOLE Nº DT3

SERIAL Nº 665/74

LOG OF DIAMOND DRILL HOLE

PROJECT MURRAY LANDS RAILWAYS

FEATURE TAILEM BEND AMPHIBOLITE DEPOSIT

LOCATION Section 68 Hd. Seymour

PLAN REFERENCE 74-314

COORDINATES 233E 100N

ANGLE FROM HORIZ. 45 DIRECTION 274° (true)

DESCRIPTION OF CORE	LOG	DEPTH (m.)	POROSITY AND CONDITION (HP P MP SP NP)	HARDNESS (VS S MH H VH)	STRUCTURES	CORE LOSS	CASING	DEPTH (FT.)
CAMBRIAN — KANMANTOO GROUP								
Schistose amphibolite — dark green		21, 22, 23						70, 75
Mica schist — green		24						
Schistose amphibolite — dark green. Mica schist interlayers 3 cms thick at 25·60 m and 5 cms thick at 26·25 m		25, 26, 27, 28			foliation at 45° to the core axis			80, 85, 90
Breccia — vein quartz fragments in a clay matrix		29						
Quartzite - grey and pink		30						95
END OF HOLE 30·40 m								100

POROSITY TERM

HP Highly Porous
P Porous
MP Moderately Porous
SP Slightly Porous
NP Non Porous

CONDITION TERM

Fresh
Decomposed
Weathered
Altered
Not applicable

HARDNESS TERM

VS Very soft
S Soft
MH Moderately Hard
H Hard
VH Very Hard

ENVIRONMENT & RESOURCES DIV.

DRILL Nº 9
TYPE MINDRILL
DRILLER J. JENSEN
START 6-12-73
FINISH 12-12-73

LOGGED D. NICHOL
DATE 12-12-73
TRACED D.J.M.
CHECKED A.F.

SHEET 2 OF 2

DRG Nº S10830aJe4

P.F. Nº S9411 MB

DEPARTMENT OF MINES · SOUTH AUSTRALIA

LOG OF DIAMOND DRILL HOLE

HOLE Nº DT 4
SERIAL Nº 667/74

PROJECT MURRAY LANDS RAILWAYS
FEATURE TAILEM BEND AMPHIBOLITE DEPOSIT
LOCATION Section 68 Hd. Seymour

PLAN REFERENCE 74-314
COORDINATES 258 E 100 N
ANGLE FROM HORIZ. 45° DIRECTION 267° (true)

Age	Group	DESCRIPTION OF CORE	LOG	DEPTH (m.)	STRUCTURES
PLEISTOCENE		No core recovered		0–3	
CAMBRIAN	KANMANTOO GROUP	Schistose amphibolite-dark green; minor mica schist	+ +		foliation at 45° to core axis
		Amphibolite – dark green	+ +	4–5	
		Amphibolite- dark green, decomposed	+ +		
		No core recovered		6	
		Schistose amphibolite	+ +		
		No core recovered		7	
		Schistose amphibolite	+ +		
		No core recovered		8	
		Schistose amphibolite	+ +	9	
		Amphibolite – dark green	+ +	10	
		Amphibolite – dark green	+ +	11	
		No core recovered			
		Schistose amphibolite – dark green, with minor mica schist and amphibolite	+ +	12–15	

END OF HOLE 15·60 m

DEPTH (FT.): 5, 10, 15, 20, 25, 30, 35, 40, 45, 50

POROSITY AND CONDITION: HP P MP SP NP; HARDNESS: VS S MH H VH; CORE LOSS; CASING

POROSITY TERM	CONDITION TERM	HARDNESS TERM
HP Highly Porous	Fresh	VS Very soft
P Porous	Decomposed	S Soft
MP Moderately Porous	Weathered	MH Moderately Hard
SP Slightly Porous	Altered	H Hard
NP Non Porous	Not applicable	VH Very Hard

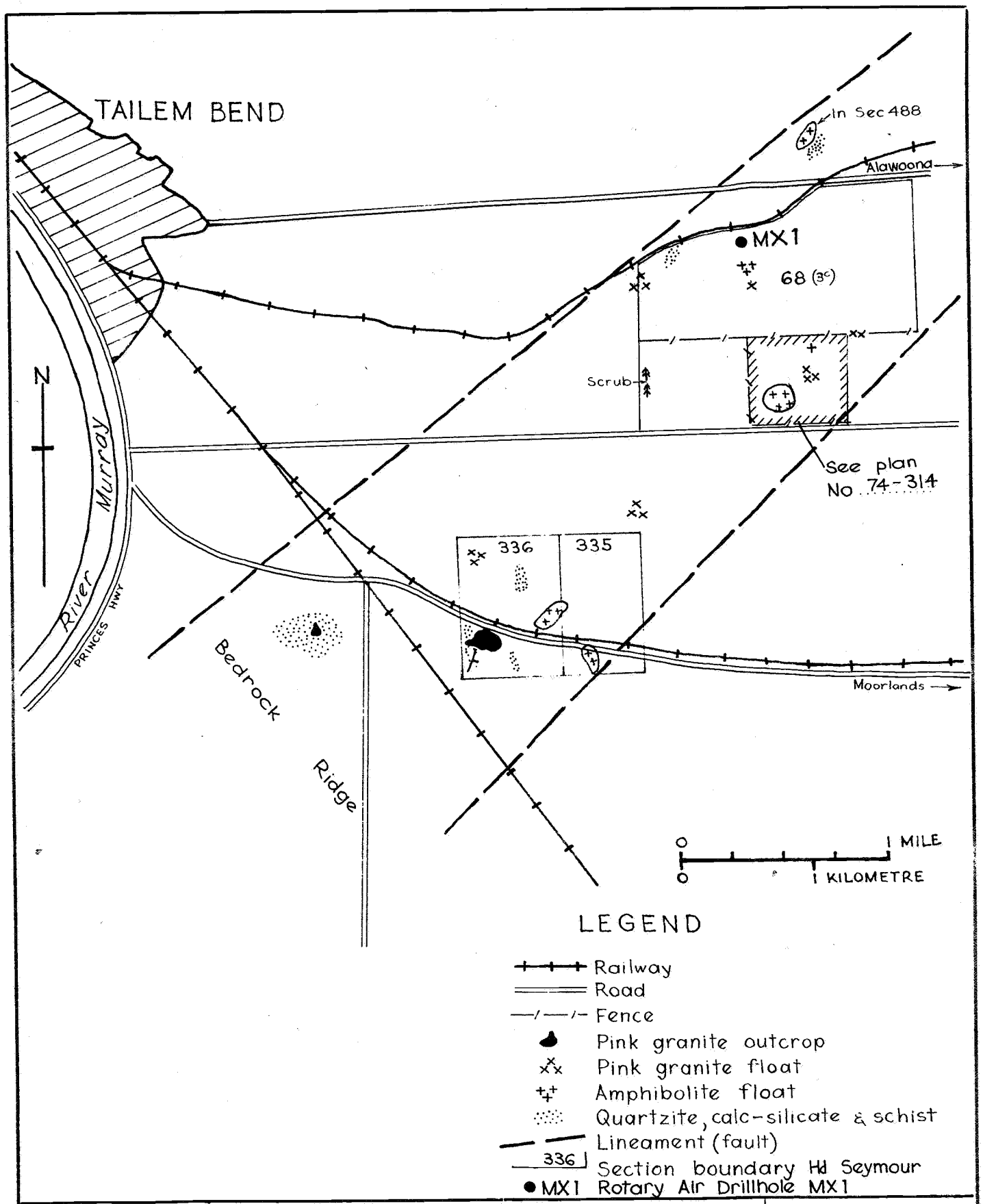
ENVIRONMENT & RESOURCES DIV.

DRILL Nº 9
TYPE MINDRILL
DRILLER J. Jensen
START 12-12-73
FINISH 14-12-73

LOGGED D. NICHOL
DATE 14-12-73
TRACED D.J.M.
CHECKED A.F.

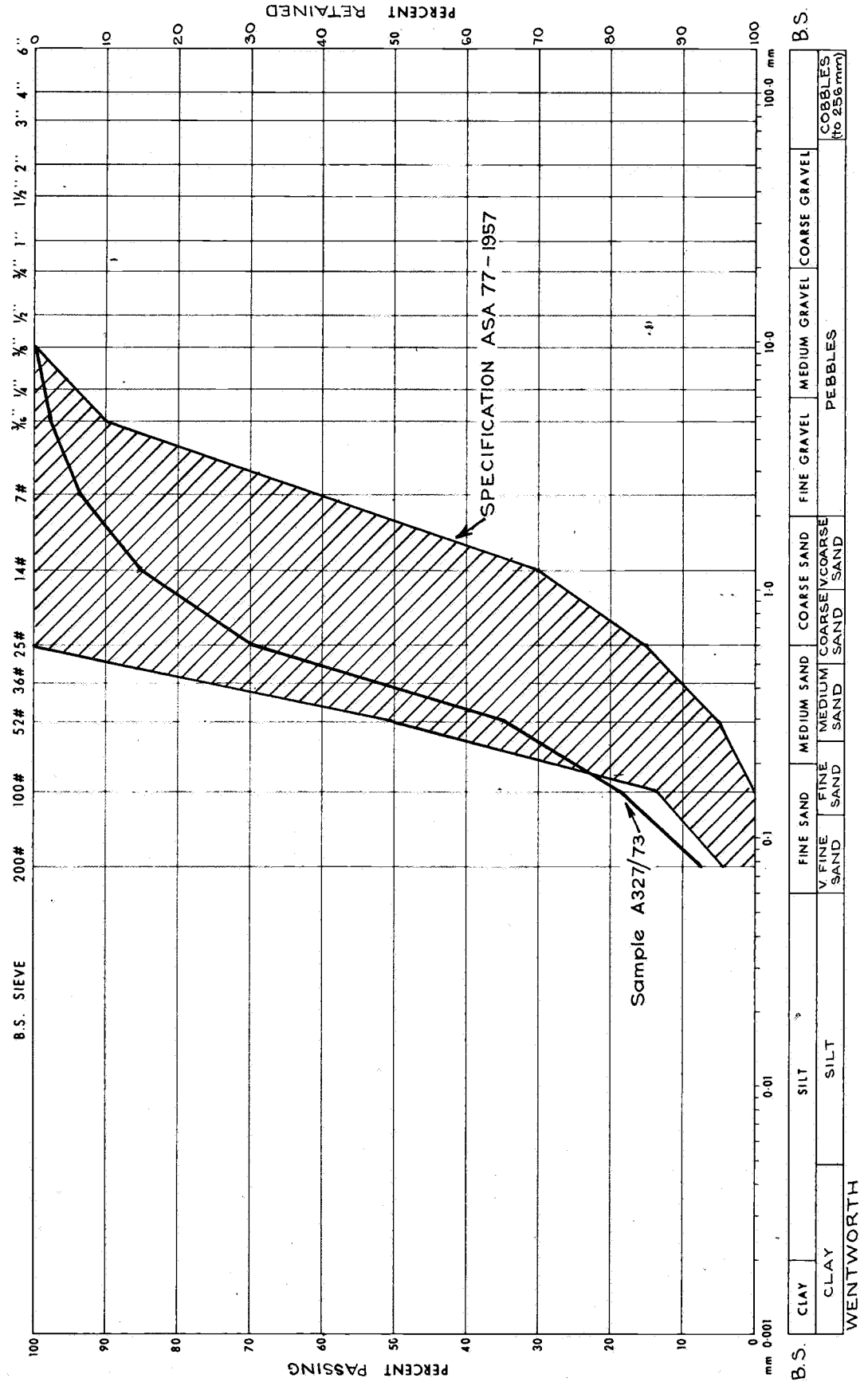
SHEET 1 OF 1 DRG Nº S10831 Je4

P.F. Nº 59411 MB



	DEPARTMENT OF MINES — SOUTH AUSTRALIA	Scale: 1:40 000 (aprox)
Compiled: D. Nichol	MURRAY LANDS RAILWAYS BALLAST SUPPLIES	Date: 6 December 1972
Drn. A.F. | Ckd. A.F.	TAILEM BEND AREA	Drg. No.
	GEOLOGICAL PLAN	S 10065a Je4

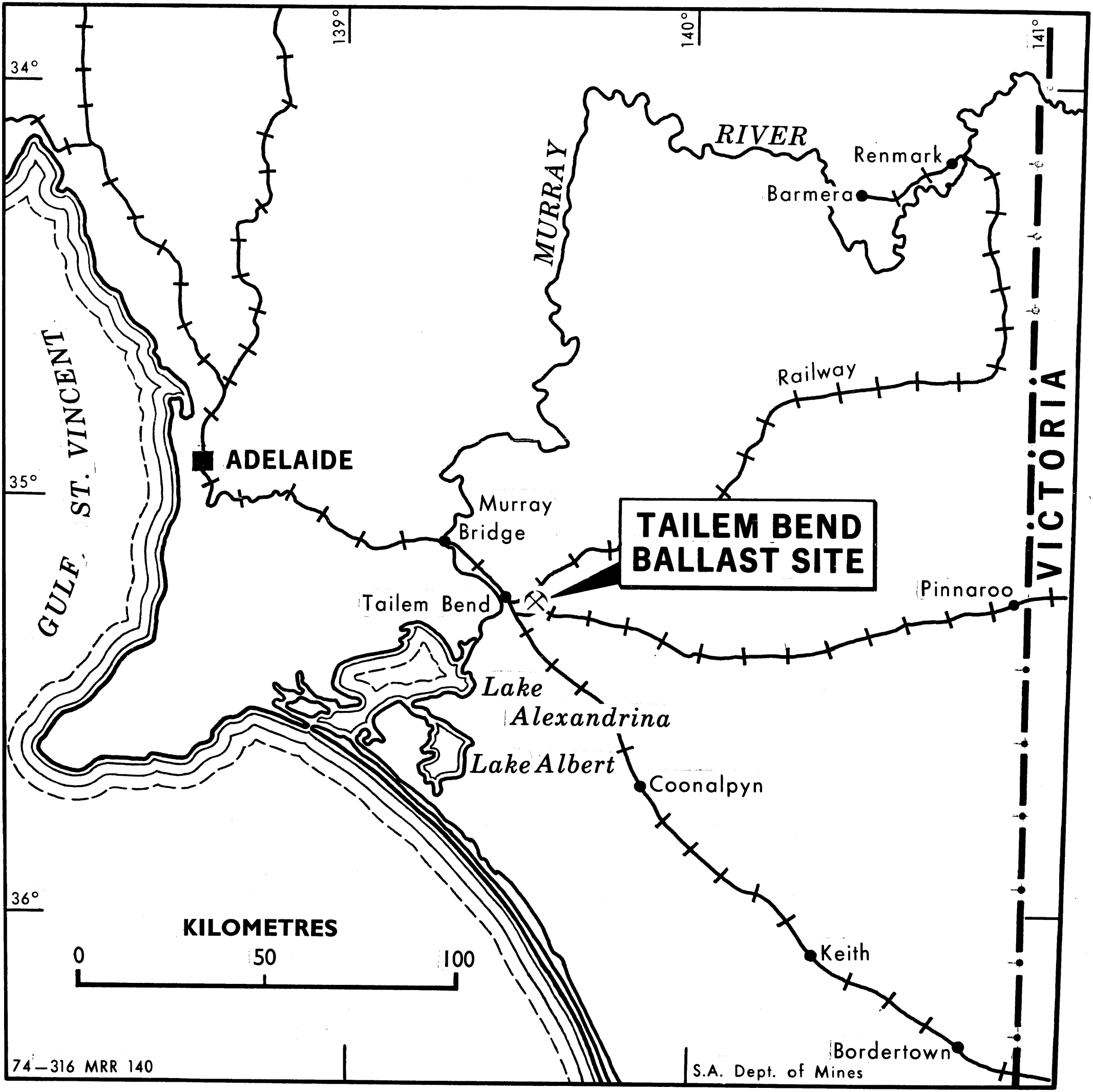
1M—2.70 A1810

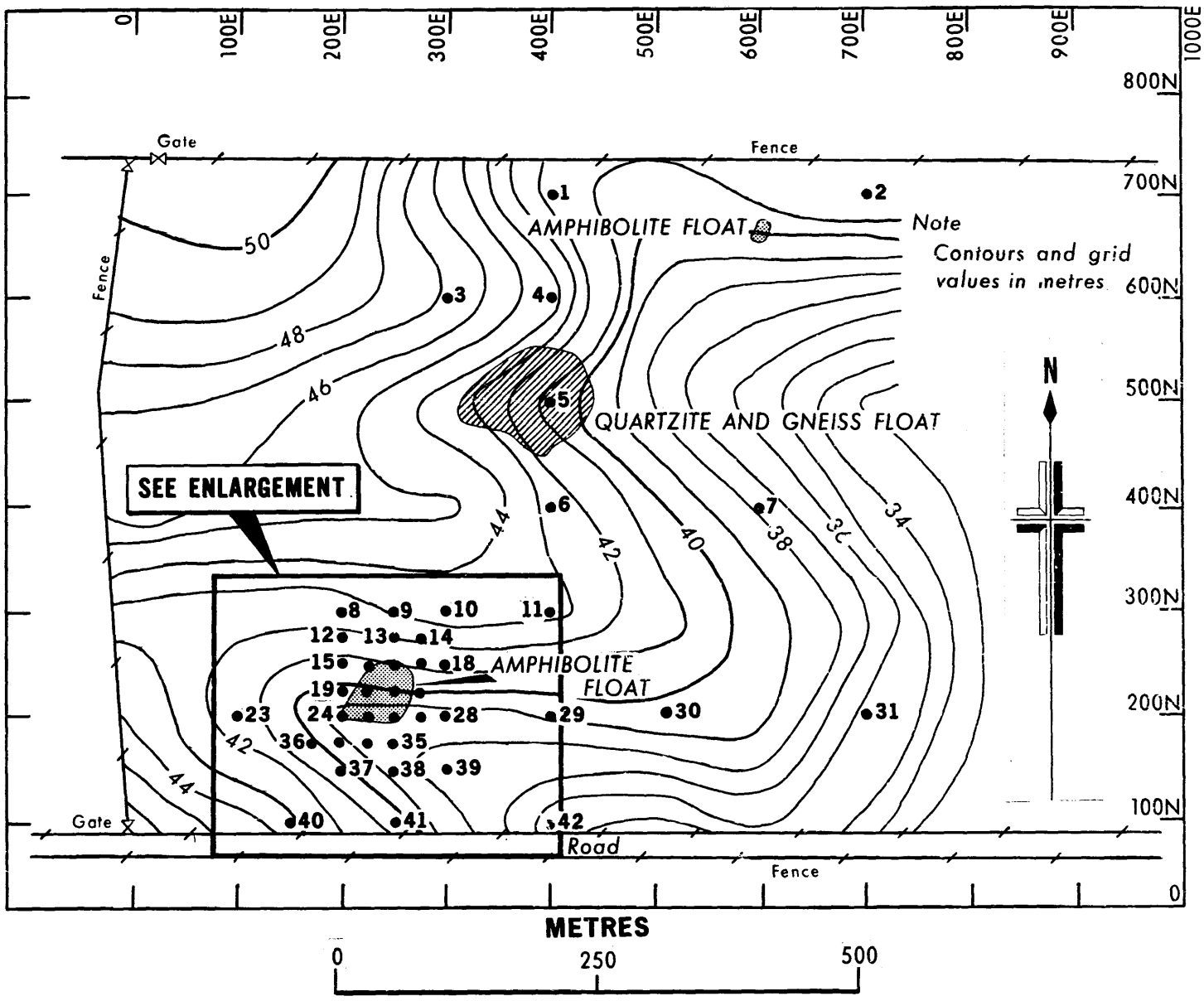


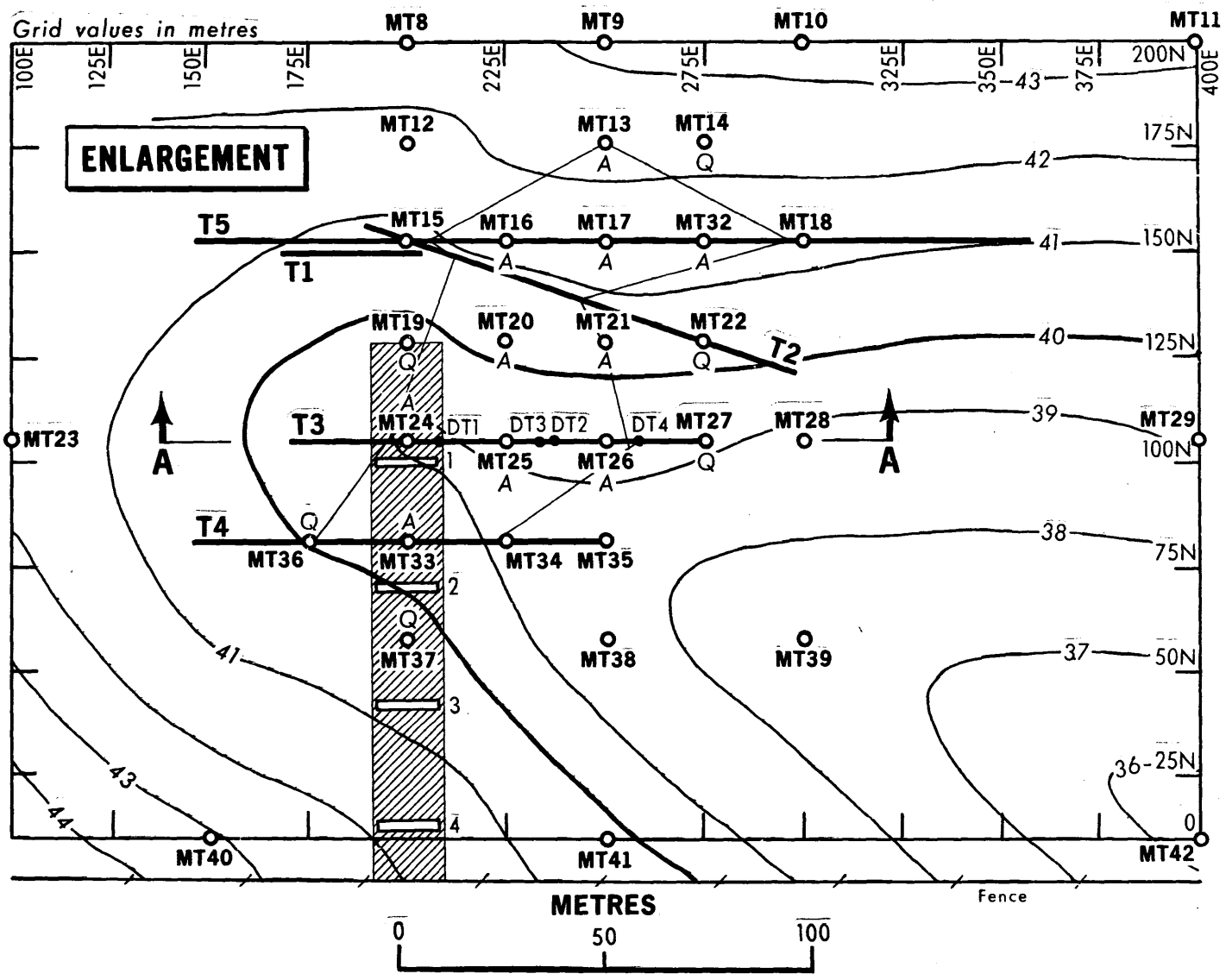
Sample taken from drillhole MT8, interval 11–16 metres

NON-METALLICS SECTION	**DEPARTMENT OF MINES — SOUTH AUSTRALIA**	Scale: As shown
Compiled: D. Nichol	MURRAY LANDS RAILWAYS — TAILEM BEND SITE	Date: May 1974
Drn: A.F.	SEC. 68 HD. SEYMOUR	FIG:
Ckd: A.F.	SCREEN SIZE ANALYSIS SAMPLE A327/73	Drg No. S10821 Je4

P.F. No S9548 MG


139°
140°
141°
34°
35°
36°
MURRAY RIVER
Renmark
Barmera
Railway
ADELAIDE
Murray Bridge
TAILEM BEND BALLAST SITE
Tailem Bend
Pinnaroo
VICTORIA
GULF ST. VINCENT
Lake Alexandrina
Lake Albert
Coonalpyn
Keith
Bordertown
KILOMETRES
0
50
100
74—316 MRR 140
S.A. Dept. of Mines



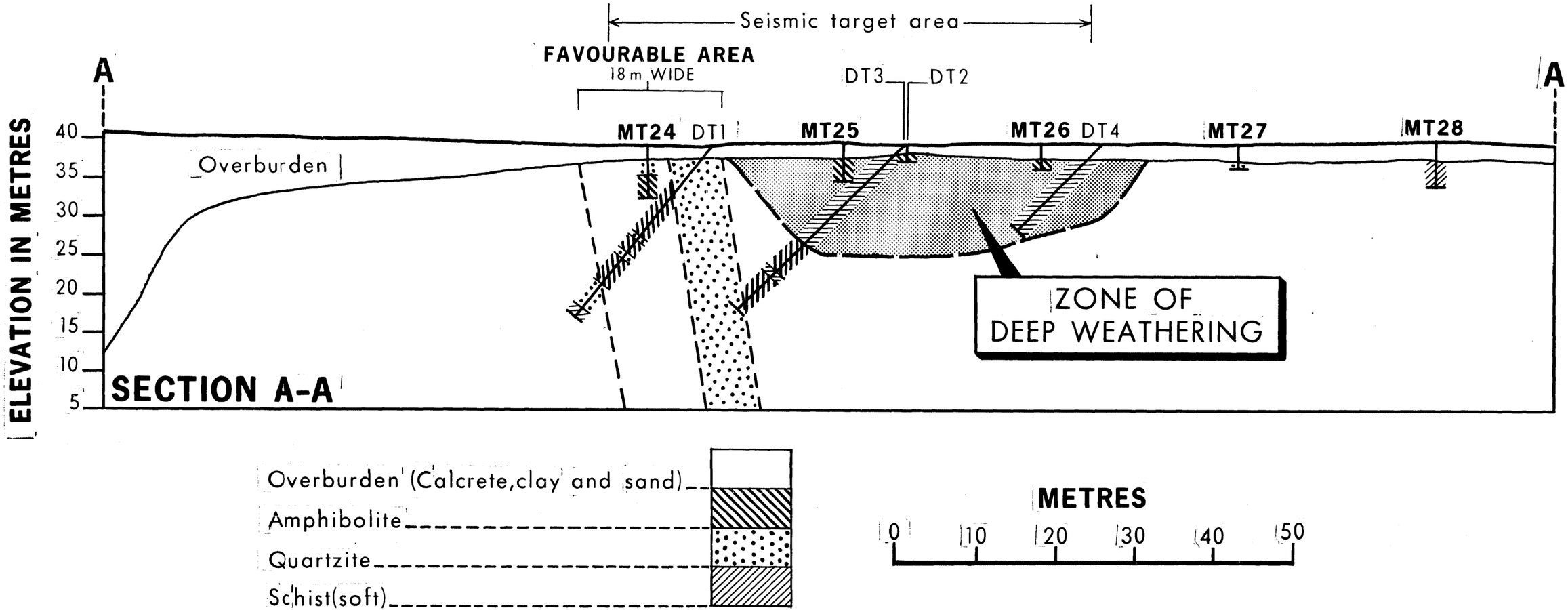


Rotary air drillhole ---------- MT8
Amphibolite ---------- A
Quartzite ---------- Q
Diamond drillhole ---------- •
Seismic traverse ---------- T4
Contours in metres ---------- 36

Target Area — defined by rotary air drilling and seismic traversing

Possible workable zone intersected in DT1 and proposed exploratory trenches

D. NICHOL Geologist



74—315 MRR140

D.Nichol geologist

S.A. Department of Mines