

Section

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ENG. GEOLOGY SECTION



DEPARTMENT OF MINES
SOUTH AUSTRALIA
GEOLOGICAL SURVEY
ENGINEERING DIVISION

REPORT ON SITE INVESTIGATION
PROPOSED S.A.C.B.H. LTD. SILO
RAILWAY YARDS, TAILLEM BEND
Hundred Seymour

by

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Engineering Geology Section

64-31

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DEPARTMENT OF MINES
SOUTH AUSTRALIA

REPORT ON SITE INVESTIGATION
PROPOSED S.A.C.B.H. LTD. SILO
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INTRODUCTION

Investigation of the foundation conditions of a proposed 4 cell silo in the railway yards at Taillem Bend was requested in a letter dated 29th June, 1965, from Mr. J.A. Corbet, Senior Engineer, South Australian Co-operative Bulk Handling Limited.

The township of Taillem Bend is situated on the eastern bank of the Murray River, 75 miles by rail from Adelaide on the main line to Melbourne. (Fig. 1).

SCOPE OF THE INVESTIGATION

The site has been explored by three percussion drill holes, in the positions shown on Fig. 2. Hole No. 1, constructed to a depth of 72 ft. by open tube sampling, disclosed a surface calcrete horizon 5 ft. deep. Standard Penetration tests were taken at 10 ft. intervals.

Holes 2 and 3, 15 ft. deep, were constructed to give some indication of the quality and continuity of the surface calcrete horizon.

OUTLINE OF REGIONAL GEOLOGY

Tailem Bend is situated in the lower eastern corner of the Mobilong 1 mile to 1 inch geological sheet (published 1960). The surrounding area is covered by north-west - south-east trending sand dunes of Recent age, and an apparently continuous calcrete horizon of variable thickness.

Near Tailem Bend, Tertiary limestones and sandstones of the Nor'west Bend Formation are exposed in cliff sections along the eastern banks of the Murray River, while Mannum Formation beds are exposed in the western river banks.

Basement rock intersected by bores in the area is granite, which is exposed in isolated outcrops 3 miles and more to the north.

GEOLOGY AT THE SITE

The ground surface in the foundation area is flat, and largely covered with calcrete outcrops and surface fragments. The geological sequence indicated by the drilling is summarised below.

<u>Depth (feet)</u>	<u>Age</u>	<u>Description</u>
0 - 5	Recent	<u>CALCRETE</u> . Very hard, very strongly cemented calcarenite.
5 - 25	"	<u>SANDS</u> , well graded towards top with up to 40% gravel fragments, mainly calcareous lumps. Whitish. Becoming clayey and iron-stained lower, with sandy clay at base.
25 - 44	Pliocene (Nor'west Bend Formation)	<u>SANDS, SILTY SANDS</u> , Generally well graded, silty, containing up to 40% gravel fragments, consisting of calcareous lumps. Whitish to pale yellowish brown.
44 - 62	Miocene to Oligocene (Mannum and Ettrick Formations)	<u>SANDS</u> , poorly graded, fine grained, generally with excess silt and few clay fines. In parts up to 30% gravel, mainly calcareous lumps. Yellowish to reddish brown.

<u>Depth (feet)</u>	<u>Age</u>	<u>Description</u>
62 - 72	Miocene to Oligocene (Mannum and Ettrick Formations)	<u>GRAVEL</u> , well graded, excess silt and few clay fines. Fragments mainly calcareous cemented lumps up to 0.2 ft. size. Sandy at base. Yellowish.

FOUNDATION CHARACTERISTICS

The calcrete above 5 ft. was sufficiently hard to require drilling with percussion bit. An attempt to sample in Hole No. 3 at 2.3 ft. resulted in 8" penetration for 300 blows. Similar material from 5 ft. to 7 ft. was tube sampled, but required more than 100 blows per foot of penetration.

From 7 ft. to 48 ft. the material consisted of alternating hard bands strongly cemented with lime, and interbedded weakly cemented or non-cemented softer bands. This sequence required generally more than 40 blows per foot of penetration, the harder bands frequently required more than 100 blows per foot. Standard Penetration Tests gave similarly variable results, ranging from 19 to 130 blows.

Loose silty sands encountered between 48 and 62 ft. required mainly less than 20 blows per foot of penetration. The tools sank under their own weight from 58 to 60 ft.

Drilling was required from 62 to 66 ft., and the gravels at the base of the hole required generally more than 100 blows per foot of penetration.

CONCLUSIONS

Surface calcrete provides an apparently continuous strong horizon at least 5 ft. deep. It is considered that footings for the proposed silo would best be seated on or near the soil surface.



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Geologist

ENGINEERING GEOLOGY SECTION

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APPENDIX A

PERCUSSION DRILL HOLE NO. 1 - LOG

<u>PROJECT:</u> Silo Site	<u>HIRER:</u> S.A.C.B.M. Ltd.
<u>LOCATION:</u> Railway Yards, Faillem Pond	<u>HUNDRED:</u> Seymour
<u>FEATURE:</u> Foundation	
<u>PLANT NO.:</u> 17	<u>TYPE:</u> Ruston
<u>DRILLER:</u> A. Tucker	<u>DEPTH:</u> 72 feet
<u>DATE COMMENCED:</u> 4th October, 1965	<u>DATE COMPLETED:</u> 8th October, 1965
<u>LOGGED BY:</u> J.A.C. Painter	<u>DATE:</u> 29th October, 1965

Depth (feet)	Group Symbol	Description	Depth (ft.)	Type of Sample	Blows per Ft.
0 - 5	-	Calcrete - NO SAMPLE	0-5	DRILLED	
5 - 9	SW	SAND, well graded, silty, maximum grain size 1.5 mm. Up to 40% GRAVEL, calcareous cemented lumps up to 0.2 ft. size. Few pockets of very clayey sand. Whitish. Very dense to hard. Humid.	5-6 6-7 7-8 8-9 9-10 10.5-11.5	SA SD SA SD " SPT	120 70 68 55 50 23
9 - 13	SP	SAND, poorly graded, medium grained, few silt and clay fines. Weakly iron cemented in parts. Brown. Hard, friable. Humid.	12-13 13-14	SD "	52 298
13 - 19	SW	SAND, well graded, silty, maximum grain size 1 mm. Up to 40% GRAVEL, mainly calcareous lumps up to 0.2 ft. size. Less well cemented lower. Whitish to pale brown. Very dense to hard. Humid.	14-15 15-16 16-17 17-18 18-19	" " " " "	126 160 100 98 45
19 - 25	CL- SC	CLAY SOIL, low plasticity, up to 50% SAND and GRAVEL, fragments 0.5 to 25 mm. Green, whitish when very sandy. Very stiff to very dense. Humid.	19-20 20.5-21.5 22-23 23-24 24-25	" SPT SA " "	26 15 79 25 48
25 - 30	SP	SAND, poorly graded, fine grained, few silt fines. Contains up to 5% silt and clay bound lumps up to 10 mm. size. Light yellowish brown. Very dense. Humid.	25-26 26-27 27-28 28-29 29-30	" SD " " "	50 51 72 45 55
30 - 35	SW- GW	SAND, well graded, silty, grains up to 2 mm. size, grades to GRAVEL, well graded, grains up to 0.5 ft. Material is calcarenite, and calcareous cemented lumps. Whitish to pale yellow-brown. Very dense to hard. Humid.	30.5-31 31-32 32-33 33-34 34-35	SPT SD SD SA "	67 blow for 6 in. 72 157 145 48

PERCUSSION DRILL HOLE NO. 1 - LOG (Contd.) (S.A.C.B.H. Ltd. Tailum Ben

Depth (feet)	Group Symbol	Description	Depth (feet)	Type* of Sample	Blows per ft.
35 - 37	-	No sample	35-37	DRILLED	
37 - 44	SP- SM	SAND, poorly graded, very fine grained, excess silt and clay fines below 40 ft. with numerous clay bound lumps. Whitish, yellow-brown mottled. Very dense to hard. Humid.	37-38 38-39 39-40 40.5-41.5 42-43 43-44	SD " " SPT SD "	72 182 130 130 45 52
44 - 49	ML	SILT SOIL, low plasticity, slightly sandy. Yellow-brown and light red-brown mottled. Very stiff. Humid.	44-45 45-46 46-47 47-48 48-49	SA " " " "	100 60 58 51 44
49 - 54	SP- SM	SAND, poorly graded, slightly silty, excess silt and clay fines in parts. Up to 20% GRAVEL, calcareous cemented lumps 2 to 40 mm. size. Light reddish brown. Compact to dense. Humid.	49-50 50.5-51.5 52-53 53-54	" SPT SA "	40 19 16 21
54 - 61	SM	SAND, fine grained, excess silt fines. Contains up to 30% gravel fragments up to 0.2 ft. Very pale yellowish brown. Loose to compact. Humid to saturated.	54-55 55-56 56-57 57-58 58-59 59-60 60-61	" " " " " " "	16 10 12 12 0 0 8
61 - 62	-	No samples. Driller's Note "saturated silt".	61-62	"	4
62 - 66	-	Drilled - No sample. Driller's note "large boulders in soft silt".	62-66 66-67	DRILLED SA	12
66 - 72	GM	GRAVEL, well graded, excess silt and few clay fines, grains 2 mm. to 0.3 ft., calcareous lumps and fragments of limestones. Contains 10 to 40% fine to medium sand. Grades to fine sand at base. Whitish brown. Compact to hard. Saturated.	67-68 68-69 69-70 70-71 71-72	" " " " "	120 170 180 15 14

END OF HOLE - 72 ft.

* Type of Sample

- SA. Open Tube, "A" shoe
- SD. Open Tube, "D" shoe.
- SAL. Sealed Tube, "A" shoe.
- SDL. Sealed Tube, "D" shoe.
- SPT. Standard Penetration Test.

PERCUSSION DRILL HOLE NO. 2 - LOG

<u>PROJECT:</u> Silo Site	<u>HIRER:</u> S.A.C.B.H. Ltd.
<u>LOCATION:</u> Railway Yards, Taillem Bend	<u>HUNDRED:</u> Seymour
<u>FEATURE:</u> Foundation	
<u>PLANT NO.:</u> 17	<u>TYPE:</u> Ruston
<u>DRILLER:</u> A. Tucker	<u>DEPTH:</u> 15 ft.
<u>DATE COMMENCED:</u>	<u>DATE COMPLETED:</u>
<u>LOGGED BY:</u> J.A.C. Painter	<u>DATE:</u> 29th October, 1965

Depth (feet)	Group Symbol	Description	Depth (ft.)	Type of Sample	Blows per foot
0 - 3.3	-	No sample.	DRILLED		
3.3 - 9	GW- SP	GRAVEL, well graded, grains up to 0.2 ft., contains 30 to 60% SAND, fine grained, few silt fines. Material is mainly calcareous cemented lumps. Pale whitish brown. Hard. Humid.	3.3-4	SD	210
			4-5	"	88
			5-6	"	118
			6-7	"	86
			7-8	"	70
9 - 14	SW- SM	SAND, well graded, silty, maximum grain size 1.5 mm, excess silt and clay fines in parts. Up to 10% GRAVEL, calcareous cemented lumps 2 to 25 mm. size. Brown to red-brown, grey mottled. Dense. Humid.	8-9	"	48
			9-10	"	50
			10-11	"	63
			11-12	"	66
			12-13	"	28
14 - 15	SP- GW	SAND, poorly graded, fine grained, contains 40 to 60% GRAVEL, grains 2 to 20 mm. size. Pale whitish brown. Hard. Humid.	13-14	"	101
			14-15	"	143

END OF HOLE - 15 ft.

PERCUSSION DRILL HOLE NO. 3 - LOG

PROJECT: Silo Site

HIRER: S.A.C.B.H. LTD.

LOCATION: Railway Yards, Tailom Bend

HUNDRED: Seymour

FEATURE: Foundation

PLANT NO.: 17

TYPE: Ruston

DRILLER: A. Tucker

DEPTH: 15 ft.

DATE COMMENCED:

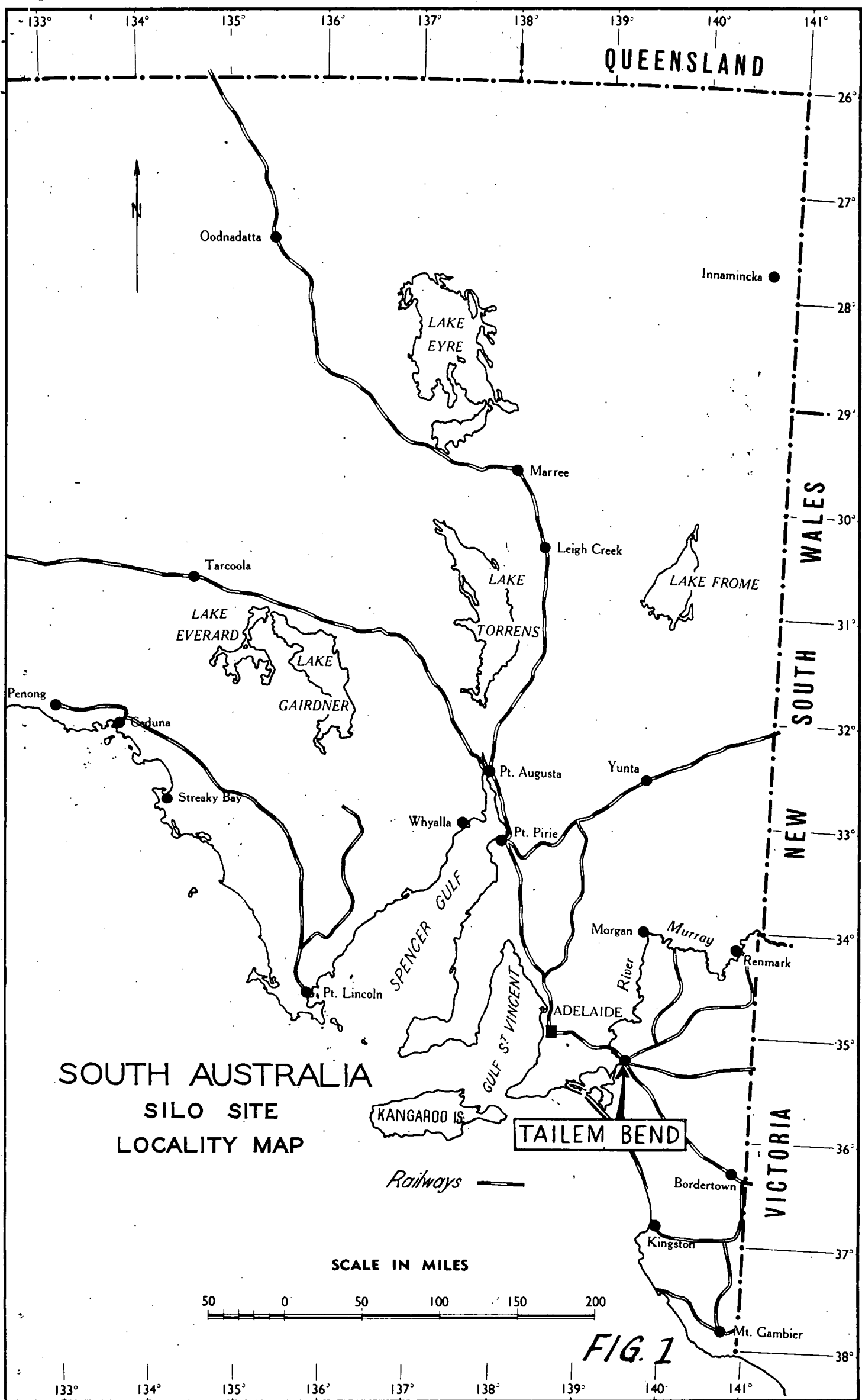
DATE COMPLETED:

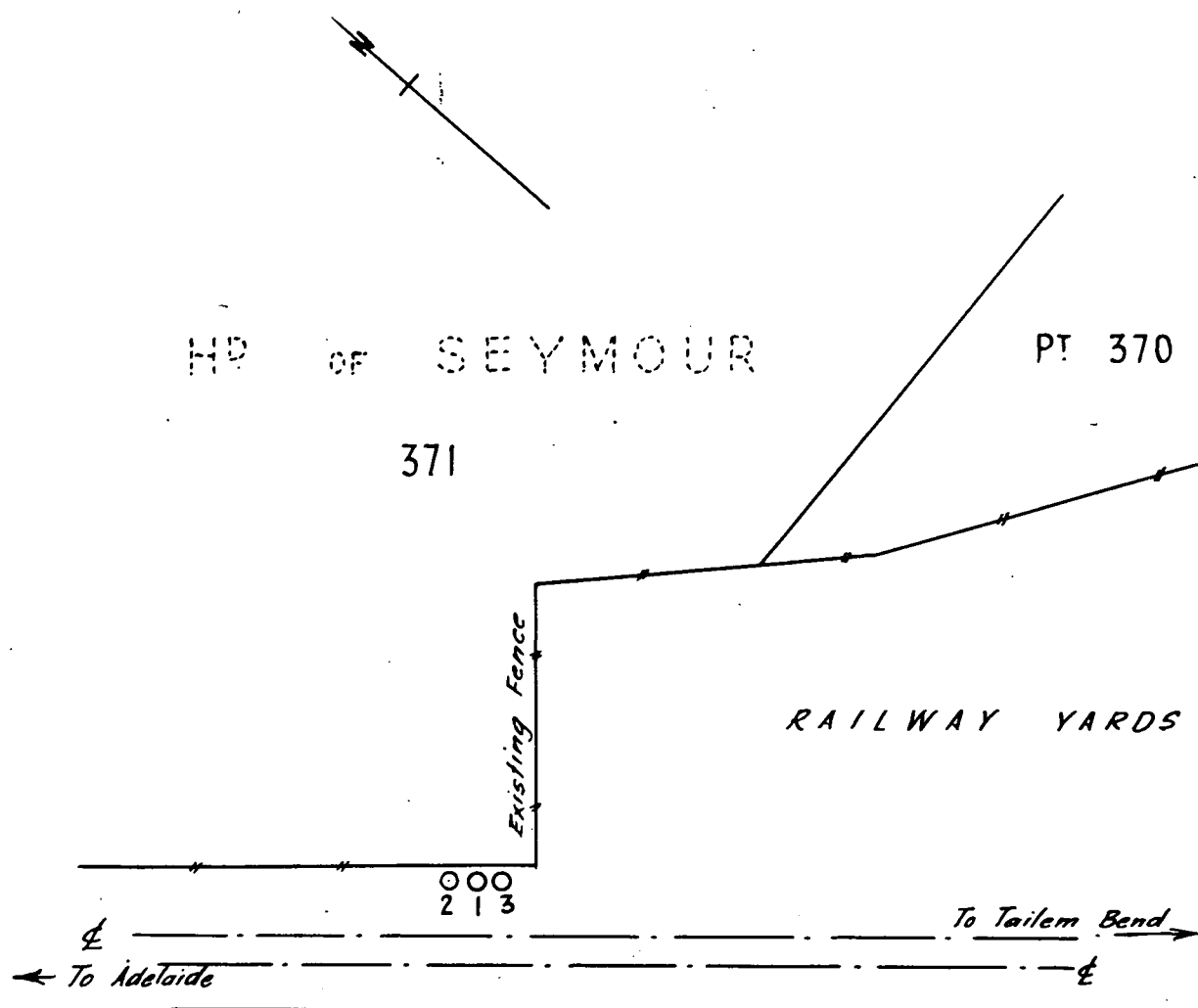
LOGGED BY: J.A.C. Painter

DATE: 29th October, 1965

Depth (feet)	Group Symbol	Description	Depth (feet)	Type of Sample	Blews per foot
0 - 5	-	No sample - calcrete	DRILLED		
5 - 9.5	GW	GRAVEL, well graded, grains 2 mm. to 0.2 ft. Contains up to 50% SAND, fine grained, few silt fines. Whitish. Hard. Humid	5-6 6-7 7-8 8-9 9-10	SD " " " "	107 85 78 80 47
9.5 - 13	SP- SC	SAND, poorly graded, medium grained, often with excess clay and few silt fines. Up to 10% GRAVEL, fragments up to 10 mm. size. Red-brown and grey mottled. Dense to hard. Humid.	10-11 11-12 12-13	" " "	140 52 48
13 - 15	GW	GRAVEL, well graded, calcareous fragments up to 0.2 ft. Contains up to 50% SAND, fine grained, few silt and clay fines. Whitish brown. Hard. Humid.	13-14 14-15	" "	181 200

END OF HOLE - 15 ft.





SCALE 200 0 200 400 FEET

Percussion Drill Hole O

FIG. 2

DEPARTMENT OF MINES — SOUTH AUSTRALIA

	Drn. J.C.P. Tcd. <i>W</i> Ckd. Exd.	S. A. C. B. H. LTD SILO SITE TAILERN BEND - RAILWAY YARD DRILL HOLE LOCATIONS	SCALE: — S 4827 Je 4. DATE: 27. 10. 65
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LOG OF PERCUSSION DRILL HOLE

HOLE
NO. 1

SHEET 1 OF 1

PROJECT SILO SITE

Hirer. S.A.C.B.H. LTD

LOCATION RAILWAY YARDS, TALEM BEND

Sec. Hd SEYMOUR

FEATURE FOUNDATION

Depth 72 ft R.L.

Coords

SOIL TYPE GEOLOGICAL DESCRIPTION	CASING R.L. (FEET)	DEPTH (FEET)	GRAPHIC LOG	GROUP SYMBOL	SOIL DESCRIPTION GROUP NAME	CONSISTENCY REL. DENSITY	MOISTURE CONTENT	WATER LEVELS	PENETRATION DATA	
									BLOWS/FOOT 20 40 60 80 100	STANDARD PENETRATION BLOWS/FOOT 10 20 30 40
RECENT	6 1/2					Hard			DRILLED	
						Very dense				
						Hard				
						Very dense				
						Hard				
PLIOCENE	10					Hard				
						Very dense				
						Hard				
						Very dense				
						Hard				
PLIOCENE	20					Hard				
						Very dense				
						Hard				
						Very dense				
						Hard				
PLIOCENE	30					Hard				
						Very dense				
						Hard				
						Very dense				
						Hard				
PLIOCENE	40					Hard				
						Very dense				
						Hard				
						Very dense				
						Hard				
PLIOCENE	50					Hard				
						Very dense				
						Hard				
						Very dense				
						Hard				
PLIOCENE	60					Hard				
						Very dense				
						Hard				
						Very dense				
						Hard				
PLIOCENE	70					Hard				
						Very dense				
						Hard				
						Very dense				
						Hard				
72 FEET END OF HOLE										

TYPE OF SAMPLE	HYDROLOGY	CONSISTENCY	REL. DENSITY	MOISTURE	Plan No 17	Logged
Open Tube	Water cut 58%	VS-Very Soft	VL-Very Loose	H-Humid	Driller A. Tucker	Date 29 Oct 65
Sealed Tube	Static level 58%	S-Soft	L-Loose	D-Damp	Drawn J.A.C.P.	Traced T.P.S.
Auger barrel	Supply	F-Firm	C-Compact	M-Moist	Started 4 Oct 65	Checked L.V.W.
Slush pump	Analysis (ppm)	St-Stiff	D-Dense	W-Wet	Finished 8 Oct 65	
Casing	Water level (Date)	VSt-Very Stiff	VD-Very Dense	S-Saturated	PLAN No 54869	Vertical Scale 1 inch = 10 feet
		H-Hard			Je4	

LOG OF PERCUSSION DRILL HOLE

PROJECT SILO SITE

S.A.C.B.H. Ltd.

LOCATION RAILWAY YARDS, TAILEM BEND

SEYMOUR

FEATURE FOUNDATION

Depth 15 ft. R.L.

Coords

SOIL TYPE GEOLOGICAL DESCRIPTION	CASING R.L. (FEET)	DEPTH (FEET)	GRAPHIC LOG	GROUP SYMBOL	SOIL DESCRIPTION GROUP NAME	CONSISTENCY REL. DENSITY	MOISTURE CONTENT	WATER LEVELS
CALCRETE <i>Gravel mainly irregular calcareous cemented lumps. Sand mainly quartz.</i> <i>Grains sub-angular quartz. Iron stained and weakly iron cemented in parts</i> <i>Calc-cemented lumps</i>		10				Mainly Hard	HUMID	
					GW GRAVEL, well graded, grains from 2mm to 0.2ft. Pale whitish-brown. Contains 30 to 60% SAND, fine grained, few silt fines.			
					SP SAND, well graded, grains from silt size to 15mm. Excess silt and clay fines in parts. Up to 10% GRAVEL, 2mm to 25mm size. Brown to red-brown, grey mottled.			
					SW SAND, poorly graded, fine grained. Contains 40 to 60% GRAVEL, 2 to 20 mm size. Off white to pale whitish brown.			
					END OF HOLE 15 FT.			

TYPE OF SAMPLE	HYDROLOGY	CONSISTENCY	REL. DENSITY	MOISTURE	PLAN	Vertical Scale
Open Tube	Water cut	VS-Very Soft	VL-Very Loose	H-Humid	17	J.A.C.P.
Sealed Tube	Static level	S-Soft	L-Loose	D-Damp	Ruston	29 Oct 65
Auger barrel	Supp	F-Firm	C-Compact	M-Moist	Driller: A. Tucker	J.A.C.P.
Slush pump	Analysis (ppm)	St-Stiff	D-Dense	W-Wet	Started	Traced T.P.S.
Casing	Water level (Date)	VSt-Very Stiff	VD-Very Dense	S-Saturated	Finished	Checked L.V.W.
		H-Hard			S4870	Vertical Scale
					PLAN No	1 inch = 10 feet

LOG OF PERCUSSION DRILL HOLE

SHEET 1 OF 1

PROJECT SILO SITE

Hirer S.A.C.B.H. Ltd

LOCATION RAILWAY YARDS, TAILLEM BEND

Sec. - rd SEYMOUR

FEATURE FOUNDATION

Depth 15 ft. R.L.

Coords

SOIL TYPE GEOLOGICAL DESCRIPTION	CASING R.L. (FEET)	DEPTH (FEET)	GRAPHIC LOG	GROUP SYMBOL	SOIL DESCRIPTION GROUP NAME	CONSISTENCY REL. DENSITY MOISTURE CONTENT	WATER LEVELS	PENETRATION DATA BLOWS FOOT 00 40 60 80 100
RECENT			0 0 0	GW	GRAVEL, well graded. Whitish			DRILLED 450 DRILLED
			0 0 0 0 0 0 0 0 0	GW	GRAVEL, well graded grains 2mm to 0.2ft. Contains up to 50% SAND, fine grained; few silt fines. Whitish.			107
		10	0 0 0 0 0 0 0 0 0	SP - SC	SAND, poorly graded, medium grained, often with excess clay and few silt fines. Up to 10% GRAVEL > 10mm. Red- brown and grey mottled.	Mainly Hard HUMID		140 181 200
			0 0 0	GW	GRAVEL, well graded, fragments up to 0.2ft. Up to 50% SAND, fine grained few silt and clay fines. Whitish-brown.			
END OF HOLE 15 FT.								

TYPE OF SAMPLE	HYDROLOGY	CONSISTENCY	REL. DENSITY	MOIST. RE.	PLAN	Vertical Scale
Open Tube	Water cut -	VS-Very Soft	VL-Very Loose	H-Humid	PLAN 54871	Vertical Scale
Sealed Tube	Static level -	S-Soft	L-Loose	D-Damp	Je4	1 inch to 10ft.
Auger barrel	Supply	F-Firm	C-Compact	M-Moist		
Slush pump	Analysis (ppm)	Sh-Stiff	D-Dense	W-Wet		
Casing	← Water level. (Date)	VSt-Very Stiff	VD-Very Dense	S-Saturated		
		H-Hard				

Part No. 17... J.A.C.P.
 Date 29 Oct 65
 Driller A. Tucker
 Started...
 Finished...
 Traced T.P.S.
 Checked L.V.W.