DEPARTMENT OF MINES
SOUTH AUSTRALIA

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GEOLOGICAL SURVEY
ENGINEERING DIVISION

GOVERNMENT OFFICE BUILDING - VICTORIA SQUARE WEST

TA.335 Hd. Adelaide

GEOLOGICAL INVESTIGATIONS - REPORT NO.1

DESIGN STAGE

- Public Buildings Department -

by

W.R.P. BOUCAUT
SUPERVISING GEOLOGIST
ENGINEERING DIVISION

11th July, 1970

Rept.Bk.No.70/105

DEPARTMENT OF MINES
SOUTH AUSTRALIA

Rept. Bk. No. 70/105
G.S. No. 4493
D.M. No. 968/69

GOVERNMENT OFFICE BUILDING - VICTORIA SQUARE WEST

TA. 335 Hd. Adelaide

GEOLOGICAL INVESTIGATIONS - REPORT NO. 1

DESIGN STAGE

Client: Public Buildings Dept.

SUMMARY AND CONCLUSIONS

Drilling has indicated a relatively uniform near horizontal succession consisting of 40 to 50 ft. of stiff to very stiff* clay (Hindmarsh Clay formation) overlying 27 to 32 ft. of medium strong calcareous sandstone (Hallett Cove Sandstone formation), which in turn overlies at least 43 ft. of moderately compact silts and medium dense sands (Blanche Point Marls). The clay is limy and weaker in its upper 5 to 10ft. The sandstone contains numerous solution holes from a few mms. to 3ft. in size.

* Terms Underlined are defined in Appendix A.

DEPARTMENT OF MINES
SOUTH AUSTRALIA

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FIGURES

Rept.Bk.No. 70/105
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11th July, 1970

The main groundwater table occurs in the Hallet Cove Sandstone at about 53 ft. below ground surface. Perched groundwater occurs in limy horizon of the Hindmarsh Clay formation, probably associated with gilgai structures.

The clays of the Hindmarsh formation, below the weaker near surface materials (limy clay), could be utilized for raft-type foundation.

The Hallett Cove Sandstone would provide a suitable base for end-bearing piles. However its nature and thickness should be proved at each pile site, either before or during construction, as it is known that solution holes up to 20 ft. diameter can occur.

INTRODUCTION

Drilling to determine foundation condition beneath the proposed State Government Office Building, Victoria Square West was requested in a letter from the Director, Public Buildings Department, dated 20th October. The holes were to be put down by a combination of cable tool and diamond drilling, and were to be preserved for use as drainage bores beneath the building, as finally constructed.

The building will occupy an area of about 180 ft. by 100 ft. and will be multi-storey with a basement.

Four holes (CH 1 to 4) were put down at the corners of the proposed building. The holes were put down with a cable-tool rig to the limit of open tube sampling, usually about 50 ft. below ground surface, and then extended through rock for a further 24 to 33 ft.

This section in rock was then reamed out by a cable tool rig and the hole completed by open tube sampling. Sealed tube samples were taken continuously for the first 15 ft. of each hole (that is over the extent of the proposed basement and then at specified intervals for the remainder of the hole. Each hole has been preserved with plastic piping, perforated and screened in the bottom 20 ft, so that the hole can be used as a drainage bore beneath the basement of the building. Steel casing installed during drilling has also been left in each hole to assist in preservation during construction. This will be recovered during basement excavation.

Within about 3 ft. of each bore a further drill hole was put down to a depth of 15 ft. and cased with plastic pipe. These holes will be used to monitor "perched" ground water levels close to the ground surface.

Geological logs of the holes are included in Appendix A and their results are summarized in section on Figure 1.

This report discusses the drilling results, and past experience in drilling and excavations elsewhere in the Adelaide city area.

SITE GEOLOGY

Soil and Rock Types

The drilling indicates a rather uniform near horizontal succession.

Results are summarized in Table 1. The Hallet Cove Sandstone is divided into two layers on the basis of strength of material. Layer A, the weaker zone, probably represents a weathered zone at the top of the sandstone, and appears to be variable in thickness across the site.

TABLE I

GEOLOGY OF SITE AREA AS INDICATED BY DRILLING, AND DESCRIPTION OF MATERIALS

DEPTH (FEET) FROM	TO	THICKNESS (FEET) MAX.	MIN.	GEOLOGY AGE	UNIT & ENVIRONMENT OF DEPOSITION	NOTES ON LITHOLOGY	ENGINEERING PROPERTIES DESCRIPTION	CONSISTENCY ETC., MOISTURE CONTENT
0	45-50	50	40	Pleistocene	Hindmarsh Clay Fluvio-Lacustrine	Mainly clay. Grey green to red-brown mottled, limy in upper 5-10 ft. A bed of clayey sand 4-7 ft. thick occurs about 28 ft. below the ground surface.	Clay SOIL, high plasticity (CH) Lower plasticity (CL) & limy (ML) in upper 5-10ft. Bed of SAND excess clayey fines (SC) to SAND poorly graded (SP) at depth of 28ft.	Clay is stiff to very stiff. Moisture content at about plastic limit. Sand is dense and humid to moist.
45-50	47-55	9 (Hole CH3)	1 (Hole CH2)	Pliocene	Hallett Cove Sandstone, Shallow Marine.	Layer A Lime gravel with a white silt-clay matrix. Gravel is sandstone fragments.	SILT SOIL, low plasticity, (ML), white with up to 50% GRAVEL fragments to 30mm size.	Silt is moderately compact at moisture content greater than plastic limit.
47-55	76.3-78	31	22.5			Layer B Sandstone, fine grained, fossiliferous, white to buff coloured, with calcareous cement. Contains solution holes from a few mms to 3 ft. in size - usually infilled.	Sandstone has rock properties. Infill in CLAY SOIL low plasticity, sandy with lime in silt sizes.	Rock is medium strong to very strong. Clay is stiff. Materials are saturated with moisture content of clay greater than plastic limit.
76.5-78	>81-120 (End of holes)	>43	>5	Eocene	Blanche Point Marls. Marginal marine.	Mainly silt or sand beds, some micaceous. Fossiliferous (shelly) in part. Light grey (glauconitic) to dark brown (micaceous). Sand is mainly quartz fragments.	SILT SOIL High plasticity, sandy (MH) or SAND poorly graded (SP), to with excess silt/clay fines (SM/SC). Sand is fine to medium grained.	Silt is moderately compact, with moisture content less than or equal to plastic limit. Sand is medium dense and saturated.

Core losses recorded while drilling in the sandstone probably represent cavities, or lenses of sandy material washed away during drilling.

Groundwater

The main groundwater table was cut within the Hallett Cove Sandstone at about 53 ft. below the ground surface. The sandy horizon within the Hindmarsh Clay was wet but no groundwater inflows were recorded.

During drilling of the shallow observation holes in the summer period of February-March, groundwater was only encountered in hole CH3 observation. In this hole a small seepage occurred from a depth of about 4 ft, but water level in the hole was static at about 13.5 ft. until early April. Since the onset of periods of rain at this time, water has been recorded in all observation holes as shown on Figure 2.

Tests on a sample of the water taken when first cut in hole CH3 Observation, showed that the water was naturally occurring and was not from leaking service lines.

DISCUSSION

Hindmarsh Clay

Drilling results and experience at other sites, suggest that these clays are fairly uniform in lateral extent (Fig.2). They are highly plastic (CH) soils, stiff or very stiff, and usually at moisture content close to their plastic limit.

The clay is intersected by two sets of near-vertical joints roughly at right angles to each other, spaced about 5 cm. apart, which tend to divide

the mass into a series of vertical columns. Other less regular low dipping (30° to 45°) joints occasionally occur. (Ref. 1 and 2).

The upper 10 ft. of clay is limy and is considerably weaker than the underlying clay. It is probable that the upper surface of the clay is irregular and deformed into a series of mounds and depressions (gilgai structures) (Ref. 3). These depressions often contain pools of perched groundwater.

The sand, clayey sand, or clayey silt horizon about 30 ft. below the ground surface is dense to medium dense.

The following notes are made based on experience in similar materials elsewhere in the Adelaide City area.

....Auger drilling is feasible through the Hindmarsh Clay formation. Casing is generally required as any water cut can weaken the clays and cause collapse. (Ref. 4).

....Excavation can be readily carried out in the Hindmarsh Clay formation by mechanical equipment. The joints control the overall strength of the clay, which may be significantly lower than that obtained in the laboratory by testing of small clay samples (Ref. 5). In most cases of failure of excavation walls in the city, failure has occurred along pre-existing joint planes. However, in most of these failures, water has been allowed to seep into the joints, thus weakening the clay mass further (Ref. 3). Seepage of water from "gilgai" structures is often a major cause of these failures.

....Permanent drainage of water from leaking pipes and perched water tables is usually desirable in buildings with basements.

Hallett Cove Sandstone

All holes penetrated the base of this formation, and showed a total thickness of Hallett Cove Sandstone formation of from 27 to 32 ft.

Observations at other sites in the city, and variations between each drill hole at the site, indicate that the sandstone is extremely variable both laterally and vertically. The rock substance ranges from very weak to strong, and the rock mass is weakened by joints, solution cavities, clay seams or pockets, and lenticular beds of silt and sand.

The upper surface of the sandstone is also highly irregular in shape. Buried erosional pinnacles and sink holes are common. One large sinkhole approximately 20 ft. in diameter was discovered during pier boring at the Public Library Site, Kintore Avenue, (Ref. 4).

The following notes are made based on experience in similar materials elsewhere in the Adelaide city area:-

....Piers have founded in the Hallet Cove Sandstone, usually at the top of Layer B. As the material in this formation is usually very variable, it is advisable to prove the presence and thickness of sandstone at each pier site, usually by visual examination and drilling at each pier base during construction. (Ref. 6).

....Belling in Layer A by machine generally has not been possible and hand mining methods have been used.

....Cement grouting has been used in an attempt to strengthen the Hallett Cove Sandstone. Generally, it has been of doubtful value due to clay and fine sand in joints and cavities, preventing the penetration of grout. The grout takes can vary considerably

depending on the number of solution cavities and fissures intersected.

Blanche Point Marls

Hole CH1 penetrated some 43 ft. of this formation which consists of fairly strong soils, mainly compact silts and medium dense sands. At depth the soils become micaceous.

WRPB:PMM
11th July, 1970

W.R.P. BOUCAUT
SUPERVISING GEOLOGIST
ENGINEERING DIVISION

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COX, J.B. 1970. A review of the geotechnical characteristics of the soils in the Adelaide City area. Symposium on Soils and Earth Structures in Arid Climates, Adelaide May 1970, the Institution of Engineers, Australia.

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APPENDIX A

LOGS OF DRILLHOLES AND EXPLANATORY NOTES

APPENDIX A

LOGS OF CABLE TOOL HOLES AND EXPLANATORY NOTES

NOTES ON DRILLING PROCEDURES

Equipment

The drilling is carried out with a cable tool drilling plant using sampling tubes attached, through a vacuum head, to the sampling tools (figs. 1 and 2).

Sampling Procedures

To obtain, for logging purposes, an almost continuous series of samples, with a relatively small amount of sample disturbance, SA type samples are taken. These are obtained by driving an "S" tube, fitted with a Mark A shoe (Fig. 2), into the material to be sampled.

The assembly is lowered carefully to the bottom of the hole, and the tube driven exactly 1 foot, and the number of blows required for the 1 foot of penetration recorded.

The samples, or core, is extruded from the sampling tube using an hydraulic ram. The extruded core is sealed in a labelled plastic bag and stored in a core box (Fig. 3).

The hole is reamed with a "D" or "E" shoe (Fig. 2) and then the next sample is taken, using the same procedure as above. Thus the hole proceeds by alternate sampling, reaming (and where required, casing) operations, and the samples form a continuous record of the materials penetrated except for a few inches which may be lost between samples during reaming operations.

SA sampling equipment is a composite sampler for simple class sampling. Details are as follows:

"S" SERIES CUTTING SHOES

MARK	FEATURES	USES
A	Inside clearance 3%. Area ratio 33%.	Continuous open-tube sampling in strong soils, in which it causes little deformation. Hole is reamed after each sample.
D	Shoe belled out to 4 29/32 in. (just greater than outside dia. of vacuum head)	Continuous open tube sampling where considerable deformation of sample is permissible. Essentially self-reaming.
E	Shoe belled out to 5 7/16 in. (just less than internal dia. of 6 in. casing)	Cleaning hole and reaming out hole.

SAL Samples

Sealed tube samples, for laboratory testing, are taken at various intervals during drilling.

The drilling procedure is similar to that for obtaining SA Samples, but in order to completely fill the sampling tube, it is driven 1.5 ft. into the material to be sampled. On removal from the drill hole, both ends of the sampling tube are sealed with paraffin wax and screwed caps are fitted to the tube. The sealed tubes are labelled as in Fig. 4.

Standard Penetration Test

The Standard Penetration Test (Ref. 1) is used to test the in-situ density of sands and to give an indication of the consistency of clays, and compactness of silts. However, the test results can be effected by several geological factors such as degree of cementation, and size and shape of grains. These factors should be taken into account in interpretation of results.

The equipment is illustrated in Fig. 5 and consists of a 2 in. diameter, sampling spoon (tube) and a hammer of standard weight (140lnm).

With the equipment assembled as in Fig. 5 the hammer is allowed to fall on to the drill rods until the sampling shoe has penetrated 6 in. into the soil. The Standard Penetration is the number of blows (N) required to produce the next foot of penetration.

NOTES ON DRILL LOG SHEETS

The logs are plotted on a standard cable-tool log form.

Near the centre of the form a graphic log of the materials encountered is shown.

In the column to the right of the graphic log, the soils are classified and described according to the Unified Soil Classification (Ref. 2), (Fig. 6).

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

..... Geological age)
..... Soil unit name } printed vertically
..... Type of material)
..... Mineral composition
..... Grain shape
..... Cementation
..... Organic materials

Water levels are indicated by a small arrow with the date at which the observation was made.

In the blows per foot column, a continuous histogram is made of the number of blows required to drive the sampling tube through each foot of material. A hatching code is used to distinguish various types of sample. This code is reproduced at the bottom of each log sheet.

In the column on the far right of the log sheet, readings of unconfined compressive strength (qu) made with a Soiltest Penetrometer, are recorded. The readings are plotted as a histogram. The Soiltest Penetrometer only gives true values of qu when used in clays in which $\phi = 0$.

REFERENCES

1. TERZAGHI, K. and PECK, R.B. 1948. Soil Mechanics in Engineering Practice. John Wiley and Sons.

2. UNITED STATES DEPARTMENT OF THE INTERIOR BUREAU OF RECLAMATION, 1966 Earth Manual, 2nd Edition.

APPENDIX

LOGS OF DIAMOND DRILL HOLES AND EXPLANATORY NOTES

NOTES ON DRILLING PROCEDURES

Equipment

The core sizes are as follows:-

Symbol	Nominal Diameter of Cores (inches)
NXC (NX casing)	2.8
NMLC	2.0
BMLC	1.4

The NMLC and BMLC cores were obtained with "M" type stationery inner tube core barrels fitted with bottom discharge bits. The inner tubes were of the split type, ensuring minimum disturbance of the core during removal from the barrel.

Storing and marking of core

Cores are stored in wooden boxes, each compartment of which is designed to contain five feet of core. The internal length for each compartment is actually five feet one inch, to allow for 100 per cent core recovery. Roughness of the ends of the core, and small inaccuracies in measurement when breaking it to fit the box, make it difficult to fit five feet of core in a compartment of exactly that length. The boxes are marked with consecutive compartment numbers at one end, and the drilled depths from the surface in feet at the other.

The core was boxed in this manner at the drill site, the core being placed in its appropriate place in the box as soon as it was extracted from the core barrel. The bottom of each lift was marked with paint or indelible ink immediately it was placed in the box, and a corresponding mark made on the side of the core box. The measured depth of the hole in feet from the surface was painted on the side of the core box and on the core. Timber blocks cut to the correct length indicate core not recovered (red blocks), and core removed for testing (white blocks).

The core has been stored at the Department of Mines, Drilling and Mechanical Branch, Dalgleish Street, Thebarton, South Australia.

NOTES ON DIAMOND DRILL LOG SHEETS

The logs are plotted on a vertical scale of one inch = 10 feet (1:120) or one inch = five feet (1:60). In the column headed "Log", places where core was obtained are shown by stippling. Places where core was lost are shown by blank spaces.

The descriptions given on the log sheet refer only to materials recovered as core. Core is lost by the material being

ground or washed away during the drilling process; it may usually be inferred that such material is relatively weak. The weakness may arise from weathering or else from sheared, crushed, or closely jointed rock. It cannot always be assumed that the material not recovered is weak, since even solid rock core may be ground away and lost during drilling operations.

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

... Geological age)
... Rock unit name) Printed vertically
... Type of material)
... Mineral composition
... Cementation
... Physical description of core

Classification of the rock substance in terms of its strength and its condition (eg. weathering, alteration) is shown graphically in the column "Strength Term". The terms used in the classification are defined in Table 1. Where the substance has soil properties this is shown graphically in the column, and immediately to the left of the column under "Group Symbol", the symbol representing the remoulded sample as classified under the Unified Soils Classification (USBR 1966) is given.

The "Fracture Log" to the right of the graphic log column shows the degree of fracturing of the core by means of a histogram-type plot. Degree of fracturing means the degree to which the rock has mechanically broken up along geological defects such as joints, cleavage planes, foliation planes, bedding planes or seams. Fresh fractures across the fabric of the rock, not along the existing planar geological defects, are not included. In sections in which no core was recovered, the fracture log column is left blank.

In the column marked "Structures" the angles shown on joints, bedding, or other geological structures are the angles which they make with the plane at 90° to the axis of the core, unless otherwise stated.

Percentage loss of drilling water as recorded by the driller is shown graphically in the column "Drill Water Loss %".

REFERENCE

1. UNITED STATES BUREAU OF RECLAMATION 1966, Earth Manual 2nd Edition.

DESCRIPTIVE TERMS

1. CLAY SOILS

CONSISTENCY

CONSISTENCY	SYMBOL	UNCONFINED COMPRESSIVE STRENGTH (kg/sq. cm)	FIELD TEST	N
Very Soft	V.S.	less than 0.25	Easily penetrated several inches by fist.	2
Soft	S	0.25 to 0.5	Easily penetrated several inches by thumb.	2 to 4
Firm	F	0.5 to 1.0	Can be penetrated several inches by thumb with moderate effort.	4 to 8
Stiff	St	1.0 to 2.0	Readily indented by the thumb but penetrated only with great effort	8 to 15
Very Stiff	V.St.	2.0 to 4.0	Readily indented by thumb nail.	15 to 30
Hard (Extremely stiff)	H	over 4.0	Indented with difficulty by thumb nail.	30 and over

Based partly on Terzaghi, K. and Peok. R.B. 1966. Soil Mechanics in Engineering Practice, Wiley - New York.

MOISTURE CONTENT

Abbreviation	Meaning
MC ≃ LL	Moisture Content near liquid limit.
MC < LL	" " less than liquid limit.
MC > PL	" " greater than plastic limit.
MC ≃ PL	" " near " "
MC ≤ PL	" " less or equal to plastic limit.
MC < PL	" " less than " "
MC << PL	" " much less than " "

2. SILT SOILS

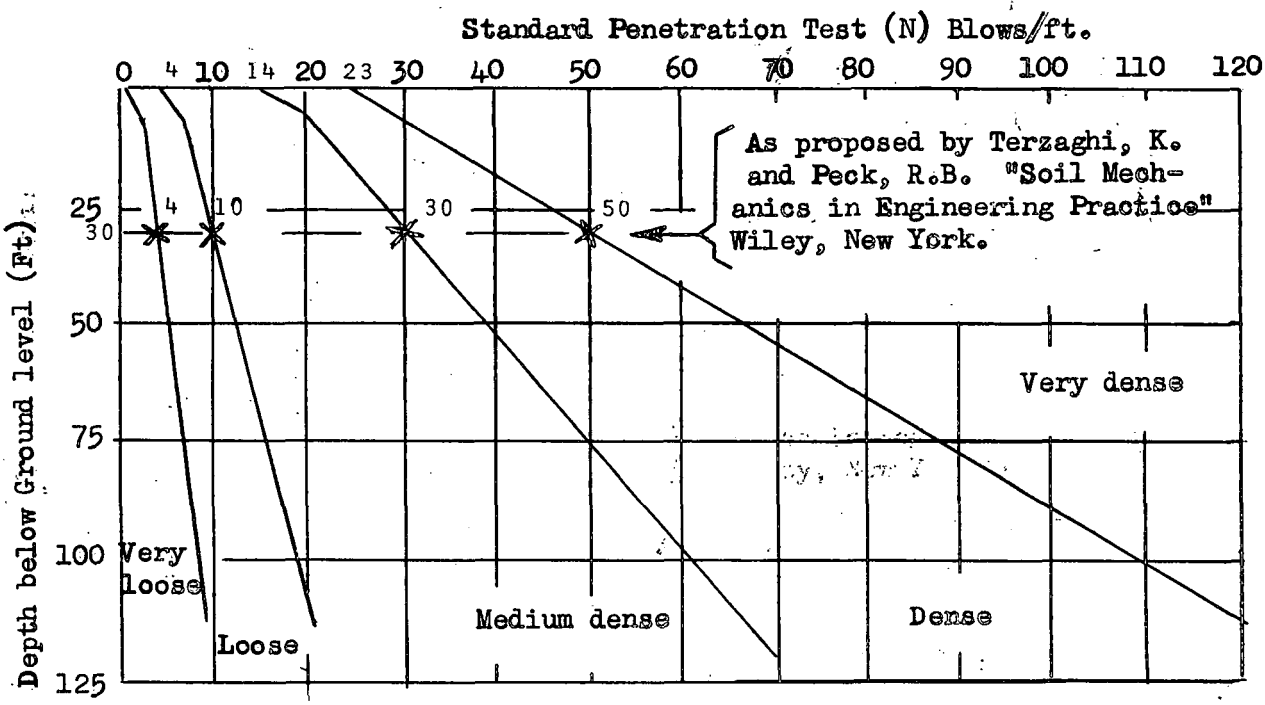
COMPACTNESS	SYMBOL	N
Loose	Ls	0 to 8
Moderately compact	MC	8 to 15
Compact	C	15 to 30
Very Compact	VC	greater than 30

3. SANDS

CLASSIFICATION OF SANDS BY STANDARD PENETRATION TEST

The relative density of granular soils has been judged from the results of Standard Penetration Tests carried out by the procedure described by Terzaghi and Peck (1948) bearing in mind the limitations of the method as discussed by Gibbs and Holtz (1957). At all times the water in the drill hole was kept at the level of surrounding groundwater.

EFFECT OF OVERBURDEN PRESSURE ON STANDARD PENETRATION TEST



Based on Gibbs, H.J. & Holtz, W.G. (1957) "Research on Determining the Density of Sands by Spoon Penetration Testing" Vol. I Proc. 4th Int. Conf. SM & FE, London.

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GIBBS, H.T. and HOLTZ, W.G., 1957. Research on Determining the Density of Sands by Spoon Penetration Testing. Proc. 4th Inter. Conf. SM & FE, London, Vol. 9.

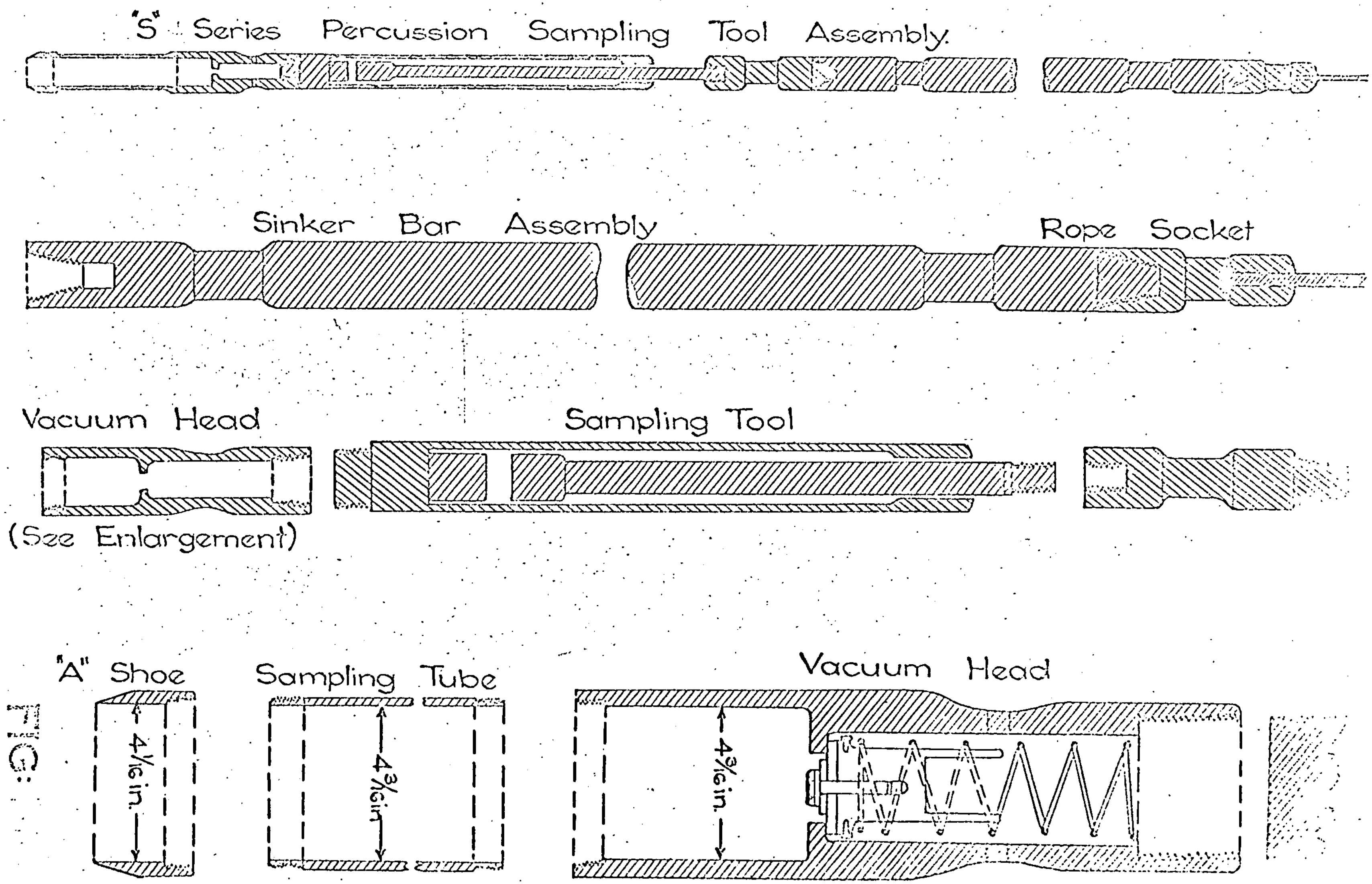


FIG:

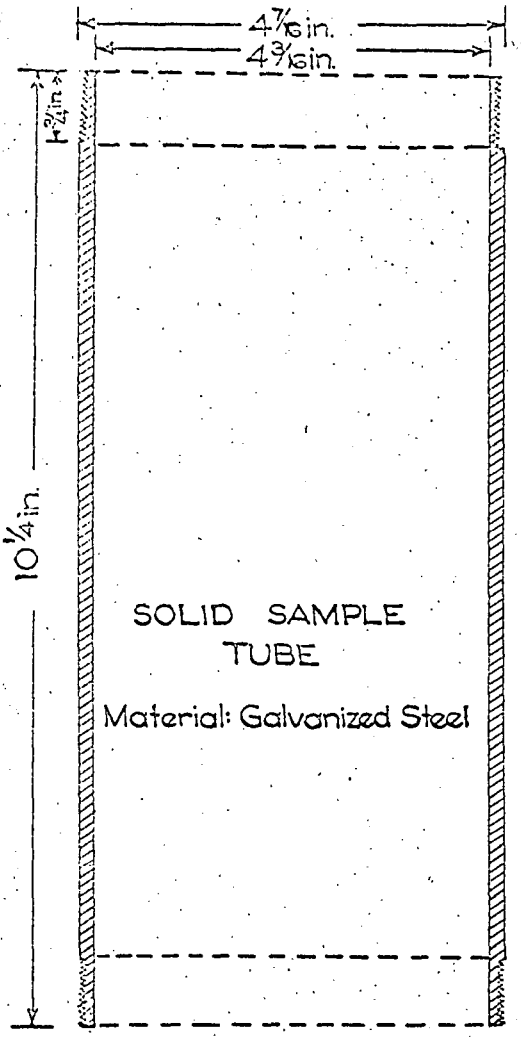
DEPARTMENT OF MINES – SOUTH AUSTRALIA

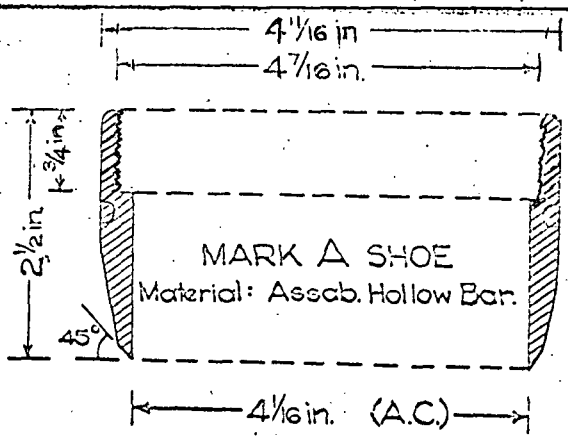
CABLE – TOOL DRILLING
SAMPLING TOOL ASSEMBLY
WITH "S" SERIES SHOES

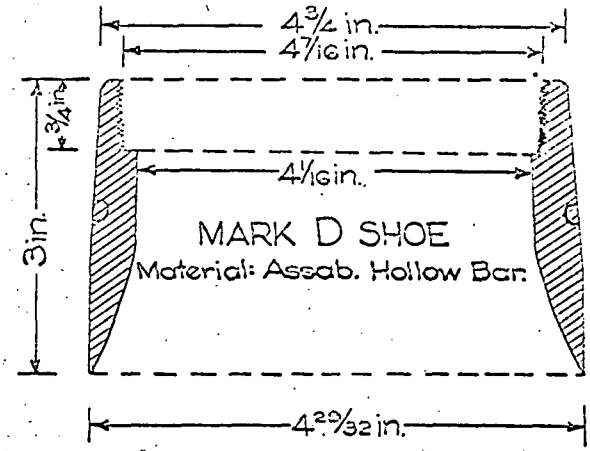
ENGINEERING GEOLOGY SECTION

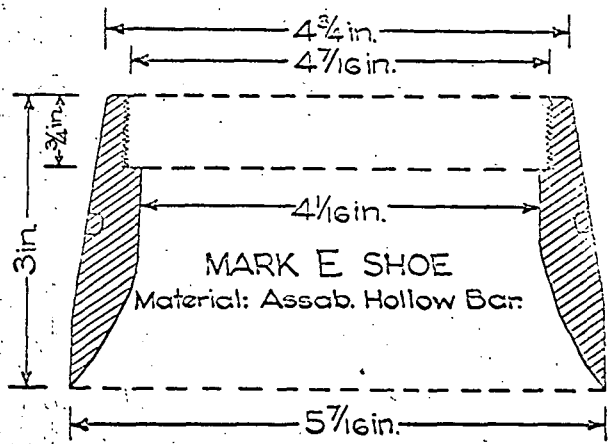
SENIOR GEOLOGIST

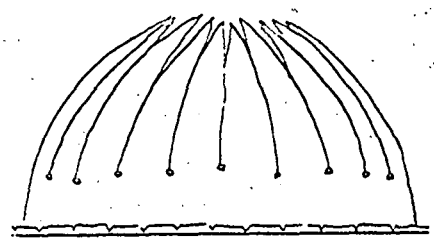
S 4 4









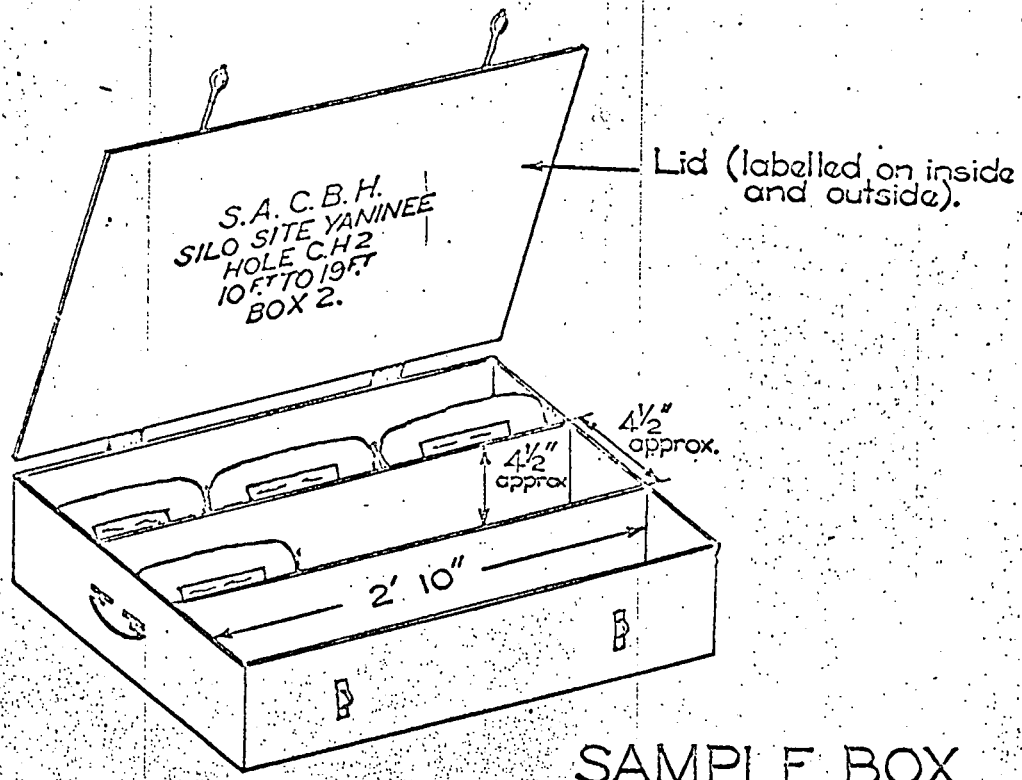


(Copper Basket Retainer)

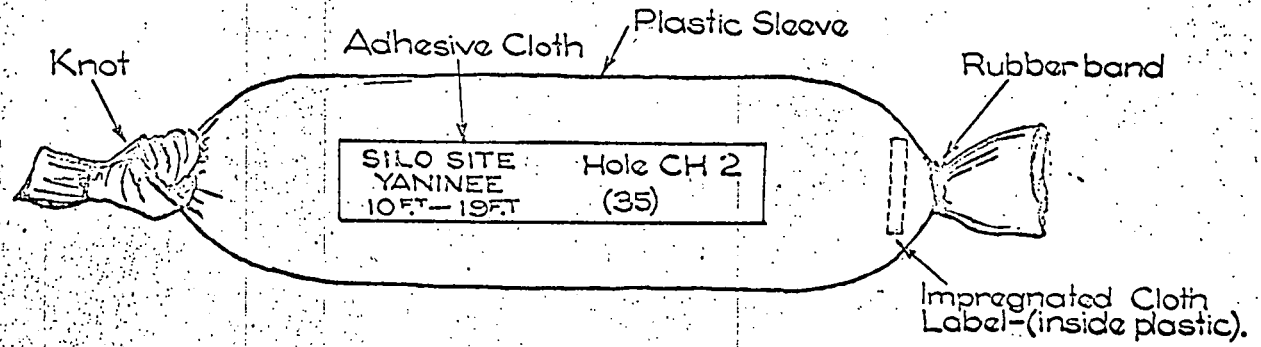
FIG: 2

DEPARTMENT OF MINES — SOUTH AUSTRALIA

ENGINEERING GEOLOGY SECTION SENIOR GEOLOGIST	Drn D.H.D. Tcd AMcD Chd L.V.W. Exd T.W.P.	CABLE-TOOL DRILLING S SERIES SAMPLING TUBE AND SHOTS	SCALE: NOT TO SCALE S 4418 MB Date 21 Oct '69



SAMPLE BOX



EXTRUDED SAMPLE SEALED IN PLASTIC SLEEVE.

FIG: 3

ENGINEERING DIVISION	DEPARTMENT OF MINES - SOUTH AUSTRALIA	Scale:
Compiled: W.R.P.B		Date: 17 Dec '60
Drn A.M.S.D. Chd:	CABLE TOOL DRILLING LABELLING AND BOXING OF EXTRUDED SAMPLES	Dg. No. S7580 MB

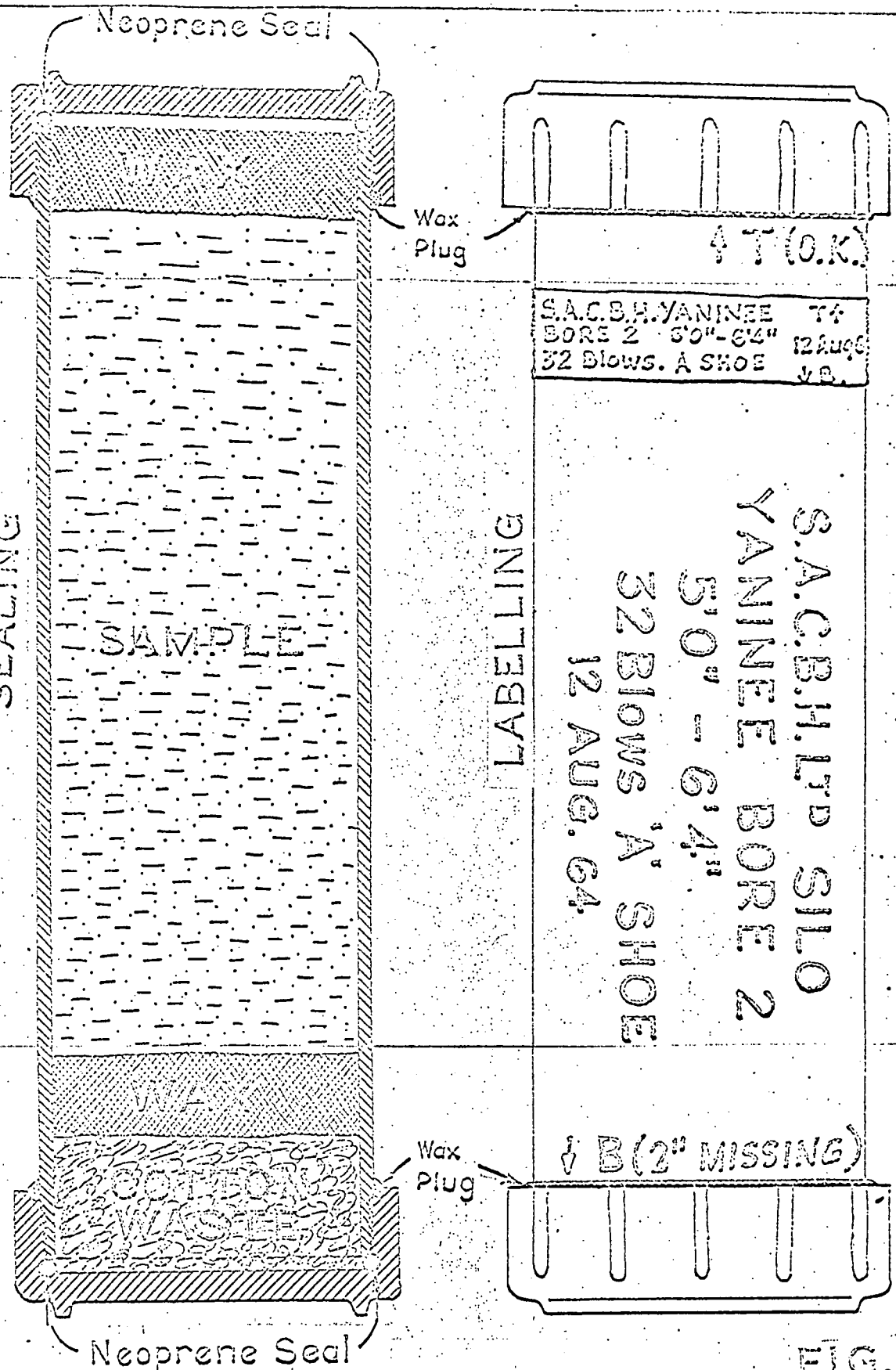


FIG. 4

DEPARTMENT OF MINES — SOUTH AUSTRALIA

ENGINEERING SERVICES SECTION	Drn. R.D.S.	SEALED TUBE SAMPLE	SCALE: NOT TO SCALE
	Tcd. R.D.S.		S4419 MB
DIRECTOR OF MINES	Ckd. A.H.S.		DATE: 29 JUNE 65
	Exd.		

FIG. 4

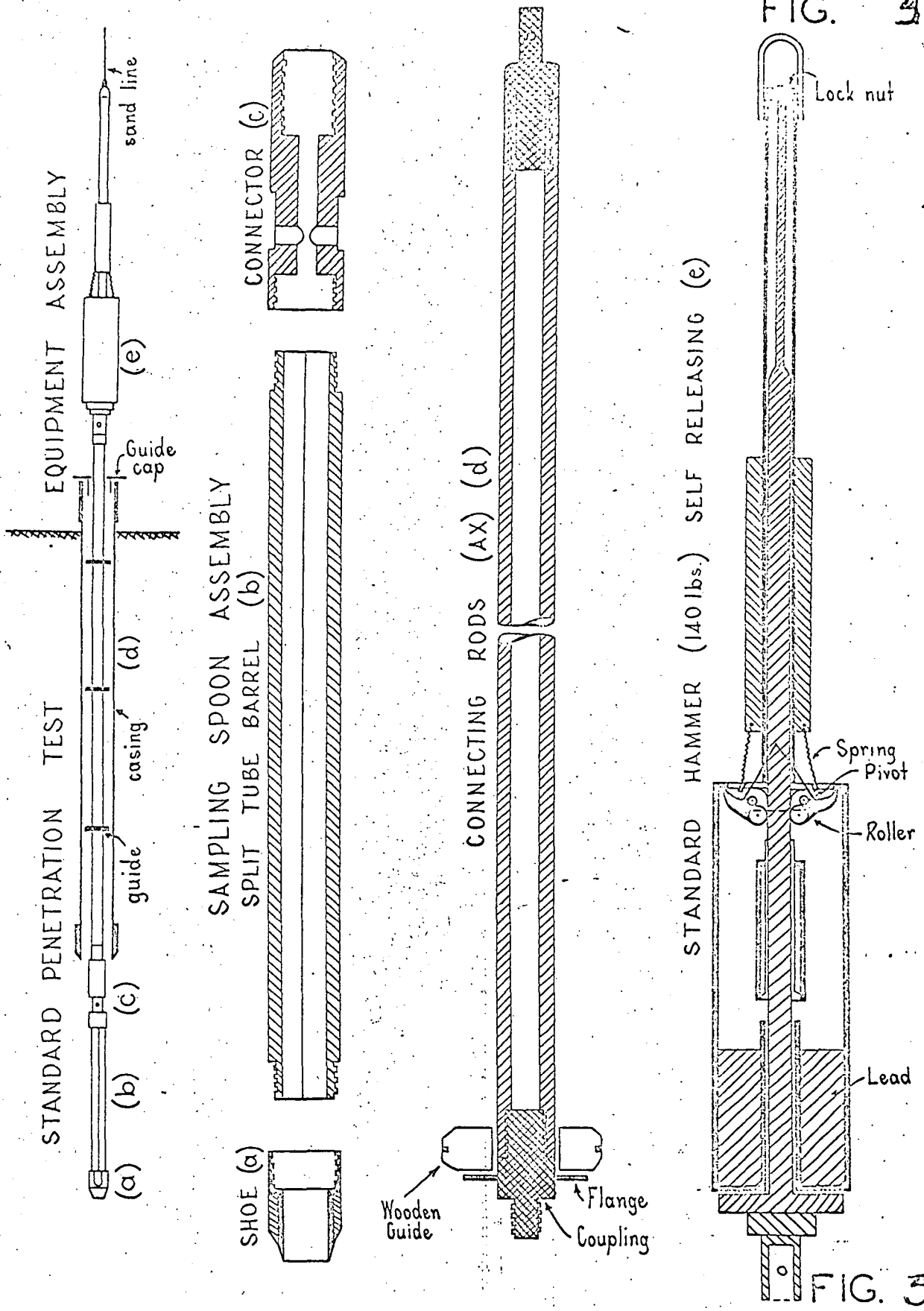


FIG. 5

ENGINEERING DIVISION	DEPARTMENT OF MINES - SOUTH AUSTRALIA	Scale: Not to scale
Compiled: W.R.P.B.	STANDARD PENETRATION TEST EQUIPMENT	Date: 22 Dec 1969
Drn. R.H. Ckd.		Drg. No. S4420 MB

ENGINEERING GEOLOGY SECTION

SOILS CLASSIFICATION CHART

S.A. DEPARTMENT OF MINES

			FIELD IDENTIFICATION PROCEDURES (Excluding particles larger than 0.25 ft. and basing fractions on estimated weights)	GROUP SYMBOL	GROUP NAME and typical materials
COARSE GRAINED SOILS More than 50% of material is larger than No. 200 B.S. Sieve size.	GRAVELS More than 50% of the coarse fraction is larger than 2 mm (retained on B.S.7 sieve)	CLEAN GRAVELS Little or no fines	Wide range in grain size and substantial amounts of all intermediate particle sizes.	GW	GRAVEL, well graded; gravel sand mixtures, little or no fines
			Predominantly one size, or a range of sizes, with some intermediate sizes missing.	GP	GRAVEL, poorly graded; gravel sand mixtures, little or no fines.
		DIRTY GRAVELS Appreciable amount of fines	Non-plastic fines – for identification see ML below.	GM	GRAVEL, excess silty fines; poorly graded gravel-sand-silt mixtures
			Plastic fines – for identification see CL below	GC	GRAVEL, excess clayey fines; poorly graded gravel-sand-clay mixtures
	SANDS More than 50% of the coarse fraction is smaller than 2 mm (passing B.S.7 sieve)	CLEAN SANDS Little or no fines.	Wide range in grain sizes, and substantial amounts of all intermediate particle sizes	SW	SAND, well graded; well graded sands, gravelly sands, little or no fines.
			Predominantly one size or a range of sizes, with some intermediate sizes missing.	SP	SAND, poorly graded; poorly graded sands gravelly sands, little or no fines
		DIRTY SANDS Appreciable amount of fines	Non plastic fines – for identification see ML below	SM	SAND, excess silty fines; poorly graded sand-silt mixtures
			Plastic fines – for identification see CL below	SC	SAND excess clayey fines; poorly graded sand-clay mixtures.

		FIELD INVESTIGATION PROCEDURES on fraction smaller than 0·4 mm (passing B.S.36 sieve)						GROUP SYMBOL	GROUP NAME (and typical materials)
		SOIL CAST (wet soil)	SOIL THREAD	SHINE	DILATANCY	ODOUR	DRY STRENGTH		
FINE GRAINED SOILS More than 50% of material is smaller than No. 200 B.S. sieve size.	SILTS AND CLAYS Liquid limit less than 50	Forms fragile cast Cracks form when kneaded while moist	Thick crumbly thread; easily broken	None to very dull	Distinct	Not significant	None to slight	ML	SILT SOIL, low plasticity; inorganic silts and very fine silty or clayey sands, rock flour.
		Cast maybe handled freely without breaking. Can be kneaded moist without cracking. Material adheres to the hand.	Thread can be pointed as fine as a lead pencil, but is fragile.	Moderate	None to slight	Not significant	Moderate	CL	CLAY SOIL, low plasticity; inorganic clays of low to medium plasticity, gravelly clays, sandy clays silty clays, lean clays
		Cast fragile to cohesive material will adhere somewhat to the hand.	Soft, weak thread.	None to very dull	Slight to distinct	Decayed organic matter	Low	OL	ORGANIC SOIL low plasticity; organic silts and silt clays of low plasticity
	SILTS AND CLAYS Liquid limit more than 50	Moderately plastic and cohesive. Material adheres somewhat to the hand	Weak to medium thread. May be crumbly.	Dull	None to slight	Not significant	Moderate Powdered soil feels floury	MH	SILT SOIL, high plasticity; inorganic silts, micaceous or diatomaceous fine sandy or silty soils elastic silts.
		Very plastic and cohesive. Material very sticky to the hand. Greasy to to touch.	Very tough thread Can be rolled to a pin point.	Very glossy	None	Strong earthy.	High to very high. Cannot be powdered by finger pressure.	CH	CLAY SOIL, high plasticity; inorganic clays of high plasticity, fat clays
		Plastic and cohesive. Feels slightly spongy Greasy to touch.	Weak to medium thread. Often soft and fibrous	Moderate to very glossy	None	Decayed organic matter	Moderate to high. Powdered soil may be fibrous.	OH	ORGANIC SOIL, high plasticity; organic clays of medium to high plasticity
HIGHLY ORGANIC SOILS		Readily identified by colour, odour, spongy feel and frequently by fibrous texture.						Pt	PEATY SOIL; Peat and other highly organic soils.

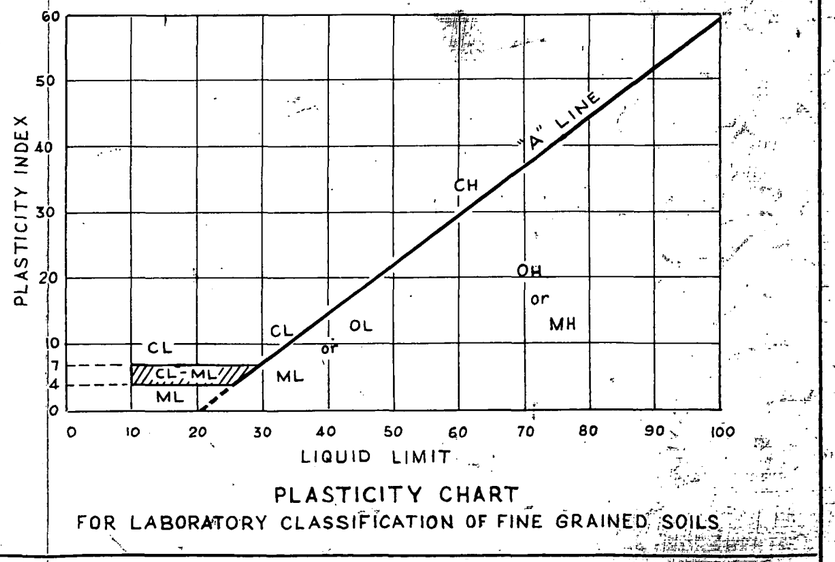
GRAIN SIZE CURVE to be used to identify soil fractions.

LABORATORY CLASSIFICATION CRITERIA

Coarse grained soils classified on basis of percentage of fines, as follows

PERCENT OF FINES	GRAVELS	SANDS
Less than 5	GW, GP	SW, SP
More than 12	GM, GC	SM, SC
5 to 12	Borderline cases, use 2 symbols	

$Cu = \frac{D60}{D10}$ Greater than 4 $Cc = \frac{(D30)^2}{D10 \times D60}$ Between one and 3		
Not meeting all gradation requirements for GW		
Atterberg limits below "A" line or PI less than 4		Above "A" line with PI between 4 and 7 are borderline cases requiring use of dual symbols
Atterberg limits above "A" line with PI greater than 7		
$Cu = \frac{D60}{D10}$ Greater than 6 $Cc = \frac{(D30)^2}{D10 \times D60}$ Between one and 3		
Not meeting all gradation requirements for SW		
Atterberg limits below "A" line or PI less than 4		Above "A" line with PI between 4 and 7 are borderline cases requiring use of dual symbols
Atterberg limits above "A" line with PI greater than 7		



PLASTICITY CHART
FOR LABORATORY CLASSIFICATION OF FINE GRAINED SOILS

NOTE : BOUNDARY CLASSIFICATIONS : Soils possessing characteristics of two groups are shown as a combination of two group symbols, e.g. GW-GC, well graded gravel with clay binder.

Based on "The Unified Soil Classification System" United States Department of the Interior Bureau of Reclamation "Earth Manual" First Edition, Denver COLORADO 1960

FIG. 6

70-641|6 MG

DEPARTMENT OF MINES · SOUTH AUSTRALIA

LOG OF CABLE TOOL HOLE

HOLE CH 1

SERIAL No.

PROJECT GOVERNMENT OFFICES BUILDING

TOWN ACRE 335

FEATURE FOUNDATION INVESTIGATION

HUNDRED ADELAIDE

LOCATION VICTORIA SQUARE WEST

CO-ORDS —

R.L. Surface FT.

R.L. Collar FT.

Datum

GEOLOGICAL NOTES AND CLASSIFICATION	R.L. (FEET) DEPTH	GRAPHIC LOG	GROUP SYMBOL	SOIL DESCRIPTION GROUP NAME Unified Soil Classification, U.S.B.R. Earth Manual 2nd Edition 1966	WATER LEVEL Casing	MOISTURE CONTENT	Consistency Compct. Density	FIELD TEST DATA: BLOWS PER FOOT 20 40 60 80	SOILTEST P'TR'METER Units * 1 2 3 4
Calcareous Silt is highly calcareous Nodules are ferruginous and calcareous.			ML-SM	SILT SOIL, low plasticity, very sandy (40%), light brown.		H	L		
	5		CL	CLAY SOIL, low plasticity, very sandy, grey. Contains patches of silt (ML) and some weakly cemented nodules. Sand content is 20 to 40%		MC > PL	Firm	N = 6	
	10		CH	CLAY SOIL, high plasticity, grey, mottled red-brown and yellow-brown. Contains few sand grains.		MC > PL	Stiff	N = 9	
Decomposed rootlet, 1 m.m. diameter.	15								
	20							N = 13	
Decomposed rootlet 2 m.m. diameter. Fines are ferruginous.	25								
	30		SP to SC	SAND, poorly graded, fine to coarse grained, 10 to 15% clayey fines, brown.		H	Dense		
			CH	CLAY SOIL, high plasticity, grey, mottled yellow brown. Few sand grains.		MC < PL	V. Stiff		
	35								

PLEISTOCENE HINDMARSH CLAY

TYPE OF SAMPLE
A shoe (SA)
D " (SD)
E " (SE)
G " (SG)
Sealed Tube - A Shoe - SAL
Standard Penetration Test - SPT

Water level, (date) → 7 Dec. '66
WC ▶ Water cut
Casing

CONSISTENCY (Clays)
VS. — Very Soft
S — Soft
F — Firm
St. — Stiff
V. St. — Very Stiff
H. — Hard

COMPACTNESS (Silts)
Ls — Loose
MC — Moderately Compact
C — Compact
VC — Very Compact

RELATIVE DENSITY (Sands)
VL — Very Loose
L — Loose
MD — Medium Dense
D — Dense
VD — Very Dense

MOISTURE CONTENT
H — Humid
D — Damp
M — Moist
W — Wet
S — Saturated
LL — Liquid Limit
PL — Plastic Limit

* These values refer to clay soils only and provide an indication of their consistency.

ENGINEERING GEOLOGY SECTION

DRILL No. 1
TYPE RUSTON
DRILLER D.R. PHILLIPS
START 25 Feb. '70
FINISH 26 Feb. '70

LOGGED BY J.P.T.
DATE 8 Apr. '70
TRACED S.L.T.
CHECKED R.H.

SHEET 1 OF 4
DRG No. S 7744

DF N° S6676 MB

DEPARTMENT OF MINES · SOUTH AUSTRALIA

LOG OF CABLE TOOL HOLE

PROJECT GOVERNMENT OFFICES BUILDING — TOWN ACRE 335

FEATURE FOUNDATION INVESTIGATION — HUNDRED ADELAIDE

LOCATION VICTORIA SQUARE WEST — CO-ORDS

HOLE CH 1

SERIAL No.

R.L. Surface FT.

R.L. Collar FT.

Datum

GEOLOGICAL NOTES AND CLASSIFICATION	R.L. (FEET) DEPTH	GRAPHIC LOG	GROUP SYMBOL	SOIL DESCRIPTION GROUP NAME Unified Soil Classification, U.S.B.R. Earth Manual 2nd Edition 1966	WATER LEVEL CASING	MOISTURE CONTENT	Consistency Compact. Dens'y	FIELD TEST DATA: BLOWS PER FOOT 20 40 60 80	FIELD TEST DATA: SOILTEST P'TR METER Units * 1 2 3 4
PLEISTOCENE HINDMARSH CLAY	35		CH	As above with silty patches as shown, weakly cemented in part.		MC < PL	Very Stiff		
Silt is calcareous									
Some MnO_2.	40			Mottling mainly red-brown, some black spots.					
Slickensided joints →									
Gravel is calcrete	45			Up to 10% gravel, where shown.					
				Contains up to 20% fine grained sand.		MC > PL			
	50			Rock, weakly to moderately cemented, white.					
UPPER PLIOCENE HALLET COVE SANDSTONE	55			HOLE DIAMOND - DRILLED TO 79·0 FT. see seperate sheet for detailed log	2 June '70				
	60								
	65								
	70								

TYPE OF SAMPLE

A shoe (SA)
D " (SD)
E " (SE)
G " (SG)
Sealed Tube - A Shoe - SAL
Standard Penetration Test SPT

Water level (date) → 7 Dec. '66
WC Water cut
Casing

CONSISTENCY (Clays)	COMPACTNESS (Silts)	RELATIVE DENSITY (Sands)	MOISTURE CONTENT
VS. — Very Soft	Ls — Loose	VL — Very Loose	H — Humid
S — Soft	MC — Moderately Compact	L — Loose	D — Damp
F — Firm	C — Compact	MD — Medium Dense	M — Moist
St. — Stiff	VC — Very Compact	D — Dense	W — Wet
V. St. — Very Stiff		VD — Very Dense	S — Saturated
H. — Hard			LL — Liquid Limit
			PL — Plastic Limit

* These values refer to clay soils only and provide an indication of their consistency.

ENGINEERING GEOLOGY SECTION

DRILL No. 1
TYPE RUSTON
DRILLER D. R. PHILLIPS
START 25 Feb '70
FINISH 26 Feb '70

LOGGED BY J P T
DATE 8 Apr. '70
TRACED S. L. T.
CHECKED R. R.

SHEET 2 OF 4 — DRG No. S7744-0

PI No 56676 MB

PROJECT GOVERNMENT OFFICES BUILDING

LOG OF CABLE TOOL HOLE

HOLE CH1

SERIAL No.

TOWN ACRE 335

FEATURE FOUNDATION INVESTIGATION

HUNDRED ADELAIDE

R.L. Surface FT.

LOCATION VICTORIA SQUARE WEST

CO-ORDS

R.L. Collar FT.

Datum

GEOLOGICAL NOTES AND CLASSIFICATION	R.L. (FEET) DEPTH	GRAPHIC LOG	GROUP SYMBOL	SOIL DESCRIPTION GROUP NAME Unified Soil Classification, U.S.B.R. Earth Manual 2nd Edition 1966	WATER LEVEL	CRUST	MOISTURE CONTENT	Consistency Consist. Dens.	FIELD TEST DATA: BLOWS PER FOOT 20 40 60 80	SOILTEST P'TROMETER Units * 1 2 3 4
UPPER PLIOCENE HALLET COVE SANDSTONE				END OF DIAMOND DRILL HOLE						
UPPER EOCENE BLANCHE POINT MARLS. Calcareous, glauconitic, abundant shelly fossil fragments and impressions. Weathering has altered most of the glauconite to limonite, bleached.	80		MH	SILT SOIL, high plasticity, sandy, clayey. Grey with brownish mottling. Weakly cemented bands and patches as shown. Sand grains form up to 30%			MC ≪ PL	MC		
	85									
	90			Mainly dark grey.						
Sand consists of quartz, glauconite and shell fragments. Minor mica flakes. Calcareous.	95		SM (SC)	SAND, excess fines (20%) light grey. Sand is fine to medium grained.			S	Medium Dense	N = 20	
	100		SP	SAND, poorly graded, few fines, fine to medium grained.					N = 17	
	105									

TYPE OF SAMPLE

A shoe (SA)
D " (SD)
E " (SE)
G " (SG)
Sealed Tube - A Shoe - SAL
Standard Penetration Test - SPT

Water level, (date) 7 Dec. '66
WC Water cut
Casing

CONSISTENCY (Clays)	COMPACTNESS (Silts)	RELATIVE DENSITY (Sands)	MOISTURE CONTENT
VS. — Very Soft	Ls — Loose	VL — Very Loose	H — Humid
S — Soft	MC — Moderately Compact	L — Loose	D — Damp
F — Firm	C — Compact	MD — Medium Dense	M — Moist
St. — Stiff	VC — Very Compact	D — Dense	W — Wet
V. St. — Very Stiff		VD — Very Dense	S — Saturated
H. — Hard			LL — Liquid Limit
			PL — Plastic Limit

* These values refer to clay soils only and provide an indication of their consistency.

ENGINEERING GEOLOGY SECTION

DRILL No. 1
TYPE RUSTON
DRILLER D.R. PHILLIPS
START 18 Mar. '70
FINISH 21 Mar. '70

LOGGED BY J.P.T
DATE 8 Apr. '70
TRACED S.L.T.
CHECKED R.H.

SHEET 3 OF 4
DRG No. S7744-b Ha6

PF No. S6676 MB

DEPARTMENT OF MINES · SOUTH AUSTRALIA

LOG OF CABLE TOOL HOLE

HOLE CH 1

SERIAL No.

PROJECT GOVERNMENT OFFICES BUILDING

TOWN ACRE 335

FEATURE FOUNDATION INVESTIGATION

HUNDRED ADELAIDE

LOCATION VICTORIA SQUARE WEST

CO-ORDS

R.L. Surface FT.

R.L. Collar FT.

Datum

GEOLOGICAL NOTES AND CLASSIFICATION	R.L. (FEET) DEPTH	GRAPHIC LOG	GROUP SYMBOL	SOIL DESCRIPTION GROUP NAME Unified Soil Classification, U.S.B.R. Earth Manual 2nd Edition 1966	WATER LEVEL	COLOUR MOISTURE CONTENT	Consistency Correct. Dens.	FIELD TEST DATA: BLOWS PER FOOT 20 40 60 80	FIELD TEST DATA: SOILTEST P'TR'METER Units * 1 2 3 4
UPPER EOCENE BLANCHE POINT MARLS. Slightly calcareous. Micaceous (?)	110		SP	as above		S	MD		
	115		MH	SILT SOIL, high plasticity, some fine grained sand. Dark grey/ black.		MC < PL	Compact		
				END OF HOLE 119·5 FT.					

TYPE OF SAMPLE

A shoe (SA)
D " (SD)
E " (SE)
G " (SG)
Sealed Tube - A Shoe - SAL
Standard Penetration Test - SPT

Water level, (date) 7 Dec. '66
WC Water cut
Casing

CONSISTENCY (Clays)	COMPACTNESS (Silts)	RELATIVE DENSITY (Sands)	MOISTURE CONTENT
VS. — Very Soft	Ls — Loose	VL — Very Loose	H — Humid
S — Soft	MC — Moderately Compact	L — Loose	D — Damp
F — Firm	C — Compact	MD — Medium Dense	M — Moist
St. — Stiff	VC — Very Compact	D — Dense	W — Wet
V. St. — Very Stiff		VD — Very Dense	S — Saturated
H. — Hard			LL — Liquid Limit
			PL — Plastic Limit

* These values refer to clay soils only and provide an indication of their consistency.

ENGINEERING GEOLOGY SECTION

DRILL No. 1
TYPE RUSTON.
DRILLER D.R. PHILLIPS
START 18 Mar. '70
FINISH 21 Mar. '70

LOGGED BY JPT
DATE 8 Apr. '70
TRACED S.L.T.
CHECKED R.H.

SHEET 4 OF 4.
DRG No. S7744-C Ha6

PF Nº S6676 MB

GOVERNMENT OFFICES — DEPARTMENT OF MINES SOUTH AUSTRALIA

LOG OF DIAMOND DRILL HOLE

HOLE NO. CH 1

SERIAL No.

PROJECT. BUILDING.

FEATURE. FOUNDATION INVESTIGATION

LOCATION VICTORIA SQUARE WEST.

TOWN ACRE 335 HUNDRED ADELAIDE.

CO-ORDINATES

ANGLE FROM HORIZ. 90° DIRECTION

R.L. Surface . FT.

R.L. Collar . FT.

Datum

DESCRIPTION OF CORE	② GROUP SYMBOL	① STRENGTH TERM VS S MS W VW SO	CORE SIZE DEPTH R.L. FT.	LOG	③ FRACTURE LOG 1 4 16 64	STRUCTURES	LIFT CORE LOSS% 10 5 30	WATER LEVEL DATE	CASING	DRILL WATER LOSS % 0 100	WATER PRESSURE TESTS LUGEONS ④ 0.1 1 5 10 50 100
Rock is LIMESTONE to CALCAREOUS SANDSTONE, partly re-crystallized and severely leached (originally calcarenite) highly fossiliferous. Solution cavities occur mainly along fossil remains, some along joints.			50 55 60 65 70 75	Core is mainly in lenghts of 3 to 30 cms. Core lenghts 1 to 10 cms		Cable Tool drilling to 50 ft 10 ins. Infillings as shown, consist of, CLAY SOIL, high plasticity sandy, grey. Numerous small voids open up to 4m.m Voids open up to 4m.m. occupy 10 to 20% of total volume. SAND, poorly graded, fine grained, few silty fines. (SP)		2 June '70			not tested
UPPER PLIOCENE HALLET COVE SANDSTONE											
BLANCHE POINT MARLS SILT SOIL, high plasticity, yellow brown.						END OF DIAMOND DRILLING 79·0 FT.					

LEGEND

⌀ fossil

① ROCK SUBSTANCE

STRENGTH TERM
VS-Very Strong
S-Strong
MS-Medium Strong
W-Weak
VW-Very Weak
SO-Soil properties

CONDITION TERM
Fresh
Decomposed
Weathered
Altered
Not Applicable

② Substances with soil properties remoulded and classified by Unified System

③ FRACTURE LOG
1 4 16 64 Natural fractures per foot of core
12 3 3/4 3/16 Equivalent length of core in inches

④ (3·5) Maximum effective pressure (bars) reached during test.
Min. = Minimum value.

ENGINEERING GEOLOGY SECTION

DRILL No. 1	LOGGED J.P.T.
TYPE RUSTON	DATE 8 Apr. '70.
DRILLER D.R. PHILLIPS	TRACED S.L.T.
START 9 Mar. '70	CHECKED R.H.
FINISH 10 Mar. '70	

SHEET 1 OF 1. DRG. No. S7744-d Ha6

P.F. N° S5027D MB

DEPARTMENT OF MINES · SOUTH AUSTRALIA

LOG OF CABLE TOOL HOLE

HOLE CH 2

SERIAL No.

PROJECT GOVERNMENT OFFICE BUILDING

TOWN ACRE 335.

FEATURE FOUNDATIONS

HUNDRED. ADELAIDE.

LOCATION. VICTORIA SQUARE WEST

CO-ORDS

R.L. Surface FT.

R.L. Collar FT.

Datum

GEOLOGICAL NOTES AND CLASSIFICATION	R.L. (FEET) DEPTH	GRAPHIC LOG	GROUP SYMBOL	SOIL DESCRIPTION GROUP NAME Unified Soil Classification, U.S.B.R. Earth Manual 2nd Edition 1966	WATER LEVEL	CASING MOISTURE CONTENT	Consistency Compact. Density	FIELD TEST DATA: BLOWS PER FOOT 20 40 60 80	SOIL TEST PENETROMETER Units * 1 2 3 4
Silt patches are calcareous			CH	CLAY SOIL, high plasticity, sandy. Grey with red-brown and some yellow-brown mottling. Some patches of white silt as shown. Sand content decreases from approx. 20% at top to less than 5% at 25 ft.		MC > PL	Firm	N = 7	
	5								
	10							N = 9	
	15						Stiff	N = 12	
PLEISTOCENE: HINDMARSH CLAY FORMATION. Numerous rootlets less than 0·5 m.m. diam.	20								
Rootlet, partly decomposed, 1m.m. diam.	25					MC < PL	Very Stiff		
Dyke of clayey sand, 2m.m. wide.	30		SC to SP	SAND, poorly graded, 10 to 25% clayey fines. Sand is mainly medium grained. Pale grey with yellow-brown and red-brown patches.			Humid Dence		
	35								

TYPE OF SAMPLE

A shoe (SA)
D " (SD)
E " (SE)
G " (SG)
Sealed Tube - A Shoe - SAL
Standard Penetration Test - SPT

Water level, (date) 7 Dec. '66
WC Water cut
Casing

CONSISTENCY (Clays)	COMPACTNESS (Silts)	RELATIVE DENSITY (Sands)	MOISTURE CONTENT
VS. — Very Soft	Ls — Loose	VL — Very Loose	H — Humid
S — Soft	MC — Moderately Compact	L — Loose	D — Damp
F — Firm		MD-Medium Dense	M — Moist
St. — Stiff	C — Compact		W — Wet
V. St. — Very Stiff	VC — Very Compact	D — Dense	S — Saturated
H. — Hard		VD — Very Dense	LL — Liquid Limit
			PL — Plastic Limit

* These values refer to clay soils only and provide an indication of their consistency.

ENGINEERING GEOLOGY SECTION

DRILL No. 1
TYPE RUSTON
DRILLER D.R. PHILLIPS
START 20 Feb. '70.
FINISH 24. Feb. '70.

LOGGED BY J.P.T.
DATE 26 Feb '70
TRACED S.L.T.
CHECKED R.H

SHEET 1 OF 3. DRG No. S 7745 Ha6

PF Nº S6676 MB

DEPARTMENT OF MINES · SOUTH AUSTRALIA

PROJECT . GOVERNMENT . OFFICE . BUILDING

LOG OF CABLE TOOL HOLE

HOLE CH 2

SERIAL No.

TOWN ACRE 335

FEATURE . FOUNDATIONS

HUNDRED. ADELAIDE

R.L. Surface . . . FT.

LOCATION. VICTORIA . SQUARE . WEST

CO-ORDS

R.L. Collar . . . FT.

Datum.

GEOLOGICAL NOTES AND CLASSIFICATION	R.L. (FEET) DEPTH	GRAPHIC LOG	GROUP SYMBOL	SOIL DESCRIPTION GROUP NAME Unified Soil Classification, U.S.B.R. Earth Manual 2nd Edition 1966	WATER LEVEL	CORE	MOISTURE CONTENT	Consistency Comp. Dens'y	FIELD TEST DATA: BLOWS PER FOOT 20 40 60 80	SOILTEST P'TR METER Units * 1 2 3 4
PLEISTOCENE HINDMARSH CLAY FORMATION			SP to SC	As above			H	D		
Slickensided joint.				CLAY SOIL, high plasticity, few sand grains. Grey, yellow brown mottled			MC≫PL	Very Stiff		
	40		CH							
Silty patches are calcareous.	45			Silty patches, weakly to moderately cemented in part, white.						
				Hole continued by diamond drill to 79·2 ft. For detailed log see dwg. no. S7745- C						
UPPER PLIOCENE HALLET COVE SANDSTONE	50									
	55									
	60									
	65									
	70				2 June '70					

TYPE OF SAMPLE	CONSISTENCY (Clays)	COMPACTNESS (Silts)	RELATIVE DENSITY (Sands)	MOISTURE CONTENT
A shoe (SA)	VS. — Very Soft	Ls — Loose	VL — Very Loose	H — Humid
D " (SD)	S — Soft	MC — Moderately Compact	L — Loose	D — Damp
E " (SE)	F — Firm	C — Compact	MD-Medium Dense	M — Moist
G " (SG)	St. — Stiff	V C — Very Compact	D — Dense	W — Wet
Sealed Tube - A Shoe - SAL	V. St. — Very Stiff		VD — Very Dense	S — Saturated
Standard Penetration Test - SPT	H. — Hard			LL — Liquid Limit
				PL — Plastic Limit

Water level, (date) 7 Dec. '66 → WCP Water cut

Casing

* These values refer to clay soils only and provide an indication of their consistency.

ENGINEERING GEOLOGY SECTION

DRILL No. 1 — LOGGED BY J.P.T.

TYPE RUSTON

DRILLER D.R. PHILLIPS — DATE 23 Feb '70

START 20 Feb. '70 — TRACED S.L.T.

FINISH 24 Feb. '70 — CHECKED R.H.

SHEET 2 OF 3. — DRG No. S7745 - a

Has

PF Nº S6676 MB

DEPARTMENT OF MINES · SOUTH AUSTRALIA

LOG OF CABLE TOOL HOLE

PROJECT . GOVERNMENT . OFFICE . BUILDING .

FEATURE . FOUNDATIONS .

LOCATION. VICTORIA . SQUARE . WEST

TOWN ACRE 335 .

HUNDRED. ADELAIDE

CO-ORDS .

HOLE CH 2

SERIAL No.

R.L. Surface . FT.

R.L. Collar . FT.

Datum .

GEOLOGICAL NOTES AND CLASSIFICATION	R.L. (FEET) DEPTH	GRAPHIC LOG	GROUP SYMBOL	SOIL DESCRIPTION GROUP NAME Unified Soil Classification, U.S.B.R. Earth Manual 2nd Edition 1966	WATER LEVEL	CASING	MOISTURE CONTENT	Consistency Compct. Density	FIELD TEST DATA: BLOWS PER FOOT 20 40 60 80	SOILTEST P'TR'METER Units * 1 2 3 4
UPPER PLIOCENE HALLET COVE SANDSTONE	75			END OF DIAMOND DRILL HOLE 79.2 FT						
UPPER EOCENE BLANCHE POINT MARLS (Weathered zone. Leached) Sand consists of quartz, glauconite and minor mica. Fines are highly calcareous. Numerous fossils.	80		MH	SILT SOIL, high plasticity, Sandy. Pale grey-green. Contains strongly cemented bands as shown.			MC ≫ PL	Moderately compact		
	85									
	90			Mainly dark grey						
	95		SM-MH	SAND, excess silt. Mainly fine grained. Grey to yellow brown.			MC ≫ PL	MD		
	100									

TYPE OF SAMPLE

- A shoe (SA)
- D " (SD)
- E " (SE)
- G " (SG)
- Sealed Tube - A Shoe - SAL
- Standard Penetration Test - SPT

Water level, (date) 7 Dec. '66 — Casing — WCP Water cut

CONSISTENCY (Clays)	COMPACTNESS (Silts)	RELATIVE DENSITY (Sands)	MOISTURE CONTENT
VS. — Very Soft	Ls — Loose	VL — Very Loose	H — Humid
S — Soft	MC — Moderately Compact	L — Loose	D — Damp
F — Firm	C — Compact	MD-Medium Dense	M — Moist
St. — Stiff	VC — Very Compact	D — Dense	W — Wet
V. St. — Very Stiff		VD — Very Dense	S — Saturated
H. — Hard			LL — Liquid Limit
			PL — Plastic Limit

* These values refer to clay soils only and provide an indication of their consistency.

ENGINEERING GEOLOGY SECTION

DRILL No. 1 .
TYPE . RUSTON .
DRILLER D.R. PHILLIPS
START 13 Mar. '70 .
FINISH 13 Mar. '70 .

LOGGED BY J P T
DATE 26 Feb '70
TRACED S.L.T.
CHECKED . R.H.

SHEET 3 OF 3 . DRG No. S7745-b Ha6

PF Nº S6676 MB

GOVERNMENT OFFICE

PROJECT. BUILDING

FEATURE. FOUNDATIONS

LOCATION VICTORIA SQUARE WEST.

DEPARTMENT OF MINES SOUTH AUSTRALIA

LOG OF DIAMOND DRILL HOLE

TOWN ACRE 335 HUNDRED ADELAIDE

CO-ORDINATES

ANGLE FROM HORIZ. 90° DIRECTION

HOLE NO. CH 2

SERIAL No

R.L. Surface . . FT.

R.L. Collar . . FT.

Datum . .

DESCRIPTION OF CORE	② GROUP SYMBOL	① STRENGTH TERM VS S MS W VW SO	CORE SIZE DEPTH R.L. FT.	LOG	③ FRACTURE LOG 1 4 16 64	STRUCTURES	LIFT CORE LOSS% 10 5 50	WATER LEVEL DATE	CASING	DRILL WATER LOSS % 0 100	WATER PRESSURE TESTS LUGEONS 0.5 1 5 10 50 ④ 100
START OF DIAMOND DRILL HOLE 46 FT.											
Rock is LIMESTONE to CALCAREOUS SANDSTONE partly re-crystallised, and severely leached highly fossiliferous. Solution cavities occur along fossils and along joints.			50		Core in lengths of 1 to 8 cms.	Infillings as shown, consist of; CLAY SOIL, high plasticity, very sandy, grey.					
			55		Core in lengths of 2 to 30 cms. Mainly 10 cms.	Numerous smaller voids open to 2 m.m, form up to 20% of volume.		2 June '70			not tested
UPPER PLIOCENE HALLET COVE SANDSTONE			60			Voids form less than 10% of volume					
			65								
			70		4 to 20 cms. lengths						
SAND, poorly graded, (SP), few silty fines.			75		2 to 20cms. lengths						
					3 to 10cms. lengths	Several voids open up to 10 m.m.					
BLANCHE POINT MARLS			80			END OF DIAMOND DRILL HOLE 79·2 FT.					

① ROCK SUBSTANCE STRENGTH TERM
VS-Very Strong
S-Strong
MS-Medium Strong
W-Weak
VW-Very Weak
SO-Soil properties

CONDITION TERM
Fresh
Decomposed
Weathered
Altered
Not Applicable

② Substances with soil properties remoulded and classified by Unified System

③ FRACTURE LOG
1 4 16 64 Natural fractures per foot of core
12 3 3/4 3/16 Equivalent length of core in inches

④ (3·5) Maximum effective pressure (bars) reached during test.
Min. = Minimum value.

ENGINEERING GEOLOGY SECTION

DRILL No. 2
TYPE MINDRILL E1000
DRILLER ASHMORE J.T.
START 5 Mar. '70
FINISH 7 Mar. '70

LOGGED J.P.T.
DATE 26 Feb. '70
TRACED S.L.T.
CHECKED R.H.

SHEET 1 OF 1

DRG. No. S7745-C Hag

P.F. Nº S5027D MB

DEPARTMENT OF MINES · SOUTH AUSTRALIA

LOG OF CABLE TOOL HOLE

HOLE CH 3

SERIAL No.

PROJECT . GOVERNMENT . OFFICE . BUILDING . . . . . TOWN ACRE . 335

FEATURE . FOUNDATIONS. HUNDRED. ADELAIDE

LOCATION. VICTORIA SQUARE WEST. . S.E. corner CO-ORDS

R.L. Surface. . . FT.

R.L. Collar . . . FT.

Datum.

GEOLOGICAL NOTES AND CLASSIFICATION	R.L. (FEET) DEPTH	GRAPHIC LOG	GROUP SYMBOL	SOIL DESCRIPTION GROUP NAME Unified Soil Classification, U.S.B.R. Earth Manual 2nd Edition 1966	WATER LEVEL	CASING	MOISTURE CONTENT	Consistency Correct. Density	FIELD TEST DATA: BLOWS PER FOOT 20 40 60 80	FIELD TEST DATA: SOILTEST P'TR'METER Units * 1 2 3 4
SAND is quartz SILT is lime				CLAY SOIL, low plasticity, sandy, silty (lime), grey-brown contains patches of silt and cemented nodules.				F	N=7	>4.5
decreasing lime content.	5		CL							
	10			CLAY SOIL, high plasticity, grey to red-brown mottled Bright sheens on structural units.				St	N=12	>4.5
PLEISTOCENE HINDMARSH CLAY little or no calcareous fines.	15		CH	Logged from peices from sealed tube shoes			MC ≥ PL		N=13	>4.5
	20									
	25			← Slickensided joint surface at 45°						
iron stained in part minor local lime patches	30		SC SP-SC	SAND, poorly graded, with clayey fines to SAND excess clayey fines, grey to red brown			M	MD/D	102	NA
	35			As from 7 to 29 ft.			>PL	St		>4.5

TYPE OF SAMPLE

A shoe (SA)
D " (SD)
E " (SE)
G " (SG)
Sealed Tube - A Shoe - SAL
Standard Penetration Test - SPT

Water level, (date) → 7 Dec. '66
WC Water cut
Casing

CONSISTENCY (Clays)
VS. — Very Soft
S — Soft
F — Firm
St. — Stiff
V. St. — Very Stiff
H. — Hard

COMPACTNESS (Silts)
Ls — Loose
MC — Moderately Compact
C — Compact
VC — Very Compact

RELATIVE DENSITY (Sands)
VL — Very Loose
L — Loose
MD - Medium Dense
D — Dense
VD — Very Dense

MOISTURE CONTENT
H — Humid
D — Damp
M — Moist
W — Wet
S — Saturated
LL — Liquid Limit
PL — Plastic Limit

* These values refer to clay soils only and provide an indication of their consistency.

ENGINEERING GEOLOGY SECTION

DRILL No. 1
TYPE RUSTON
DRILLER D. PHILLIPS
START 17 Feb '70
FINISH 19 Feb '70

LOGGED BY W. Boucaut
DATE 21 Apr '70
TRACED SLT
CHECKED R.H.

SHEET 1 OF 3. DRG. No. S7746 Ha6

PF Nº S6676 MB

DEPARTMENT OF MINES · SOUTH AUSTRALIA

LOG OF CABLE TOOL HOLE

HOLE CH 3

SERIAL No.

PROJECT GOVERNMENT OFFICE BUILDING

FEATURE FOUNDATIONS

LOCATION VICTORIA SQUARE WEST

TOWN ACRE 335

HUNDRED ADELAIDE

CO-ORDS

R.L. Surface FT.

R.L. Collar FT.

Datum

GEOLOGICAL NOTES AND CLASSIFICATION	R.L. (FEET) DEPTH	GRAPHIC LOG	GROUP SYMBOL	SOIL DESCRIPTION GROUP NAME Unified Soil Classification, U.S.B.R. Earth Manual 2nd Edition 1966	WATER LEVEL	Casing	MOISTURE CONTENT	Consistency Compct. Dens.	FIELD TEST DATA: BLOWS PER FOOT 20 40 60 80	FIELD TEST DATA: SOILTEST P.T.R. METER Units * 1 2 3 4
PLEISTOCENE HINDMARSH CLAY	40		CH	CLAY SOIL, high plasticity, grey to red brown mottled			MC > PL	V. St.		> 4.5
UPPER PLIOCENE HALLET COVE SANDSTONE — Silt is lime. Gravel/Sand is sandstone fragments.	45		ML-GM	SILT SOIL, low plasticity, white, containing up to 50% SAND and GRAVEL fragments to 30 m.m. size			MC > PL / M	MC (SILT ONLY)		N.A.
EROSION SURFACE	50			SILT SOIL, grading to ROCK (Sandstone) weak, increasing sand percentage	WL. 4 MAY '70					
	55			CONTINUED BY DIAMOND DRILL SEE DWG. NO. S7746-'c						
	60									
	65									
	70									

TYPE OF SAMPLE

A shoe (SA)
D " (SD)
E " (SE)
G " (SG)
Sealed Tube - A Shoe - SAL
Standard Penetration Test - SPT

Water level, (date) → 7 Dec. '66
WC ▶ Water cut
Casing

CONSISTENCY (Clays)	COMPACTNESS (Silts)	RELATIVE DENSITY (Sands)	MOISTURE CONTENT
VS. — Very Soft	Ls — Loose	VL — Very Loose	H — Humid
S — Soft	MC — Moderately Compact	L — Loose	D — Damp
F — Firm	C — Compact	MD — Medium Dense	M — Moist
St. — Stiff	VC — Very Compact	D — Dense	W — Wet
V. St. — Very Stiff		VD — Very Dense	S — Saturated
H. — Hard			LL — Liquid Limit
			PL — Plastic Limit

* These values refer to clay soils only and provide an indication of their consistency.

ENGINEERING GEOLOGY SECTION

DRILL No. 1
TYPE: RUSTON
DRILLER D. PHILLIPS
START 17 Feb '70
FINISH 19 Feb '70

LOGGED BY W. Boucaut
DATE 21 Apr. '70
TRACED SLT
CHECKED R.H.

SHEET 2 OF 3.
DRG No. S7746-a Ha6

PF Nº S6676 MB

D ARTMENT OF MINES SO TH ST

PROJECT GOVERNMENT OFFICE BUILDING

LOG OF CABLE TOOL HOLE

HOLE CH 3

SERIAL No.

FEATURE FOUNDATIONS

TOWN ACRE 335

HUNDRED ADELAIDE

R.L. Surface FT.

LOCATION VICTORIA SQUARE WEST

CO-ORDS

R.L Collar FT.

Datum

GEOLOGICAL NOTES AND CLASSIFICATION	R.L. (FEET) DEPTH	GRAPHIC LOG	GROUP SYMBOL	SOIL DESCRIPTION GROUP NAME Unified Soil Classification, U.S.B.R. Earth Manual 2nd Edition 1966	WATER LEVEL	CORE LOSS	MOISTURE CONTENT	Consistency Compact. Density	FIELD TEST DATA: BLOWS PER FOOT 20 40 60 80	FIELD TEST DATA: SOILTEST P'TROMETER Units * 1 2 3
HALLET COVE SANDSTONE	75			54 TO 78 FT DIAMOND DRILLING. SEE DWG. NO. S7746-c						
EOCENE BLANCHE POINT MARLS: SAND, is quartz, glauconitic. Partly calcareous, shelly fossil fragment, to 20m.m. size are common.	80		MH	SILT SOIL, high plasticity, estimated up to 30% SAND, medium grained. Grey, green, yellow mottled			>PL	MC/C		>4.5
	85			Gradational to dark grey ↓ decreasing SAND						
mica in sand sizes, (fine grained)	90			Dark grey micaceous						
	95			occasional red brown to grey, more sandy, pockets to 30m.m. size and lenses to 5 m.m wide.						
	100			END OF HOLE 98 FT.						

TYPE OF SAMPLE

A shoe (SA)
D " (SD)
E " (SE)
G " (SG)
Sealed Tube - A Shoe - SAL
Standard Penetration Test - SPT

Water level, (date) → 7 Dec. '66
WC ▶ Water cut
Casing

CONSISTENCY (Clays)	COMPACTNESS (Silts)	RELATIVE DENSITY (Sands)	MOISTURE CONTENT
VS. — Very Soft	Ls — Loose	VL — Very Loose	H — Humid
S — Soft	MC — Moderately Compact	L — Loose	D — Damp
F — Firm	C — Compact	MD — Medium Dense	M — Moist
St. — Stiff	VC — Very Compact	D — Dense	W — Wet
V. St. — Very Stiff		VD — Very Dense	S — Saturated
H. — Hard			LL — Liquid Limit
			PL — Plastic Limit

* These values refer to clay soils only and provide an indication of their consistency.

ENGINEERING GEOLOGY SECTION

DRILL No. 1
TYPE RUSTON
DRILLER D. PHILLIPS.
START 10 Mar. '70
FINISH 11 Mar. '70

LOGGED BY W. Boucaut.
DATE 21 Apr. '70
TRACED S.L.T.
CHECKED R.H.

SHEET 3 OF 3. DRG No. S7746-b Ha6

PF Nº S6676 MB

GOVERNMENT OFFICE

PROJECT. BUILDING

FEATURE. FOUNDATIONS

LOCATION VICTORIA SQUARE. WEST.

DEPARTMENT OF MINES SOUTH AUSTRALIA

LOG OF DIAMOND DRILL HOLE

TOWN ACRE 335 HUNDRED ADELAIDE

CO-ORDINATES

ANGLE FROM HORIZ. 90° DIRECTION

HOLE NO. CH 3

SERIAL No.

R. L. Surface . . FT.

R.L. Collar . . FT.

Datum . .

DESCRIPTION OF CORE	② GROUP SYMBOL	① STRENGTH TERM VS S MS W VW SO	CORE SIZE DEPTH R.L. FT.	LOG	③ FRACTURE LOG 1 4 16 64	STRUCTURES	LIFT CORE LOSS% 10 5 50	WATER LEVEL DATE	CASING DRILL WATER LOSS% 0 100	WATER PRESSURE TESTS ④ LUGEONS 0.5 1 5 10 50 100
0 to 54 ft CABLE TOOL DRILLING see dwg no. S7746-a								2 June 70		
rubbly limestone →			55		NA	Infilling along joints as shown CLAY SOIL, low plasticity sandy, grey.				
Core mainly in continuous smooth surface sticks with solution cavities to 10 m.m. across.			60							
			65			← CLAY SOIL, infills.				not tested
Core in continuous sticks, with numerous surface pittings (solution holes.)			70			← rubbly fragments.				
numerous shells.			75			rubbly fragments				
BLANCHE POINT MARLS.					NA	CLAY SOIL, high plasticity grey green, glauconitic.				
			80			Hole continued by cable tool drilling see dwg. no. S7746-b				

UPPER PLIOCENE
HALLET COVE SANDSTONE
calcareous, fossiferous, fine grained, white to pale grey.

① ROCK SUBSTANCE STRENGTH TERM
VS–Very Strong
S–Strong
MS–Medium Strong
W–Weak
VW–Very Weak
SO–Soil properties

CONDITION TERM
Fresh
Decomposed
Weathered
Altered
Not Applicable

② Substances with soil properties remoulded and classified by Unified System

③ FRACTURE LOG
1 4 16 64 Natural fractures per foot of core
12 3 3/4 3/16 Equivalent length of core in inches

④ (3·5) Maximum effective pressure (bars) reached during test.
Min. = Minimum value.

ENGINEERING GEOLOGY SECTION

DRILL No. 24
TYPE E.100
DRILLER ASHMONEIT.
START 21 Feb '70
FINISH 22 Feb '70

LOGGED W. BOUCAUT
DATE 2 Apr. '70
TRACED S.L.T.
CHECKED R.H.

SHEET 1 OF 1. DRG. No. S7746-C Ha6

P.F. Nº S5027D MB

DEPARTMENT OF MINES · SOUTH AUSTRALIA

LOG OF CABLE TOOL HOLE

HOLE CH 4

SERIAL No.

PROJECT GOVERNMENT OFFICE BUILDING

FEATURE FOUNDATIONS

LOCATION VICTORIA SQUARE WEST

TOWN ACRE 335

HUNDRED ADELAIDE

CO-ORDS

R.L. Surface FT.

R.L. Collar FT.

Datum

GEOLOGICAL NOTES AND CLASSIFICATION	R.L. (FEET) DEPTH	GRAPHIC LOG	GROUP SYMBOL	SOIL DESCRIPTION GROUP NAME Unified Soil Classification, U.S.B.R. Earth Manual 2nd Edition 1966	WATER LEVEL	Casing	MOISTURE CONTENT	Consistency Condit. Density	FIELD TEST DATA: BLOWS PER FOOT 20 40 60 80	SOILTEST P.T. METER Units * 1 2 3 4
Silt is calcareous Numerous patches of MnO_2	5		SC-ML	SAND, excess clayey fines (up to 50%), brown, with patches of sandy SILT, off white.			MC > PL	Firm	N = 6	
			CH	CLAY SOIL, high plasticity, silty. Light brown. Sand dykes (SC) up to 3m.m. wide						
PLEISTOCENE HINDMARSH CLAY FORMATION Numerous rootlets along incipient shrinkage cracks	10		CH	CLAY SOIL, high plasticity, few sand grains (less than 15%), light grey with red-brown and yellow-brown mottling.			MC ≫ PL	Stiff	N = 9	
Slickensided joint.	15								N = 14	
	20							Very Stiff		
	25									
	30		SC	SAND, excess clayey fines mainly pale grey, some brown patches (weakly cemented). SAND grains are mainly medium grained. Fines form up to 30%			Humid	Dense		
			CH	CLAY SOIL, high plasticity				V St		
	35									

TYPE OF SAMPLE

A shoe (SA)
D " (SD)
E " (SE)
G " (SG)
Sealed Tube - A Shoe - SAL
Standard Penetration Test - SPT

Water level, (date) → 7 Dec. '66
WC ▶ Water cut
Casing

CONSISTENCY (Clays)	COMPACTNESS (Silts)	RELATIVE DENSITY (Sands)	MOISTURE CONTENT
VS. — Very Soft	Ls — Loose	VL — Very Loose	H — Humid
S — Soft	MC — Moderately Compact	L — Loose	D — Damp
F — Firm	C — Compact	MD — Medium Dense	M — Moist
St. — Stiff	VC — Very Compact	D — Dense	W — Wet
V. St. — Very Stiff		VD — Very Dense	S — Saturated
H. — Hard			LL — Liquid Limit
			PL — Plastic Limit

* These values refer to clay soils only and provide an indication of their consistency.

ENGINEERING GEOLOGY SECTION

DRILL No. 1
TYPE RUSTON BUCYRUS
DRILLER D. PHILLIPS
START 12 Feb '70
FINISH 16 Feb '70

LOGGED BY J.P.T.
DATE 30 Apr. '70
TRACED S.L.T.
CHECKED R.H.

SHEET 1 OF 3

DRG No. S7747 Ha6

PF Nº S6676 MB

DEPARTMENT OF MINES · SOUTH AUSTRALIA

LOG OF CABLE TOOL HOLE

PROJECT GOVERNMENT OFFICE BUILDING

FEATURE FOUNDATIONS

LOCATION VICTORIA SQUARE WEST

TOWN ACRE 335

HUNDRED ADELAIDE

CO-ORDS

HOLE CH 4

SERIAL No.

R.L. Surface FT.

R.L. Collar FT.

Datum

GEOLOGICAL NOTES AND CLASSIFICATION	R.L. (FEET) DEPTH	GRAPHIC LOG	GROUP SYMBOL	SOIL DESCRIPTION GROUP NAME Unified Soil Classification, U.S.B.R. Earth Manual 2nd Edition 1966	WATER LEVEL	CONSIST. MOISTURE CONTENT	Consistency Compact. Density	FIELD TEST DATA: BLOWS PER FOOT 20 40 60 80	FIELD TEST DATA: SOILTEST P.T.R. METER Units * 1 2 3 4
PLEISTOCENE HINDMARSH CLAY FORMATION	40		CH	CLAY SOIL, high plasticity, few sand grains. Light grey with yellow-brown mottling.		MC ≥ PL	Very Stiff		
Slickensided joint →	45								
Silt is highly calcareous		erosion surface	SM	SAND, excess silty fines (up to 30%), weakly cemented, pale grey to white. Contains numerous dykes of sandy clay (CH-SC) up to 2cms. wide.		D	Dense		
	50			Moderately cemented					
UPPER PLIOCENE HALLET COVE SANDSTONE	55			HOLE CONTINUED BY DIAMOND DRILL TO 76·7 FT. for detailed log see dwg. no.	2 June '70				
	60								
	65								
	70								

TYPE OF SAMPLE

A shoe (SA)
D, " (SD)
E " (SE)
G " (SG)
Sealed Tube - A Shoe - SAL
Standard Penetration Test - SPT

Water level, (date) 7 Dec. '66
WC Water cut
Casing

CONSISTENCY (Clays)	COMPACTNESS (Silts)	RELATIVE DENSITY (Sands)	MOISTURE CONTENT
VS. — Very Soft	Ls — Loose	VL — Very Loose	H — Humid
S — Soft	MC — Moderately Compact	L — Loose	D — Damp
F — Firm	C — Compact	MD-Medium Dense	M — Moist
St. — Stiff	VC — Very Compact	D — Dense	W — Wet
V. St. — Very Stiff		VD — Very Dense	S — Saturated
H. — Hard			LL — Liquid Limit
			PL — Plastic Limit

* These values refer to clay soils only and provide an indication of their consistency.

ENGINEERING GEOLOGY SECTION

DRILL No. 1
TYPE RUSTON BUCYRUS
DRILLER D. PHILLIPS.
START 12 Feb. '70
FINISH 16 Feb '70

LOGGED BY J.P.T.
DATE 30 Apr. 70
TRACED S.L.T.
CHECKED R.H.

SHEET 2 OF 3.
DRG No. S7747-a Ha6

PF Nº S6676 MB

DEPARTMENT OF MINES · SOUTH AUSTRALIA

LOG OF CABLE TOOL HOLE

HOLE CH 4

SERIAL No.

PROJECT GOVERNMENT OFFICES BUILDING

FEATURE FOUNDATIONS

LOCATION VICTORIA SQUARE WEST

TOWN ACRE 335

HUNDRED ADELAIDE

CO-ORDS

R.L. Surface FT.

R.L. Collar FT.

Datum

GEOLOGICAL NOTES AND CLASSIFICATION	R.L. (FEET) DEPTH	GRAPHIC LOG	GROUP SYMBOL	SOIL DESCRIPTION GROUP NAME Unified Soil Classification, U.S.B.R. Earth Manual 2nd Edition 1966	WATER LEVEL	COLOUR	MOISTURE CONTENT	Consistency Compact. Dens'y	FIELD TEST DATA: BLOWS PER FOOT 20 40 60 80	FIELD TEST DATA: SOILTEST P'TR'METER Units * 1 2 3 4
UPPER PLIOCENE HALLET COVE SANDSTONE	75			END OF DIAMOND DRILL HOLE 76·7 FT.						
UPPER EOCENE BLANCHE POINT MARLS: Sand is quartz, glauconite and mica. Silt is highly calcareous.	80			SILT SOIL, high plasticity, sandy, pale green-grey.			MC > PL	MC		
	85			END OF HOLE. 81 FT.						

TYPE OF SAMPLE

A shoe (SA)
D " (SD)
E " (SE)
G " (SG)
Sealed Tube - A Shoe - SAL
Standard Penetration Test - SPT

Water level, (data) → 7 Dec. '66
WC Water cut
Casing

CONSISTENCY (Clays)	COMPACTNESS (Silts)	RELATIVE DENSITY (Sands)	MOISTURE CONTENT
VS. — Very Soft	Ls — Loose	VL — Very Loose	H — Humid
S — Soft	MC — Moderately Compact	L — Loose	D — Damp
F — Firm	C — Compact	MD - Medium Dense	M — Moist
St. — Stiff	VC — Very Compact	D — Dense	W — Wet
V. St. — Very Stiff		VD — Very Dense	S — Saturated
H. — Hard			LL — Liquid Limit
			PL — Plastic Limit

* These values refer to clay soils only and provide an indication of their consistency.

ENGINEERING GEOLOGY SECTION

DRILL No. 1
TYPE RUSTIN
DRILLER D. PHILLIPS
START 12 Feb. '70
FINISH 3 Mar. '70

LOGGED BY JPT
DATE 30 Apr. '70
TRACED S.L.T.
CHECKED R.H.

SHEET 3 OF 3

DRG No. S7747-b Ha6

PF Nº S6676 MB

GOVERNMENT OFFICE

PROJECT. BUILDING.

FEATURE. FOUNDATIONS

LOCATION VICTORIA SQUARE. WEST.

DEPARTMENT OF MINES SOUTH AUSTRALIA

LOG OF DIAMOND DRILL HOLE

TOWN ACRE. 335 HUNDRED ADELAIDE.

CO-ORDINATES

ANGLE FROM HORIZ. 90° DIRECTION

HOLE NO. CH 4

SERIAL No.

R.L. Surface . . FT.

R.L. Collar . . FT.

Datum . .

DESCRIPTION OF CORE	② GROUP SYMBOL	① STRENGTH TERM VS S MS W VW SO	CORE SIZE DEPTH R.L. FT.	LOG	③ FRACTURE LOG 1 4 16 64	STRUCTURES	LIFT CORE LOSS% 10 5 50	WATER LEVEL DATE	CASING	DRILL WATER LOSS% 0 100	④ WATER PRESSURE TESTS LUGEONS 0.5 1 5 10 50 100

START OF DIAMOND DRILL HOLE. 51 FT.

7 Feb '70

Rock with infillings as shown of, CLAY SOIL, high plasticity, grey, sandy.

Numerous small voids open to 3m.m., form up to 20% of volume in places

Voids form less than 10% of volume.

Rock is LIMESTONE to CALCAREOUS SANDSTONE, partly re-crystallised and severely leached highly fossilferous

Solution cavities occur along fossils and along joints.

Core lengths from 2 to 20 cms.

2 to 5 cms lengths

Core in lengths of 5 to 20 cms.

not tested

Driller's note Rods dropped under own weight

UPPER PLIOCENE HALLET COVE SANDSTONE.

Uncemented sand

Patch of SAND (SP), poorly graded, fine grained, few silty fines

5 to 20 cms

15 % voids

2 to 15 cms. lengths

up to 3 cms lengths

55 60 65 70 75 80 85

END OF DIAMOND HOLE 76·6 FT.

HOLE CONTINUED BY CABLE TOOL DRILL

① ROCK SUBSTANCE STRENGTH TERM
VS–Very Strong
S–Strong
MS–Medium Strong
W–Weak
VW–Very Weak
SO–Soil properties

CONDITION TERM
Fresh
Decomposed
Weathered
Altered
Not Applicable

② Substances with soil properties remoulded and classified by Unified System

③ FRACTURE LOG
1 4 16 64 Natural fractures per foot of core
12 3 3/4 3/16 Equivalent length of core in inches

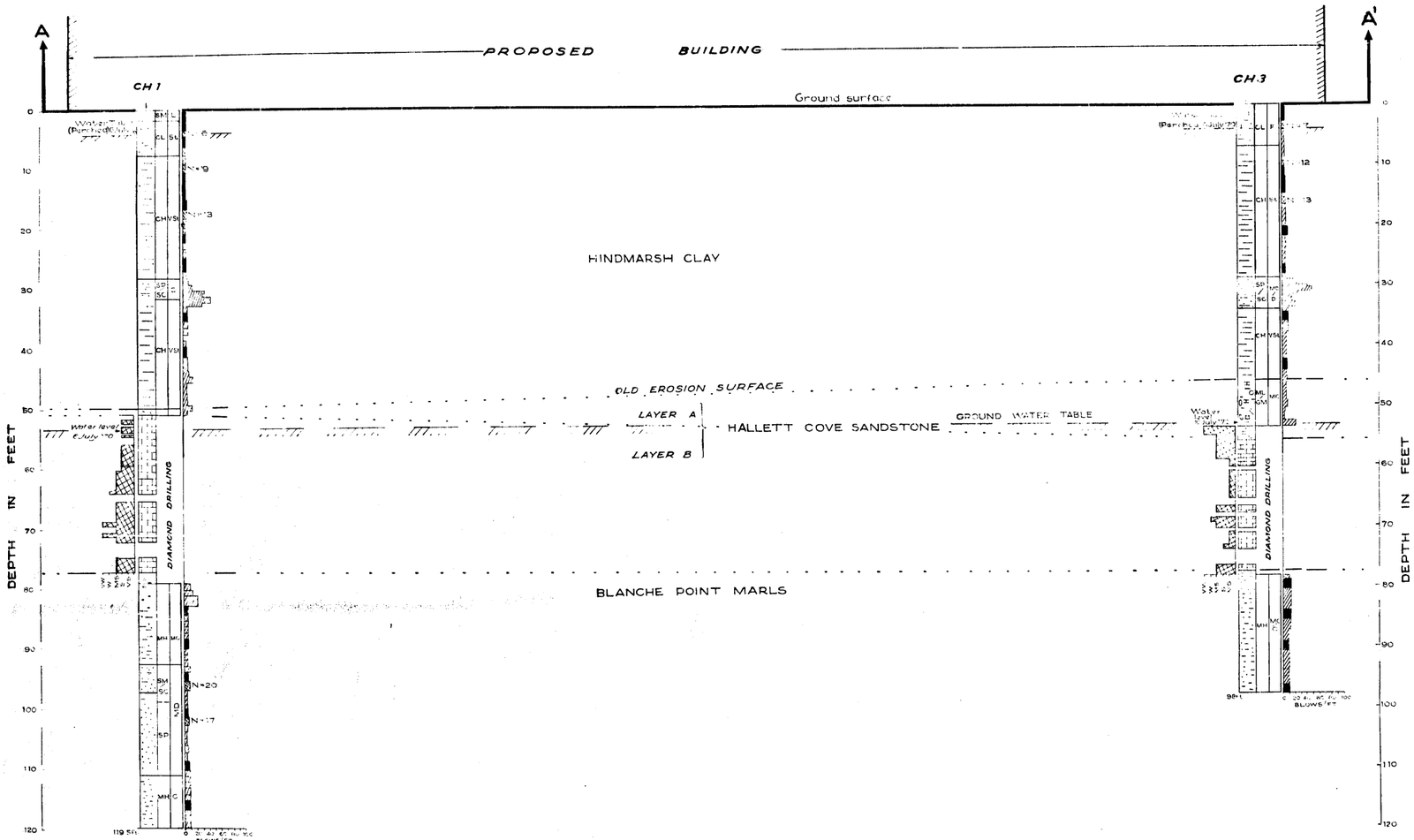
④ (3·5) Maximum effective pressure (bars) reached during test.
Min. = Minimum value.

ENGINEERING GEOLOGY SECTION

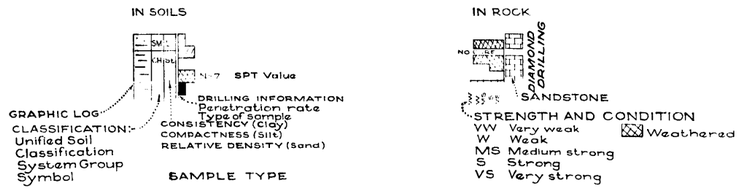
DRILL No. 24 LOGGED J.P.T.
TYPE MINDRILL E 1000
DRILLER ASH MONEIT DATE 30 Apr. '70
START 18 Feb '70 TRACED S.L.T.
FINISH 20 Feb '70 CHECKED R.H.

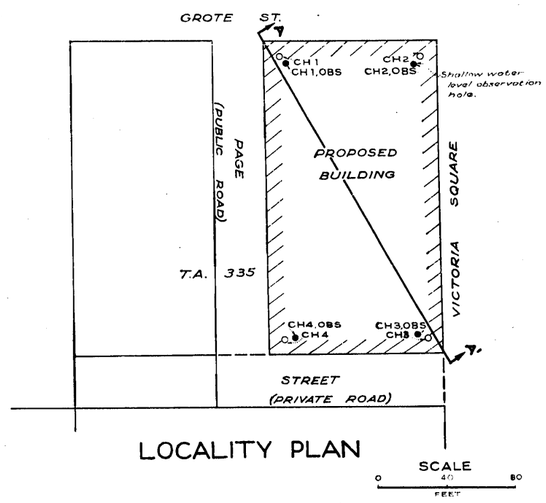
SHEET 1 OF 1 DRG. No. S7747-C

P.F. Nº S5027D MB



DRILL LOGS





UNIFIED SOIL CLASSIFICATION (in part)

	Soil Description
CH	CLAY SOIL, high plasticity
CL	CLAY SOIL, low plasticity
MH	SILT SOIL, high plasticity
SP	SAND, poorly graded
SC	SAND, excess clayey fines
SM	SAND, excess silty fines
GM	GRAVEL, excess silty fines, poorly graded gravel-sand-silt mixture

CONSISTENCY (CLAYS)

V	Very soft
S	Soft
F	Firm
St	Stiff
VSt	Very stiff
H	Hard

COMPACTNESS (SILTS)

Ls	Loose
MC	Moderately compact
C	Compact
VC	Very compact

RELATIVE DENSITY (SANDS)

VL	Very loose
L	Loose
MD	Medium dense
D	Dense
VD	Very dense

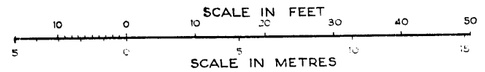


FIG. 1.

DEPARTMENT OF MINES — SOUTH AUSTRALIA

GOVERNMENT OFFICE BUILDING
T.A. 335 Hº ADELAIDE
LOCALITY PLAN AND GEOLOGICAL SECTION

ENGINEERING GEOLOGY SECTION	GEOLOGIST	Drn. W.R.D.B.	SCALE: As shown
	A. Hall 17/4/70	Ted. G.M.	70-379 H06
Director of Mines	GEN. GEOLOGIST	Chd. W.A.B.	
		Exd.	DATE: 3rd June '70

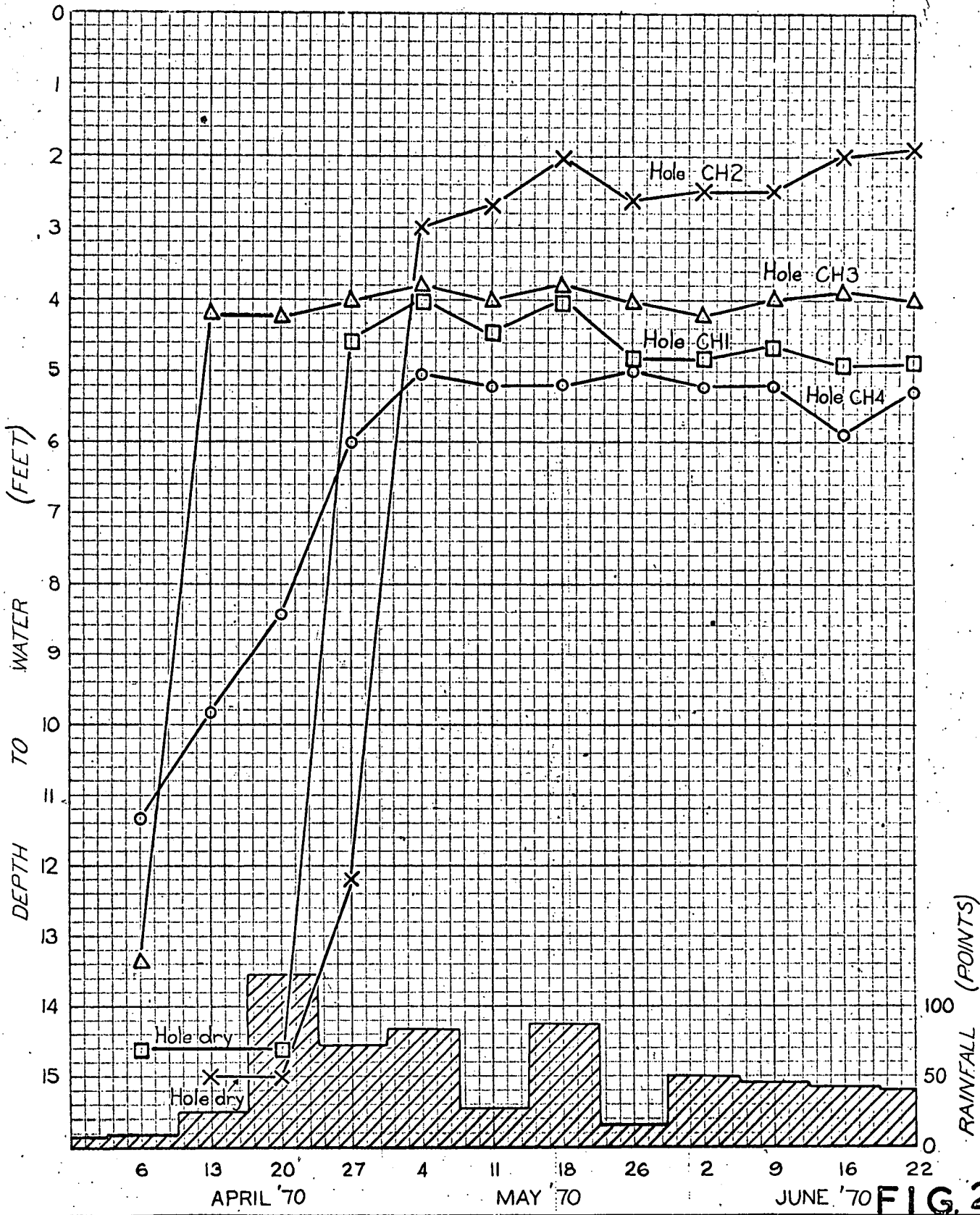


FIG. 2

	DEPARTMENT OF MINES – SOUTH AUSTRALIA	Scale: As Shown.
Compiled: W.R.P.B.	GOVERNMENT OFFICES VICTORIA SQUARE WEST OBSERVATION HOLES WATER LEVEL MEASUREMENTS	Date: 22 July 1970.
Drn. S.J.C. Ckd. L.V.W		Drg. No. S7850 Ha 6

R.F. No S7851. M.