

DEPARTMENT OF MINES AND ENERGY
SOUTH AUSTRALIA

Rept.Bk.No. 80/40

NORTHEAST TRANSIT PROJECT
KING WILLIAM STREET TUNNEL
INVESTIGATION

GEOLOGICAL SURVEY

By

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and

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RIL, 1980.

D.M. No: 207/79
Eng. No: 1979/24

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ABSTRACT

Eighteen stratigraphic and material testing holes were drilled along King William Street, as part of a feasibility study for an underground railway.

Drilling penetrated the Hindmarsh Clay and the calcareous Hallett Cove Sandstone which overlie, with a slight unconformity, sandy and silty marine Tertiary formations.

A tunnel would penetrate the Hallett Cove Sandstone at the Parade Ground in the north, but would soon pass into the Hindmarsh Clay and remain in it until the terminus at Victoria Square. Thus apart from a small section in sandstone of variable strength, some of which may require blasting, all the tunnel could be excavated by tunnelling machine.

Piezometers were set in all sandy aquifers and indicate that water levels in all would be below the tunnel except for a minor perched sandy aquifer in the Hindmarsh Clay.

INTRODUCTION

The site investigation stage of the feasibility study for a tunnel below King William Street was carried out for the Department of Transport during August and September 1979. The tunnel was planned to carry a light rail system from the existing Glenelg Tram Terminal in Victoria Square, 1125 m northward to the Torrens Parade Ground where it would continue as the proposed Northeast Transit Project rail system.

Site investigations for the Northeast Transit Project had commenced early in 1979 (Beal, 1979).

The geotechnical studies were assigned to Coffey and Partners who designed an investigation programme involving 14 stratigraphic and material sampling holes and 4 holes to be used for in-situ testing of materials.

Location of all holes drilled are shown in Figure 1 together with a generalised cross-section based on the logs of the stratigraphic holes. Engineering geological logs and photographs of all drillholes are given in the Appendix.

DRILLING PROGRAMME

A Department of Mines and Energy Gemco rig was used to drill 10 of the stratigraphic holes and a cable tool plant drilled KW 14. Push tube samples were taken for laboratory testing at selected intervals and Coffey and Partners used a pressure meter in KW 8 and KW 9 to determine in-situ stresses within the Hallett Cove Sandstone.

In general the clay sequence was sampled by hollow flight auger and either split tube or solid core barrel. The stronger sandstones were diamond drilled. Water was initially used for circulation but loose sandy parts of the sequence were lost, so that mud was then used to better effect.

In addition to the above drilling, 3 stratigraphic and 4 in-situ test holes were drilled by the Engineering and Water Supply Department's Gemco rig. Dutch Cone Penetrometer soundings and self boring pressure meter tests were carried out in the in-situ test holes.

Logs of all stratigraphic holes are included in Appendix A, and a summary of drilling is given in Table 1.

TABLE 1

SUMMARY OF DRILLING

HOLE No.	POSITION	DEPT.	TEST	COMPLETION	COLLAR EL. (m)	DEPTH (m)	BASE EL (m)	STRATA
KW1	VICTORIA SQUARE	DME	S		45.03	15.06	29.97	Hu, Hs, HL
2	VICTORIA SQUARE (NTH)	DME	S		45.12	19.80	25.32	Hu, Hs, HL Hc.
2	" "	EWS	DC, SB		44.97	16.00	28.97	Hu, Hs, HL
3	TOWN HALL	DME	S		45.31	30.00	15.31	Hu, Hs, HL PW
4	GRENFELL ST.	EWS	S	X	44.94	13.80	31.14	Hu, Hs, HL
4	" "	EWS	RP	X	44.96	13.00	31.94	Hu, Hs, HL
5	CLARENCE PL.	DME	S		43.77	31.65	12.12	Hu, Hs, HL Hc, CG, TS
6	RUNDLE ST.	EWS	S		43.07	21.30	21.77	Hu, Hs, Hc
6	" "	EWS	DC, RP		43.10	17.50	25.60	Hu, Hs, Hc
7	HINDLEY ST.	DME	S		42.82	22.25	20.57	Hu, Hs, Hc CG.
8	FOWLERS LANE	DME	RP		42.26	19.20	23.06	Hu, HC.
9	PARLIAMENT HOUSE	DME	RP	X	37.74	12.50	25.24	Hu, HC.
10	GOVT. DOMAIN	EWS	S		37.26	6.50	30.76	Hu.
10	" "	EWS	DC.SB		37.41	12.50	24.91	Hu, Hc
11	" "	DME	S		35.93	13.83	22.10	Hu, Hc, CG TS.
12	" "	DME	S		33.63	10.41	23.22	Hc, CG
13	" "	DME	S		33.58	16.00	17.58	Hc, CG, TS GR.
14	VICTORIA SQ. (STH.)	DME	S		44.74	16.75	27.99	Hu, Hs, H1 Hc.

Test Key

S = Stratigraphy only

DC = Dutch Cone Penetrometer Sounding

RD = Rock Pressure Meter

SB = Self Boring Pressure Meter

X = Unsatisfactory Completion due to technical difficulties

Strata Key

Hu = Hindmarsh Clay upper stiff clay member

Hs = Hindmarsh Clay sand member

H1 = Hindmarsh Clay, lower hard clay member

Hc = Hallett Cove Sandstone

PW = Port Willunga Formation

CG = Chinaman Gully Formation, Silt

TS = Tandanya Sand Member

GR = Gull Rock Member, Marl.

Piezometers were installed in 9 of the DME holes and 2 of the E & W.S. holes. Details of piezometers are summarised in Table 3 and shown in Figure 1.

GENERAL GEOLOGY

In the City area the sandy Hindmarsh Clay overlies and laps onto the carbonate cemented Hallett Cove Sandstone. The interface is a karstic erosion surface so that the lower part of the Hindmarsh Clay contains fragments of sandstone and infills solution cavities in the sandstone. The lower part of the Hindmarsh Clay is known as the Transition Unit which for engineering purposes has been included with the Hallett Cove Sandstone (as Zone A).

There is an angular unconformity between the near horizontal Hallett Cove Sandstone and the earlier Tertiary Formations which dip about 1° southerly. A comprehensive description of the engineering geology of the city area is given in Selby and Lindsay (1980).

The stratigraphy is summarised in Table 2 and shown in the section in Fig. 1.

TABLE 2
SUMMARY OF STRATIGRAPHY

UNIT	SUBDIVISION	THICKNESS (m)
HINDMARSH CLAY	Upper stiff clay member	>10
	Sandy clay member	0-5
	Lower hard clay member	0-6
HALLETT COVE SANDSTONE	Zone A Transitional Unit	0.5-2.5
	Zone B Massive calcareous sandstone	2.5-6.5
	Zone C Sand with some sandstone bands	0.5-2.5
	Zone D Shelly sandstone and sand	0-1.5
PT. WILLUNGA FORMATION	Upper silty member	not measured
	Aldinga Sand member	2.5
CHINAMAN GULLY FORMATION	Silty member	not measured
	Tandanya sand Member	2.0-2.5
BLANCHE POINT FORMATION	Gull Rock Member	not measured

HINDMARSH CLAY

This widespread unit can be subdivided into three distinct members:

Upper Stiff Mottled Clay Member

A light grey to buff coloured stiff clay with evidence of joints and fissures. Mottled in shades of yellow and red-brown. Quartz grains of sand-size are common but not abundant varying in quantity from scattered grains to 2%. The upper three metres is often characterised by the development of carbonate which gives the clay a cream colour and in the presence of moisture results in a low strength. This carbonate layer is known locally as the 'calcareous mantle'.

Pocket penetrometer readings indicate a compressive strength range of 150 to 400 k Pa. The weaker readings are near the surface. Recognisable joints have been logged but must be regarded with some reservations since many could have been induced during the drilling operation.

Middle Clay Sandy Member

This member is recognisable between Victoria Square and Hindley Street. Further north the Upper member lies directly on top of the Hallett Cove Sandstone Transition Zone (Fig. 1) as a result of Sedimentary onlapping.

In general the Middle sandy clay member is a dense, fine grained, clayey sand up to 5 m thick. The sand member is thickest near Clarence Place (KW5*). It thins southerly whilst remaining sand rich but it disappears northward, not by thinning but by decrease of sand (KW6, KW7). Occasional pebbles up to km in diameter appear to have been derived from the Hallett Cove Sandstone. Colour is basically light grey, but strong red mottling and red banding is common.

* refers to drill hole member.

The intense red mottling and red bands are assumed to be due to the passage of oxygenated water through the more sandy bands. Moisture content was high at the north end of Victoria Square (KW 2) and opposite the Town Hall (KW 3).

Lower Hard Mottled Clay Member

Similar to the upper clay member in all respects with the exception that the consistency is typically hard when determined with pocket penetrometer (>500 Kpa). This member is only present south of Hindley Street.

HALLET COVE SANDSTONE

The Hallett Cove Sandstone subcrops in the southern part of the Government Domain and was once quarried for building stone just to the north. Four zones have been recognised in the city area in previous work (Selby and Lindsay, 1980).

These have been summarised below:

ZONE A-Transition Zone

Up to 2.5 m of clay or silt with carbonate and sandstone rubble and some sand content, the Transition zone outcrops at the northern edge of the Government Domain and reaches its maximum thickness between Hindley and Pirie Streets.

As an engineering material the Transition Zone must be considered to be of low strength, very variable consistency, and very sensitive to changes in strength with changing moisture content.

ZONE B - Massive Calcareous Sandstone

Thickness ranges from 2 to 5 m. The Sandstone is generally white in colour, with a carbonate cement and frequently has voids up to 2 cms representing shell casts. The rock mass is medium strong to strong but sections of core with abundant shell casts can be broken fairly easily with a hammer. Some sand intervals are present and clay and silt intervals were intersected in KW 10, 11, 12, 13 at the northern end of the proposed tunnel and in KW8.

These clay and silt intervals probably represent solution cavities infilled with fine sediment. The overall strength of the rock as a unit will vary considerably depending upon the proximity, size and number of cavities.

ZONE C - Sand with some sandstone bands

A very variable zone of medium-dense sands with sandstone bands up to 30 cms in thickness. Colour is brown or orange and fragments of shell are common.

ZONE D - Shelly Sandstone and Sand

Thickness varies from 0 to 1.5 m and colour brown to orange. Large oyster shells are common with less common gasteropod and scallop shells. The sands are generally fine and medium-dense and where rock is present it is weak to medium-strong.

It is not always easy to distinguish between the unit and the underlying weathered, reworked, Tertiary marls, silts and sands.

UNDERLYING TERTIARY FORMATIONS

The Hallett Cove Sandstone unconformably overlies a series of silts, marls, and sands which in general dip towards the south at about 1 degree.

Although the tunnel will not pass through these formations, of possible engineering significance are the low strength of the silts and the fact that the sands are confined aquifers which may be discharging into the base of the overlying sandstone. (Fig. 1). This assumption is strengthened by the similarity of water levels of the Port Willunga Formation and Hallett Cove sandstone (see GROUNDWATER).

Port Willunga Formation

Hole KW3 passed through 3 m of light grey to brown mottled silt which has been interpreted as the lowest part of the Port Willunga marl immediately overlying the basal sand aquifer. KW5 also passed through part of this unit (Lindsay, J.M. pers. Comm.)

2.5 m of silty, fine grained, light brown sand forms the confined aquifer, which is interpreted to represent the Aldinga Member of the Port Willunga Formation.

Chinaman Gully Formation

30 cm of silt in KW3 and 5.5 m of similar material in KW5 are regarded as being the weathered product of the Chinaman Gully Formation (LINDSAY, J.M. & HARRIS, W.K., 1979).

Tandanya Sand Member

This unit is represented in KW5, KW11 and KW13.

IN KW5, 2.5 m of medium grained grey sand is present.

KW3 intersected 1.9 m of fine to coarse grained grey sand.

From the cross section (Fig. 1) it appears that the Tandanya Sand Member should subcrop beneath the Torrens Parade Ground.

Blanche Point Marl

KW13 was completed in 3.4 m of light grey silt and siltstone with fossil traces. This represents the partly weathered top of the Blanche Point Marl and is the lowest and oldest geological unit penetrated by the current drilling programme.

In the weathered state it should be regarded as having the properties of a low density silt and where less weathered a gravel or very weak rock.

GROUNDWATER

Hindmarsh Clay

Wet zones were encountered in some holes on the calcreted upper surface of the Hindmarsh Clay. These zones contain small amounts of perched water which may be associated with depressions on a gilgai surface. Fissures in the clay may be expected to contain water but none were encountered by drilling.

Damp or wet zones were encountered in KW1, KW2, KW3 in the middle sand member. A piezometer was set in KW1 but did not make water. It was reported that roof runoff discharged into this aquifer however the high salinity of the groundwater (Appendix B) makes this seem unlikely. Where water was present in the sand member the lower stiff Hindmarsh Clay was wet for a few centimetres below the contact but otherwise unaffected.

Hallett Cove Sandstone (Aquifer 1)

The sandstone is saturated for its full thickness beneath Victoria Square and appears to be fully drained at the northern end of the Government Domain (Fig. 2). Observed water levels thus conform broadly to the previously understood pattern in which a gentle piezometric gradient was believed to run from south to north with the implications of discharge into the alluvium of the River Torrens.

Port Willunga Formation Basal Sand (Aquifer 2)

KW3 was completed as a piezometer within the sand. The piezometric level is very close to that in the overlying Hallett Cove Sandstone which suggests that the two aquifers are in hydraulic continuity where the confined aquifer is overlapped by the Hallett Cove Sandstone. It is possible that the two units are in contact from KW5 to KW7.

If this is the case it is possible that flows may occur either from or to the confined aquifer depending upon piezometric levels. Increasing utilisation of the confined aquifer to the south of the city may result in a lowering of levels to the extent that the overlying sandstone may be partially drained in the city area.

Tandanya Sand Member (Aquifer 3)

Three holes KW5, KW11, KW13, intersected the Tandanya Sand Member and KW5 and KW13 were completed as piezometers in the sand.

Observed water levels indicate a gradient towards the north with the sand only partly saturated at KW13 i.e. at the northern end of the Government Domain.

The piezometric level is 2 to 3 metres below that of the Hallett Cove Sandstone indicating that the two aquifers are not hydraulically continuous at the present time although it seems probable that prior to the establishment of the quarry which is now occupied by the Parade Ground, the Tandanya Sand aquifer was directly overlain by Hallett Cove Sandstone, thus permitting movement of water from aquifer to aquifer on the line of section.

The quarrying has resulted in both aquifers being drained in the immediate vicinity of the Parade Ground.

Piezometers

50 mm diameter piezometers were installed in 9 of DME holes (except KW9) and 25 mm piezometers were left in E & W.S. holes at sites KW6 and KW10 (KW10 was dry and KW6 has been obscured by bitumen). Details of piezometers are shown in Table 3 and Figure 1.

TABLE 3

DETAILS OF PIEZOMETERS

HOLE NO.	SLOTTED INTERVAL (M)	FORMATION	S.W.L.R.L. (M) MN1979
KW 1	8.29-11.52	Hindmarsh clay, Sand Member	Dry
2	18.3-19.80	Hallett Cove Sandstone	27.2
3	26.0-29.0	Pt. Willunga Sand	26.7
5	29.5-31.0	Tandanya Sand Member	24.8
6	19.0-20.5	Hallett Cove Sandstone	Wet but blocked
7	15.5-21.0	" " "	26.0
8	17.5-19.0	" " "	25.36
10A	10.5-12.0	" " "	Dry
11	10.0-11.5	" " "	Dry
12	7.3-9.18	" " "	Dry
13	10.5-13.5	Tandanya Sand Member	22.26

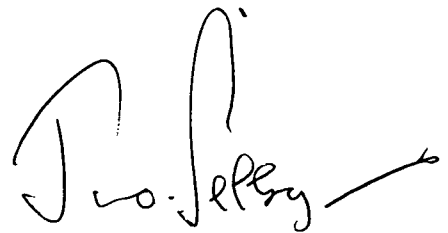
DISCUSSION

The drilling programme has shown that the engineering geology conforms to that of earlier work, particularly that of Cox (1970) and Selby and Lindsay (1980).

Most of the proposed route will pass through Hindmarsh Clay, which is generally regarded as an ideal tunnelling medium. The northern section of the route will pass through Hallett Cove Sandstone which may present difficulties for a tunnelling machine due to its variable nature, and the abrasive properties of the stronger rock material found in Zone B; it may be that hand tunnelling or cut and cover methods may be more effective along this section of the route as blasting may be necessary.

Groundwater is not expected to be a problem. The entire tunnel route will be above the water table (as recorded in August 1979) although the effect of seasonal fluctuation is not presently known. Only minor amounts of seepage water are likely to be encountered in the sand member near Victoria Square but this is not expected to cause significant problems with tunnel drainage or wall stability.

CC;DA:NK



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APPENDIX A

DRILL LOGS

PROJECT: NORTHEAST TRANSIT CORRIDOR PROJECT - FOUNDATION INVTON.				DEPARTMENT OF MINES AND ENERGY - SOUTH AUSTRALIA ENGINEERING DIVISION				HOLE NO. K.W. 1																																			
LOCATION OR CO-ORDS: Nth. Victoria Square 30m. Southwest from fountain				LOG OF FOUNDATION HOLE				UNIT/STATE NO: GG2841m EW11101																																			
SEC. HD.				EL Surface EL ref. point Datum				SERIAL NO:																																			
FOLDER NO:				FIELD TEST DATA				BLOWS PER 30 cm																																			
GEOLOGICAL DESCRIPTION OF CORE				SOIL DESCRIPTION GROUP NAME Unified Soil Classification U.S.B.R. Earth Manual 2nd Edition 1966				WATER LEVEL CASE TUBE MOISTURE CONTENT Consistency Compct Density				SOIL TEST PENETROMETER Units *																															
HOLE Dia				DEPTH m				GRAPHIC LOG				GROUP SYMBOL				WATER CUT				D MD				W F St				K PL				V St				4 8 16 32 64				1 2 3 4			
SAND GARDEN LOAM AS FILL				0				SM				SAND, silty, fine dark brown				Water Cut				D MD																							
UNIFORM VERY STIFF LIGHT GREY CLAY, MOTTLED YELLOW AND RED-BROWN WITH SCATTERED SAND GRAINS. CONTAINING CLOSELY SPACED, UNDULOSE, ROUGH, CLEAN, NON FRIABLE FIZZURES, AND MODERATELY TO WIDELY SPACED UNDULOSE, ROUGH AND SHINY, SLIGHTLY FRIABLE FIZZURES PARTLY LIMONITE STAINED ALSO OCCASIONAL ISOLATED FIZZURES (Joints) UNDULOSE, STRIATED, SHINY SURFACES				1 2 3 4 5 6 7 8 9 10				CH				Red brown mottled clay calcareous at base. CLAY, light grey, red and yellow mottled with scattered sand grains JOINT 55° to core axis JOINT 53° JOINTS 35° 50° 58° JOINT 30° JOINT 40° JOINT 20° JOINT 40° JOINT 65°				W F St K PL V St																											
DENSE FINE CLAY SAND				10				SC SM				SAND, fine to medium grained, red mottled, clay rich in part, occasional gravel-sized fragments of white sandstone				D D																											

WATER LEVELS	MOISTURE CONTENT	CONSISTENCY (Clays)	COMPACTNESS (Sils)	RELATIVE DENSITY (Sands)	TYPE OF SAMPLE	* Penetrometer value x100 = unconfined compressive strength in kPa for clay soils only	
7 Dec 66 Water level (date) WC Water Cut	H - Humid D - Damp M - Moist W - Wet S - Saturated LL - Liquid Limit PL - Plastic Limit	VS - Very Soft S - Soft F - Firm St - Stiff V St - Very Stiff H - Hard	LS - Loose MC - Moderately Compact C - Compact VC - Very Compact	VL - Very Loose L - Loose MD - Medium Dense D - Dense VD - Very Dense	OPEN TUBE A Shoe D Shoe SEALED TUBE WITH NUMBER A 1 2 3 4 5 STANDARD PENETRATION TESTS 9 12 3 4 Total blows for 0.3m (in 0.1m increments)	DRILL TYPE: GEMCO hollow auger CIRCULATION: START: 13-8-79 FINISH: 14-8-79	LOGGED BY: C. Connor DATE: 19-9-79 TRACED BY: C. J. W. DATE: 3-3-80

50mm Diameter CONE TEST eg 10 3 4 3

SHEET 1 OF 2

PROJECT: NORTHEAST TRANSIT CORRIDOR
PROJECT - FOUNDATION INVTGN.

LOCATION OR CO-ORDS: Nth Victoria Square
30m. Southwest from fountain

SEC. _____ HD _____

EL Surface

EL ref. point

Datum

HOLE NO. KWI.

UNIT/STATE NO:

662841m EW 11101

SERIAL NO:

FOLDER NO.

LOG OF FOUNDATION HOLE

GEOLOGICAL DESCRIPTION OF CORE		HOLE Dia	DEPTH m	GRAPHIC LOG	GROUP SYMBOL	SOIL DESCRIPTION GROUP NAME Unified Soil Classification U.S.B.R. Earth Manual 2nd Edition 1966	WATER LEVEL	MOISTURE CONTENT	Consistency	Compact Density	FIELD TEST DATA	
											BLOWS PER 30 cm	SOIL TEST PENETROMETER Units *
											4 8 16 32 64	1 2 3 4
SAND MEMBER	DENSE CLAYEY FINE TO MEDIUM GRAINED SAND		10		SC SM	SAND, fine to medium grained, red mottled, clay rich in part.	SLOTTED 8.9 - 11.52 m.	D	D	H		
	HARD CLAY OTHERWISE SIMILAR TO INTERVAL 1.0 - 9.0 m.		11									
HINDMARSH CLAY (LOWER)			12		C.H.	CLAY, Yellow mottled some sand grains						
			13									
			14									
			15									
						End of hole, 15.06 m.						
						x Push tube Samples 4.8 - 5.2 m 8.0 - 8.3 m 12.0 - 12.4 m 14.8 - 15.06 m						

WATER LEVELS	MOISTURE CONTENT	CONSISTENCY (Clays)	COMPACTNESS (Silt)	RELATIVE DENSITY (Sands)	TYPE OF SAMPLE	* Penetrometer value X100 = unconfined compressive strength in kPa for clay soils only		
7 Dec '66 Water level (date) WC Water Cut Casing	H - Humid	VS - Very Soft	LS - Loose	VL - Very Loose	OPEN TUBE	DRILL TYPE GEMCO hollow auger	LOGGED BY: C. Conner	
	D - Damp	S - Soft	MC - Moderately Compact	L - Loose	A Shoe D Shoe	CIRCULATION:	DATE: 19-9-79	
	M - Moist	F - Firm	C - Compact	MD - Medium Dense		SEALED TUBE WITH NUMBER	START: 13-8-79	TRACED BY: C. J. W.
	W - Wet	St - Stiff	VC - Very Compact	D - Dense	1 2 3 4 5	STANDARD PENETRATION TESTS:	FINISH: 14-8-79	DATE: 3-3-80
	S - Saturated	V St - Very Stiff	H - Hard	VD - Very Dense	9 12,3,4	Total blows for 0.3m (in 0.1m increments)		
LL - Liquid Limit		☒ 50mm Diameter CONE TEST eg 10:34:3			SHEET 2 OF 2			
PL - Plastic Limit								

PROJECT: NORTHEAST TRANSIT CORRIDOR PROJECT - FOUNDATION INVTGN.				DEPARTMENT OF MINES AND ENERGY - SOUTH AUSTRALIA ENGINEERING DIVISION				HOLE NO. KW 2				
LOCATION OR CO-ORDS:				LOG OF FOUNDATION HOLE				UNIT/STATE NO: 6628 41m EW 11102				
SEC. HD.				EL Surface EL ref. point Datum				SERIAL NO:				
								FOLDER NO.				
GEOLOGICAL DESCRIPTION OF CORE		HOLE Dia DEPTH m	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	FIELD TEST DATA	
											BLOWS PER 30 cm	SOIL TEST PENETROMETER Units *
SAND MEMBER	As for hole KW1	10		CH x	SAND, fine to medium grained red mottled, clay rich above 11. m. Occasional gravel sized (0.5mm) fragments of white sandstone	WATER CUT: 17.8.79	UNSLOTTED	V.5H	M D	SOLID TUBE		
		11		x								
		12										
HINDMARSH CLAY (LOWER)	As for hole KW1	13		CH	CLAY, light grey, red and yellow mottled. Scattered fine sand grains x As above but some parts sandier.	UNSLOTTED	V.5H	M D	SPLIT TUBE			
		14										
		15										
		16										
		17										
		18										
TRANSITIONAL UNIT		18		CL	CLAY, fine sandy with carbonate and some fragments of white sandstone.	UNSLOTTED	V.5H	M D	SOLID TUBE			
		19										
HALLETT COVE SANDSTONE	VUGGY WHITE SANDSTONE, IN PARTS MASSIVE AND RUBBLY. NUMEROUS SOLUTION. CAVITIES SANDY CLAY FILLED.	19		GM	White Calcareous rock with sandstone fragments	SLOTTED	V.5H	M D	SOLID TUBE			
		20										
		20	E.O.H.		10-80m. x Push-tube Samples							

WATER LEVELS	MOISTURE CONTENT	CONSISTENCY (Clays)	COMPACTNESS (Silt)	RELATIVE DENSITY (Sands)	TYPE OF SAMPLE	* Penetrometer value X100 = unconfined compressive strength in kPa for clay soils only		
Water level (date) WC Water Cut	H - Humid D - Damp M - Moist W - Wet S - Saturated LL - Liquid Limit PL - Plastic Limit	VS - Very Soft S - Soft F - Firm St - Stiff V St - Very Stiff H - Hard	Ls - Loose MC - Moderately Compact C - Compact VC - Very Compact	VL - Very Loose L - Loose MD - Medium Dense D - Dense VD - Very Dense	OPEN TUBE A Shoe D Shoe SEALED TUBE WITH NUMBER A 1 2 3 4 5 STANDARD PENETRATION TESTS 9 (2,3,4) Total blows for 0.3m (in 0.1m increments)	DRILL TYPE GEMCO split tube: solid tube CIRCULATION: START: 15.8.79 FINISH: 16.8.79	LOGGED BY: C. Conner DATE: 21.8.79 TRACED BY: C. J. W. DATE: 4.3.80	
	50mm Diameter CONE TEST eg 10343.						SHEET 2 OF 2	

PROJECT: NORTHEAST TRANSIT CORRIDOR
PROJECT - FOUNDATION INVTGN.

LOCATION OR CO-ORDS: King William Street
opposite Town Hall.

SEC. _____ HD _____

EL Surface

EL ref. point

Datum

HOLE NO. KW 3

UNIT/STATE NO:

6628 41m EW 11103

SERIAL NO:

FOLDER NO.

LOG OF FOUNDATION HOLE

GEOLOGICAL DESCRIPTION OF CORE		HOLE Dia	DEPTH m	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	Compaction Density	FIELD TEST DATA		
											BLOWS PER 30 cm	SOIL TEST PENETROMETER Units *	
											4 8 16 32 64	1 2 3 -	
SAND MEMBER	DENSE FINE CLAYEY SAND	10		Sc	SAND, variable clay content, mainly fine grained. Light gray, red mottled. Slightly indurated where high iron content.								
	UNIFORM, HARD, YELLOW MOTTLED, CLAY	11											
		12		CH	CLAY, Light gray, yellow mottled. Minor sand.								
		13			* Push tube samples								
HINDMARSH CLAY (LOWER)	TRANSITIONAL UNIT	14											
		15											
		16											
	17		CH	CLAY, with white calcareous grains.									
HALLETT COVE SANDSTONE	RUBBLY CALCAREOUS SANDSTONE	18		CL Sp	CLAY, green gray, appreciable fine sand. Numerous white calcareous and sandstone fragments								
		19											
		20		Highly GM weathered	SANDSTONE, SAND rubby and variable with minor intervals of gray green sandy clay.								

WATER LEVELS	MOISTURE CONTENT	CONSISTENCY (Clays)	COMPACTNESS (Silt)	RELATIVE DENSITY (Sands)	TYPE OF SAMPLE	* Penetrometer value X100 ≈ unconfined compressive strength in kPa for clay soils only	
Dec '66 Water level (date) WC Water Cut Casing	H -- Humid	VS -- Very Soft	LS -- Loose	VL -- Very Loose	OPEN TUBE	DRILL TYPE GEMCO split tube diamond	LOGGED BY: C. Conor
	D -- Damp	S -- Soft	MC -- Moderately Compact	L -- Loose	 A Shoe	CIRCULATION: mud-water	DATE: 24-9-79
	M -- Moist	F -- Firm		MD -- Medium Dense	 D Shoe	START: 7-9-79	TRACED BY: C. J. W.
	W -- Wet	St -- Stiff	C -- Compact	D -- Dense	SEALED TUBE WITH NUMBER	FINISH: 10-9-79	DATE: 5-3-80
	S -- Saturated	V St -- Very Stiff	VC -- Very Compact	VD -- Very Dense	A 1 2 3 4 5		
	LL -- Liquid Limit	H -- Hard			STANDARD PENETRATION TESTS		
PL -- Plastic Limit					9 12,3,4		
50mm Diameter CONE TEST eg 10 3 4 3					Total blows for 0.3m (in 0.1m increments)		

DEPARTMENT OF MINES AND ENERGY — SOUTH AUSTRALIA ENGINEERING DIVISION		HOLE NO. KW 3.																			
PROJECT: NORTHEAST TRANSIT CORRIDOR PROJECT - FOUNDATION INVTGN.		UNIT/STATE NO: 6628 41m EW11103																			
LOCATION OR CO-ORDS: King William Street opposite Town Hall.		SERIAL NO:																			
SEC. HD.		FOLDER NO.																			
LOG OF FOUNDATION HOLE		EL Surface EL ref. point Datum																			
GEOLOGICAL DESCRIPTION OF CORE	HOLE Dia	DEPTH m	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 30 cm 4 8 16 32 64	SOIL TEST PENETROMETER Units * 1 2 3 4									
HALLETT COVE SANDSTONE		20		Highly weathered SANDSTONE - GM.	SANDSTONE, SAND rubbly and variable.	UNSLOTTED	SLOTTED	DIAMOND DRILLING	C	MD	E.O.H.	30.0m.									
		21																			
PORT WILLUNGA FORMATION MARL		22		ML	SILT, light grey, brown mottled.	UNSLOTTED	SLOTTED	DIAMOND DRILLING	C	MD	E.O.H.	30.0m.									
		23																			
		24																			
		25																			
SAND		26		SM	SAND, Fine, silty, light brown.	UNSLOTTED	SLOTTED	DIAMOND DRILLING	C	MD	E.O.H.	30.0m.									
		27																			
		28																			
		29																			
		30		ML	SILT, light brown																

WATER LEVELS	MOISTURE CONTENT	CONSISTENCY (Clays)	COMPACTNESS (Sils)	RELATIVE DENSITY (Sands)	TYPE OF SAMPLE	* Penetrometer value X100 = unconfined compressive strength in kPa for clay soils only	
7 Dec. '66 Water level (date) WC Water Cut	H - Humid D - Damp M - Moist W - Wet S - Saturated LL - Liquid Limit PL - Plastic Limit	VS - Very Soft S - Soft F - Firm St - Stiff V.St - Very Stiff H - Hard	Ls - Loose MC - Moderately Compact C - Compact VC - Very Compact	VL - Very Loose L - Loose MD - Medium Dense D - Dense VD - Very Dense	OPEN TUBE A Shoe D Shoe SEALED TUBE WITH NUMBER A12345 STANDARD PENETRATION TESTS 9 12.3.4 Total blows for 0.3m (in 0.1m increments)	DRILL TYPE GEMCO split tube, diamond CIRCULATION: mud-water START: 7.9.79 FINISH: 10.9.79	LOGGED BY: C. Conner DATE: 24.9.79 TRACED BY: C.J.W. DATE: 5.3.80

50mm Diameter CONE TEST eg. 10:3.4:3

SHEET 3 OF 3

PROJECT: NORTHEAST TRANSIT CORRIDOR
PROJECT - FOUNDATION INVTGN

LOCATION OR CO-ORDS: King William St.
60m. South of Granfall Street.

SEC. _____ HD. _____

EL Surface

EL ref. point

Datum

HOLE NO. KW 4.

UNIT/STATE NO:

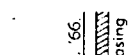
6628 41m EW 11104.

SERIAL NO:

FOLDER NO.

LOG OF FOUNDATION HOLE

[illegible]

WATER LEVELS	MOISTURE CONTENT	CONSISTENCY (Clays)	COMPACTNESS (Silt)	RELATIVE DENSITY (Sands)	TYPE OF SAMPLE	* Penetration value $\times 100 \approx$ unconfined compressive strength in kPa for clay soils only	
	H --- Humid D --- Damp M --- Moist W --- Wet S --- Saturated LL --- Liquid Limit PL --- Plastic Limit	VS --- Very Soft S --- Soft F --- Firm St --- Stiff V St --- Very Stiff H --- Hard	Ls --- Loose MC --- Moderately Compact C --- Compact VC --- Very Compact	VL --- Very Loose L --- Loose MD --- Medium Dense D --- Dense VD --- Very Dense	OPEN TUBE  A Shoe  D Shoe SEALED TUBE WITH NUMBER  12345 STANDARD PENETRATION TESTS  9 (2,3,4) Total blows for 0.3m (in 0.1m increments)	DRILL TYPE GEMCO auger diamond CIRCULATION: mud START: 9-79 FINISH: 9-79	LOGGED BY: C. Connor DATE: 24-9-79 TRACED BY: C. J. W. DATE: 5-3-80
☒ 50mm Diameter CONE TEST eg. 10.343.					SHEET 2 OF 2		

PROJECT: **NORTHEAST TRANSIT CORRIDOR**
PROJECT - FOUNDATION INVTGN.

LOCATION OR CO-ORDS: **King William St.**
55m South from Rundle Mall.

SEC. HD.

DEPARTMENT OF MINES AND ENERGY - SOUTH AUSTRALIA
ENGINEERING DIVISION

LOG OF FOUNDATION HOLE

EL Surface

EL ref. point

Datum

HOLE NO. **KW 5.**

UNIT/STATE NO:

6628 41a EW 11105

SERIAL NO:

FOLDER NO.

GEOLOGICAL DESCRIPTION OF CORE		HOLE Dia	DEPTH F	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																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																		
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HINDMARSH CLAY (UPPER)		As for KW 1.	0			Precollared part of hole																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								</

As for KW 1.

HINDMARSH CLAY (UPPER)

SAND MEMBER

DENSE FINE CLAYEY SANDS

Precollared part of hole

Calcareous sandy clay
Carbonate decreasing with depth

CLAY, light grey, red and yellow mottled. Minor sand > 2%

JOINT 50°; 70° crossing
50°; 5°

JOINT 60°
65°
60°

SAND, fine, clayey, red mottled.

M

> V.Sr

D D MD

SPLIT TUBE

WATER LEVELS	MOISTURE CONTENT	CONSISTENCY (Clays)	COMPACTNESS (Silt)	RELATIVE DENSITY (Sands)	TYPE OF SAMPLE	* Penetrometer value X100 = unconfined compressive strength in kPa for clay soils only
Water level (date)	H --- Humid D --- Damp M --- Moist W --- Wet S --- Saturated LL --- Liquid Limit PL --- Plastic Limit	VS --- Very Soft S --- Soft F --- Firm St --- Stiff V.St --- Very Stiff H --- Hard	LS --- Loose MC --- Moderately Compact C --- Compact VC --- Very Compact	VL --- Very Loose L --- Loose MD --- Medium Dense D --- Dense VD --- Very Dense	OPEN TUBE A Shoe D Shoe SEALED TUBE WITH NUMBER [A 1 2 3 4 5] STANDARD PENETRATION TESTS 9 (2,3,4) Total blows for 0.3m (in 0.1m increments)	diamond DRILL TYPE GEMCO split tube, solid tube CIRCULATION: Water START: 20.8.79 FINISH: 24.8.79
						LOGGED BY: C. Conor DATE: 23.9.79 TRACED BY: C. J. W. DATE: 5.3.80

50mm Diameter CONE TEST eg: 10.3.4.3

SHEET 1 OF 4

SEC. _____ HD. _____

EL Surface

EL ref. point

Datum

HOLE NO. KW 5.

UNIT/STATE NO:

6628 41e EW 11105

SERIAL NO:

FOLDER NO.

WATER LEVELS	MOISTURE CONTENT	CONSISTENCY (Clays)	COMPACTNESS (Silt)	RELATIVE DENSITY (Sands)	TYPE OF SAMPLE	* Penetrometer value X100 ≈ unconfined compressive strength in kPa for clay soils only	
Water level (date) WC Water Cut	H --- Humid	VS --- Very Soft	LS --- Loose	VL --- Very Loose	OPEN TUBE	DRILL TYPE	LOGGED BY: C. Conor
	D --- Damp	S --- Soft	MC --- Moderately Compact	L --- Loose	 A Shoe D Shoe	GEMCO diamond split tube; solid tube	CIRCULATION: water
	M --- Moist	F --- Firm					
	W --- Wet	St --- Stiff	C --- Compact	MD --- Medium Dense	SEALED TUBE WITH NUMBER	START: 20.8.79	TRACED BY: C. J. W.
	S --- Saturated	V. St --- Very Stiff	VC --- Very Compact	D --- Dense	A 1 2 3 4 5 STANDARD PENETRATION TESTS: 9 12,3,4 Total blows for 0.3m (in 0.1m increments)	FINISH: 24.8.79	DATE: 6.3.80
LL --- Liquid Limit	H --- Hard		VD --- Very Dense	SHEET 2 OF 4			
PL --- Plastic Limit	☒ 50mm Diameter CONE TEST eg. 10.3.4.3.						

PROJECT: NORTHEAST TRANSIT CORRIDOR PROJECT - FOUNDATION INVTGN.				DEPARTMENT OF MINES AND ENERGY — SOUTH AUSTRALIA ENGINEERING DIVISION				HOLE NO. KW 5								
LOCATION OR CO-ORDS: King William St. 55m. South from Rundle Mall.				LOG OF FOUNDATION HOLE				UNIT/STATE NO: 6628 41e EW 11105								
SEC. HD.								EL Surface EL ref. point Datum				SERIAL NO:				
								FOLDER NO.								
GEOLOGICAL DESCRIPTION OF CORE			HOLE Dia	DEPTH E	GRAPHIC LOG	GROUP SYMBOL	SOIL DESCRIPTION GROUP NAME Unified Soil Classification, U.S.B.R. Earth Manual 2nd Edition 1966			WATER LEVEL	MOISTURE CONTENT	CONSISTENCY	FIELD TEST DATA			
													BLOWS PER 30 cm			
													SOIL TEST PENETROMETER UNITS *			
													4 8 16 32 64 1 2 3 4			
HALLETT COVE SANDSTONE	ORANGE SILTY SAND SHELLY WITH OYSTER BED		20		5C	SANDS, orange, silty with much shelly material (poor returns)			UNSLOTTED	?	VL					
			21													
PT. WILLUNGA FORMATION BASED SAND			22						UNSLOTTED	?	VL					
			23													
TANDANYA CHINAMAN GULLY FORMATION SAND MEMBER	LIGHT GREY VERY COMPACT SILT OR MARL		24		ML	SILT, light grey, brown mottled			UNSLOTTED	?	VC					
			25													
			26													
			27													
			28			Sandy silt										
MEDIUM GRAINED GREY, CLEAN SAND		29		? 5W	SAND, medium grained grey (sample returned in shed)			SLOTTED	?	VL						
		30														

WATER LEVELS	MOISTURE CONTENT	CONSISTENCY (Clays)	COMPACTNESS (Sils)	RELATIVE DENSITY (Sands)	TYPE OF SAMPLE	* Penetrometer value X100 = unconfined compressive strength in kPa for clay soils only	
7 Dec '66 Water level (date) WC Water Cut	H -- Humid D -- Damp M -- Moist W -- Wet S -- Saturated LL -- Liquid Limit PL -- Plastic Limit	VS -- Very Soft S -- Soft F -- Firm St -- Stiff V.St -- Very Stiff H -- Hard	Ls -- Loose MC -- Moderately Compact C -- Compact VC -- Very Compact	VL -- Very Loose L -- Loose MD -- Medium Dense D -- Dense VD -- Very Dense	OPEN TUBE DRILL TYPE diamond split tube, solid tube SEEALED TUBE WITH NUMBER STANDARD PENETRATION TESTS 9 (2,3,4) Total blows for 0.3m (in 0.1m increments)	GEMCO DRILL TYPE diamond split tube, solid tube CIRCULATION: Water START: 20.8.79 FINISH: 24.8.79	LOGGED BY: C. Conor DATE: 23.9.79 TRACED BY: C. J. W. DATE: 6.3.80
50mm Diameter CONE TEST eg. 10 3 4 3.						SHEET 3 OF 4	

SEC. _____ HD. _____

EL Surface

EL ref. point

Datum

UNIT/STATE NO:

6628 41a EW 11105

SERIAL NO. _____

FOLDER NO.

WATER LEVELS	MOISTURE CONTENT	CONSISTENCY (Clays)	COMPACTNESS (Silt)	RELATIVE DENSITY (Sands)	TYPE OF SAMPLE	* Penetrometer value X100 = unconfined compressive strength in kPa for clay soils only	
Water level (date) WC Water Cut 7 Dec. '66	H -- Humid	VS -- Very Soft	LS -- Loose	VL -- Very Loose	OPEN TUBE	DRILL TYPE GEMCO split tube; solid tube	LOGGED BY: C. Conor
	D -- Damp	S -- Soft	MC -- Moderately Compact	L -- Loose	SEALD TUBE WITH NUMBER 12345	CIRCULATION: Water	DATE: 23.9.79
	M -- Moist	F -- Firm	C -- Compact	MD -- Medium Dense		START: 20.8.79	TRACED BY: C. J. W.
	W -- Wet	St -- Stiff	VC -- Very Compact	D -- Dense	STANDARD PENETRATION TESTS 9 (2,3,4) Total blows for 0.3m (in 0.1m increments)	FINISH: 24.8.79	DATE: 6.3.80
	S -- Saturated	V St -- Very Stiff		VD -- Very Dense			
LL -- Liquid Limit	H -- Hard	50mm Diameter CONE TEST eg 10.343			SHEET 4 OF 4		
PL -- Plastic Limit							

PROJECT: **NORTHEAST TRANSIT CORRIDOR**
PROJECT - **FOUNDATION INVTGN.**

LOCATION OR CO-ORDS: **King William Street**

Rundle Mall

SEC. HD.

DEPARTMENT OF MINES AND ENERGY - SOUTH AUSTRALIA

ENGINEERING DIVISION

LOG OF FOUNDATION HOLE

EL Surface

EL ref. point

Datum

HOLE NO. **KW 6**

UNIT/STATE NO:
6628 41e EW 11106

SERIAL NO:

FOLDER NO.

GEOLOGICAL DESCRIPTION OF CORE		HOLE Dia DEPTH m	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 30 cm	SOIL TEST PENETROMETER Units *
		0			Precollared part of hole no sample						4 8 16 32 64	1 2 3 4
(UPPER)	See log. KW1.	1		CH	Creamy, grey coloured calcareous clay.							
		2			CLAY, light grey, red and yellow mottled. Minor sand >2%							
			3									
(UPPER)	CLAY WITH PATCHES OF SANDY CLAY AND CLAYEY SAND	4										
		5										
		6		CH CL	SANDY CLAY, Light grey, yellow mottled. Mottled red in some more sandy parts							
(UPPER)		7										
		8										
		9										
(LOWER)	UNIFORM HARD MOTTLED CLAY	10		CH	CLAY, light grey, yellow mottled with minor scattered sand >2%							

WATER LEVELS	MOISTURE CONTENT	CONSISTENCY (Clays)	COMPACTNESS (Silt)	RELATIVE DENSITY (Sands)	TYPE OF SAMPLE	* Penetrometer value X100 = unconfined compressive strength in kPa for clay soils only	
7 Dec 66 Water level (date) WC Water Cut	H -- Humid D -- Damp M -- Moist W -- Wet S -- Saturated LL -- Liquid Limit PL -- Plastic Limit	VS -- Very Soft S -- Soft F -- Firm St -- Stiff V St -- Very Stiff H -- Hard	Ls -- Loose MC -- Moderately Compact C -- Compact VC -- Very Compact	VL -- Very Loose L -- Loose MD -- Medium Dense D -- Dense VD -- Very Dense	OPEN TUBE A Shoe D Shoe SEALED TUBE WITH NUMBER (A 1 2 3 4 5) STANDARD PENETRATION TESTS 9 (2,3,4) Total blows for 0.3m (in 0.1m increments)	DRILL TYPE CIRCULATION: START: FINISH:	LOGGED BY: C. Conor DATE: TRACED BY: C.J.W. DATE: 18-3-80
50mm Diameter CONE TEST eg. 10 3 4 3						SHEET 1 OF 3	

PROJECT: NORTHEAST TRANSIT CORRIDOR
PROJECT - FOUNDATION INVTGN.

LOCATION OR CO-ORDS: King William Street
Rundle Mall.

SEC. HD.

DEPARTMENT OF MINES AND ENERGY - SOUTH AUSTRALIA

ENGINEERING DIVISION

LOG OF FOUNDATION HOLE

EL Surface

EL ref. point

Datum

HOLE NO. KW 6.

UNIT/STATE NO:
6628 41a EW 11106

SERIAL NO:

FOLDER NO.

GEOLOGICAL DESCRIPTION OF CORE	HOLE Dia DEPTH m	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	FIELD TEST DATA									
							BLOWS PER 30 cm				SOIL TEST PENETROMETER Units *					
								4	8	16	32	64	1	2	3	4
ORANGE SANDS, HIGHLY FOSSILIFEROUS OYSTERS, SCALLOPS	20		SM	SAND, fine to medium, shelly.												
PT. WILLUNGA FOUNDATION BASAL SANDS	21															

WATER LEVELS	MOISTURE CONTENT	CONSISTENCY (Clays)	COMPACTNESS (Sils)	RELATIVE DENSITY (Sands)	TYPE OF SAMPLE	* Penetrometer value X100 = unconfined compressive strength in kPa for clay soils only	
Water level (date) WC Water Cut	H — Humid D — Damp M — Moist W — Wet S — Saturated LL — Liquid Limit PL — Plastic Limit	VS — Very Soft S — Soft F — Firm St — Stiff V.St — Very Stiff H — Hard	Ls — Loose MC — Moderately Compact C — Compact VC — Very Compact	VL — Very Loose L — Loose MD — Medium Dense D — Dense VD — Very Dense	OPEN TUBE A Shoe D Shoe SEALED TUBE WITH NUMBER A 1 2 3 4 5 STANDARD PENETRATION TESTS 9 (2,3,4) Total blows for 0.3m (in 0.1m increments)	DRILL TYPE CIRCULATION: START: FINISH:	LOGGED BY: C. Connor DATE: TRACED BY: C. J. W. DATE: 18.3.80

PROJECT: NORTHEAST TRANSIT CORRIDOR
PROJECT - FOUNDATION INVTGN.

DEPARTMENT OF MINES AND ENERGY - SOUTH AUSTRALIA
ENGINEERING DIVISION

LOG OF FOUNDATION HOLE

LOCATION OR CO-ORDS: King William Street
10m. North Hindlay Street

EL Surface

SEC. HD.

EL ref. point Datum

HOLE NO. KW 7

UNIT/STATE NO.
GG28 41a EW 11107.

SERIAL NO:

FOLDER NO.

GEOLOGICAL DESCRIPTION OF CORE		HOLE Dia m	DEPTH m	GRAPHIC LOG	GROUP SYMBOL	SOIL DESCRIPTION GROUP NAME Unified Soil Classification, U.S.B.R. Earth Manual 2nd Edition 1966	WATER LEVEL	MOISTURE CONTENT	CONSISTENCY	COMPACTNESS	FIELD TEST DATA	
											BLOWS PER 30 cm	SOIL TEST PENETROMETER Units *
											4 8 16 32 64	1 2 3 4
HINDMARSH CLAY (UPPER)	See log. KW1		0									
			1									
SAND MEMBER			2			Brown calcareous clay CLAY, slightly calcareous.						
			3			CLAY, light gray, red and yellow mottled some sand > 2%.						
			4			JOINT 35° 75° 60° 40° 55° 45° 40° 50° x (Poor Recovery)						
			5									
			6									
			7			SANDY CLAY AND CLAYEY SAND - Patch, light gray, red and yellow mottled, slightly indurated in part.						
			8									
			9									
			10									

WATER LEVELS	MOISTURE CONTENT	CONSISTENCY (Clays)	COMPACTNESS (Sils)	RELATIVE DENSITY (Sands)	TYPE OF SAMPLE	* Penetrometer value X100 = unconfined compressive strength in kPa for clay soils only	
7 Dec. '66 Water level (date) WC Water Cut	H - Humid D - Damp M - Moist W - Wet S - Saturated LL - Liquid Limit PL - Plastic Limit	VS - Very Soft S - Soft F - Firm St - Stiff V.St - Very Stiff H - Hard	Ls - Loose MC - Moderately Compact C - Compact VC - Very Compact	VL - Very Loose L - Loose MD - Medium Dense D - Dense VD - Very Dense	OPEN TUBE A Shoe D Shoe SEALED TUBE WITH NUMBER STANDARD PENETRATION TESTS 9 (2,3,4) Total blows for 0.3m (in 0.1m increments)	DRILL TYPE GEMCO split tube; diamond CIRCULATION: mud START: 5.2.79 FINISH: 6.2.79	LOGGED BY: C. CONOR DATE: 23.2.79 TRACED BY: C. J. W. DATE: 18.2.79

DEPARTMENT OF MINES AND ENERGY — SOUTH AUSTRALIA ENGINEERING DIVISION				LOG OF FOUNDATION HOLE		HOLE NO. KW 7.	
PROJECT: NORTHEAST TRANSIT CORRIDOR PROJECT - FOUNDATION INVTGN.						UNIT/STATE NO: 6628 41a EW 11107	
LOCATION OR CO-ORDS:						SERIAL NO:	
SEC. HD.				EL Surface EL ref. point Datum		FOLDER NO.	
GEOLOGICAL DESCRIPTION OF CORE			HOLE Dia DEPTH m	GRAPHIC LOG	GROUP SYMBOL	SOIL DESCRIPTION GROUP NAME Unified Soil Classification, U.S.B.R. Earth Manual 2nd Edition 1966	FIELD TEST DATA
							BLOWS PER 30 cm 4 8 16 32 64
							SOIL TEST PENETROMETER Units * 1 2 3 4
HINDMARSH CLAY SAND MEMBER	CLAYS AND PATCHY FINE SANDS		10			SANDY CLAY AND CLAYEY SAND.	
	TRANSITIONAL UNIT		11			SOFT CALCAREOUS SILT with sandstone fragments	
HALLETT COVE SANDSTONE	WHITE SANDSTONE RUBBLY, CALCAREOUS WITH SOLUTION CAVITIES INFILLED BY FINE, GREY, SAND		13			SAND and SANDSTONE, rubbly, white, calcareous. Occasional partings and cavities infilled by grey, fine sand.	
			14				
			15				
			16				
	HARD AND RUBBLY CALCAREOUS SANDSTONE, WITH AND PINK WITH FOSSIL MOULDS, INTERBEDDED WITH ORANGE SANDS		17				
			18				
			19				
			20				

Highly weathered rock - G.M.

slotted
unslotted

DIAMOND
↓

WATER LEVELS	MOISTURE CONTENT	CONSISTENCY (Clays)	COMPACTNESS (Sils)	RELATIVE DENSITY (Sands)	TYPE OF SAMPLE	* Penetrometer value X100 = unconfined compressive strength in kPa for clay soils only	
7 Dec. '66 Water level (date) WC Water Cut	H — Humid D — Damp M — Moist W — Wet S — Saturated LL — Liquid Limit PL — Plastic Limit	VS — Very Soft S — Soft F — Firm St — Stiff V.St — Very Stiff H — Hard	Ls — Loose MC — Moderately Compact C — Compact VC — Very Compact	VL — Very Loose L — Loose MD — Medium Dense D — Dense VD — Very Dense	OPEN TUBE A Shoe D Shoe SEALED TUBE WITH NUMBER A12345 STANDARD PENETRATION TESTS 9 (2,3,4) Total blows for 0.3m (in 0.1m increments)	DRILL TYPE GEMCO split tube, diamond CIRCULATION: mud START: 5.9.79 FINISH: 6.9.79	LOGGED BY: C. Conner DATE: 23.9.79 TRACED BY: C. J. W. DATE: 19.8.80

50mm Diameter CONE TEST eg. 10.3.43.

SHEET 2 OF 3

PROJECT: NORTHEAST TRANSIT CORRIDOR.
PROJECT - FOUNDATION INVTGN.

LOCATION OR CO-ORDS: King William Street
10m. North Hindley Street

SEC. _____ HD _____

EL Surface

EL ref. point

Datum

HOLE NO. KW 7

UNIT/STATE NO:
6628 41a EW 11107

SERIAL NO:

FOLDER NO.

LOG OF FOUNDATION HOLE

[illegible]

WATER LEVELS	MOISTURE CONTENT	CONSISTENCY (Clays)	COMPACTNESS (Siltst)	RELATIVE DENSITY (Sands)	TYPE OF SAMPLE	* Penetrometer value X100 = unconfined compressive strength in kPa for clay soils only	
7 Dec. '66 Casing Water level (date) WC Water Cut	H --- Humid D --- Damp M --- Moist W --- Wet S --- Saturated LL --- Liquid Limit PL --- Plastic Limit	VS --- Very Soft S --- Soft F --- Firm St --- Stiff V.St --- Very Stiff H --- Hard	Ls --- Loose MC --- Moderately Compact C --- Compact VC --- Very Compact	VL --- Very Loose L --- Loose MD --- Medium Dense D --- Dense VD --- Very Dense	OPEN TUBE A Shoe D Shoe SEALED TUBE WITH NUMBER A 1 2 3 4 5 STANDARD PENETRATION TESTS 9 12,3,4 Total blows for 0-3m (in 0-1m increments)	DRILL TYPE GEMCO split tube, diamond CIRCULATION: mud START: 5-9-79 FINISH: 6-9-79	LOGGED BY: C. Conor DATE: 22-9-79 TRACED BY: C. J. W. DATE: 19-3-80
50mm Diameter CONE TEST eg. 10.3:4.3.					SHEET 3 OF 3		

PROJECT: NORTHEAST TRANSIT CORRIDOR
PROJECT - FOUNDATION INVTGN.

DEPARTMENT OF MINES AND ENERGY - SOUTH AUSTRALIA
ENGINEERING DIVISION

LOCATION OR CO-ORDS: King William Street
65 m. south of North Terrace

LOG OF FOUNDATION HOLE

EL Surface

SEC.

HD.

EL ref. point

Datum

HOLE NO. K.W 8

UNIT/STATE NO.

6628 41a EW 11108

SERIAL NO.

FOLDER NO.

FIELD TEST DATA

BLOWS
PER 30 cm

SOIL TEST
PENETROMETER
Units *

4 8 16 32 64

1 2 3 4

GEOLOGICAL DESCRIPTION OF CORE

HOLE Dia
DEPTH m

GRAPHIC
LOG

GROUP
SYMBOL

SOIL DESCRIPTION
GROUP NAME

Unified Soil Classification,
U.S.B.R. Earth Manual 2nd Edition 1966

WATER
LEVEL

MOISTURE
CONTENT

Consistency

Compact Density

Precollared part
no sample

See KW1

CLAY, light gray, red yellow
mottled, some minor sand
> 2%

> V.
PL St.

SPLIT
TUBE

HINDMARSH CLAY (UPPER)

x
Joints

65°
65°
35°-60°
40°-70°

45°
45°

50°, 55°

40°
55°

H

WATER
LEVELS

MOISTURE
CONTENT

CONSISTENCY
(Clays)

COMPACTNESS
(Silt)

RELATIVE
DENSITY (Sands)

TYPE OF SAMPLE

* Penetrometer value X100 = unconfined compressive
strength in kPa for clay soils only

7 Dec. 66
Casing
Water level (date)
WC
Water Cut

H - Humid
D - Damp
M - Moist
W - Wet
S - Saturated
LL - Liquid Limit
PL - Plastic Limit

VS - Very Soft
S - Soft
F - Firm
St - Stiff
V St - Very Stiff
H - Hard

Ls - Loose
MC - Moderately
Compact
C - Compact
VC - Very
Compact

VL - Very Loose
L - Loose
MD - Medium
Dense
D - Dense
VD - Very Dense

OPEN TUBE
..... A Shoe
..... D Shoe
SEALED TUBE
WITH NUMBER
A 1 2 3 4 5
STANDARD PENETRATION
TESTS
9 (2,3,4)
Total blows for 0.3m
(in 0.1m increments)

DRILL TYPE GEMCO
split tube, diamond

LOGGED BY: C. Conar

CIRCULATION: mud

DATE: 24. 9. 78

START: 11. 9. 79

TRACED BY: C. J. W.

FINISH: 13. 9. 79

DATE: 19. 3. 79

SHEET 1 OF 2

DEPARTMENT OF MINES AND ENERGY - SOUTH AUSTRALIA ENGINEERING DIVISION				HOLE NO. KW 8 UNIT/STATE NO: 6628 41a EW III08 SERIAL NO: FOLDER NO:	
PROJECT: NORTHEAST TRANSIT CORRIDOR PROJECT - FOUNDATION INVTGN.				LOG OF FOUNDATION HOLE	
LOCATION OR CO-ORDS: King William Street 65m. South of North Terrace				EL Surface EL ref. point Datum	
SEC: HD.				FIELD TEST DATA BLOWS PER 30 cm SOIL TEST PENETROMETER 4 8 16 32 64 Units * 1 2 3 4	
GEOLOGICAL DESCRIPTION OF CORE		HOLE Dia. m	DEPTH m	GRAPHIC LOG	GROUP SYMBOL
SOIL DESCRIPTION GROUP NAME Unified Soil Classification, U.S.B.R. Earth Manual 2nd Edition 1966		WATER LEVEL		MOISTURE CONTENT	CONSISTENCY
FIELD TEST DATA		BLOWS PER 30 cm		SOIL TEST PENETROMETER	
4 8 16 32 64		1 2 3 4		Units *	
HINDMARSH CLAY		10		CH * CLAY	
TRANSITIONAL UNIT MOTTLED SANDY CLAY PASSING DOWN INTO SOFT CALcareous ROCK WITH SANDSTONE FRAGMENTS AND FINE SILTY SAND INTERVALS		11		SANDY CLAY, RUBBLY SANDSTONE, CALcareous	
WHITE, RUBBLY CALcareous, SAND- STONE WITH PARTINGS AND SOLUTION CAVITIES INFILLED BY DARK GREY- GREEN SILTY SAND. SANDSTONE VUGGY WITH FOSSIL MOULDS		12		SAND and SANDSTONE, rubbly, white, calcareous. Occasional partings and cavities infilled by grey, fine silty sand.	
PINKISH SANDSTONE BANDS IN SOFT, ORANGE, SHELLY FINE SANDS		13		SANDSTONE, bands in fine, orange, shelly sands.	
HALLETT COVE SANDSTONE		14		Highly weathered rock - GM.	
E.O.H. 19.2m.		15		x Push tube samples. High pressure tests at 10.45m. 18.30m.	
16		17		18	
19		20		21	
22		23		24	
25		26		27	
28		29		30	
31		32		33	
34		35		36	
37		38		39	
40		41		42	
43		44		45	
46		47		48	
49		50		51	
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103		104		105	
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466		467		468	
469		470		471	
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499		500		501	
502		503		504	
505		506		507	
508		509		510	
511		512		513	
514		515		516	
517		518		519	
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523		524		525	
526		527		528	
529		530		531	
532		533			

DEPARTMENT OF MINES AND ENERGY — SOUTH AUSTRALIA ENGINEERING DIVISION					HOLE NO. K.W. 9		
PROJECT: NORTHEAST TRANSIT CORRIDOR PROJECT - FOUNDATION INVNTN.					UNIT/STATE NO: 662841a EW 11109		
LOCATION OR CO-ORDS: King William Road 100m North of North Terrace					SERIAL NO:		
SEC. HD. EL Surface EL ref. point Datum					FOLDER NO:		
GEOLOGICAL DESCRIPTION OF CORE			SOIL DESCRIPTION GROUP NAME Unified Soil Classification, U.S.B.R. Earth Manual 2nd Edition 1966		FIELD TEST DATA		
HOLE Dia m	DEPTH m	GRAPHIC LOG	GROUP SYMBOL	WATER LEVEL	Casing	MOISTURE CONTENT	
						BLOWS PER 30 cm	
						SOIL TEST PENETROMETER Units *	
						4 8 16 32 64 1 2 3 4	
			0	Precollared part no sample			
HINDMARSH CLAY (UPPER)			1	CH	CLAY, slightly calcareous, red and yellow mottled, minor sand > 2%	> V.Sr	SPLIT TUBE
			2				
			3				
			4				
			5				
			6				
			7	MH GM	SILT and RUBBLY SANDSTONE		DIAMOND
HALLETT COVE SANDSTONE			8				
			9				
White, rubbly, calcareous sandstone with partings and solution cavities infilled by sand and dark gray-green silty sand.			10	Highly weathered rock - G.M.	SANDSTONE, SAND, SILT, white, calcareous		

WATER LEVELS	MOISTURE CONTENT	CONSISTENCY (Clays)	COMPACTNESS (Silt)	RELATIVE DENSITY (Sands)	TYPE OF SAMPLE	* Penetrometer value X100 = unconfined compressive strength in kPa for clay soils only	
	H -- Humid	VS -- Very Soft	LS -- Loose	VL -- Very Loose	OPEN TUBE	DRILL TYPE GEMCO	LOGGED BY: C. Conor
	D -- Damp	S -- Soft	MC -- Moderately Compact	L -- Loose	 A Shoe	SPLIT tube, diamond	
	M -- Moist	F -- Firm	C -- Compact	MD -- Medium Dense	 D Shoe	CIRCULATION: mud	DATE: 24.9.79
	W -- Wet	St -- Stiff	VC -- Very Compact	D -- Dense	SEALD TUBE WITH NUMBER	START: 3.9.79	TRACED BY: C. J. W.
	S -- Saturated	V.St -- Very Stiff		VD -- Very Dense	 (A 1 2 3 4 5)	FINISH: 4.9.79	DATE: 21.3.80
LL -- Liquid Limit	H -- Hard				STANDARD PENETRATION TESTS		
PL -- Plastic Limit					9 (2,3,4)		
						Total blows for 0.3m (in 0.1m increments)	

PROJECT: **NORTHEAST TRANSIT CORRIDOR**
PROJECT - **FOUNDATION INVTGN.**

DEPARTMENT OF MINES AND ENERGY - SOUTH AUSTRALIA

ENGINEERING DIVISION

LOCATION OR CO-ORDS: **King William Road.**

100m. North of North Terrace

SEC. HD.

EL Surface

EL ref. point

Datum

HOLE NO. **KW 9**

UNIT/STATE NO:

6628 41a EW11109

SERIAL NO:

FOLDER NO.

LOG OF FOUNDATION HOLE

GEOLOGICAL DESCRIPTION OF CORE		HOLE Dia	DEPTH m	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 30 cm				SOIL TEST PENETROMETER Units *					
												4	8	16	32	64	1	2	3	4	
HALLETT COVE SANDSTONE	WHITE, CALCAREOUS RUBBLY SANDSTONE		10		Highly weathered rock - GM	SANDSTONE, RUBBLY															
			11																		
			12				High pressure test														

DEPARTMENT OF MINES AND ENERGY - SOUTH AUSTRALIA ENGINEERING DIVISION						HOLE NO. KW 10A	
PROJECT: NORTHEAST TRANSIT CORRIDOR PROJECT - FOUNDATION INVTGN.						UNIT/STATE NO: 6020 412 EW 11110.	
LOCATION OR CO-ORDS: Govt. Domain 185 m. north of North Terrace						SERIAL NO:	
LOG OF FOUNDATION HOLE						FOLDER NO.	
SEC. HD.		EL Surface		EL ref. point		Datum	
GEOLOGICAL DESCRIPTION OF CORE		HOLE Dia DEPTH m	GRAPHIC LOG	GROUP SYMBOL	SOIL DESCRIPTION GROUP NAME Unified Soil Classification, U.S.B.R. Earth Manual, 2nd Edition 1966	WATER LEVEL	FIELD TEST DATA
							BLOWS PER 30 cm 4 8 16 32 64 SOIL TEST PENETROMETER UNITS * 1 2 3 4
HINDMARSH CLAY (UPPER)		0			SAND, sandy loam as fill.	W.C.	AUGER
		1		ML	SILT, Calcareous, creamy and orange coloured		
HINDMARSH CLAY (UPPER)		2		CH	CLAY, light gray, yellow and red mottled. Minor sand - 2% fine.	W.C.	AUGER
		3					
		4					
		5					
TRANSITIONAL UNIT		5		SM	SANDY SILT mottled grey-green and brown. Calcareous at base.	W.C.	DIAMOND
HALLETT COVE SANDSTONE		6			SANDSTONE, SAND, SILT, CALCAREOUS, WHITE		
		7					
		8			SAND, orange with fragments hard sandstone		
MASSIVE AND RUBBLY INTERLAYERED WITH ORANGE SANDS, SOME SHELLEY.		9		GM		W.C.	DIAMOND
10							

WATER LEVELS	MOISTURE CONTENT	CONSISTENCY (Clays)	COMPACTNESS (Sills)	RELATIVE DENSITY (Sands)	TYPE OF SAMPLE	* Penetrometer value X100 = unconfined compressive strength in kPa for clay soils only	
 Water level (date) WC Water Cut	H --- Humid	VS --- Very Soft	LS --- Loose	VL --- Very Loose	OPEN TUBE	DRILL TYPE GEMCO	LOGGED BY: C. Conner
	D --- Damp	S --- Soft	MC --- Moderately Compact	L --- Loose	A Shoe	auger: diamond	S. Kent
	M --- Moist	F --- Firm	C --- Compact	MD --- Medium Dense	D Shoe	CIRCULATION: mud	DATE: 9.79
	W --- Wet	St --- Stiff	VC --- Very Compact	D --- Dense	SEALED TUBE WITH NUMBER	START: 9.79	TRACED BY: C. J. W.
	S --- Saturated	V St --- Very Stiff		VD --- Very Dense	STANDARD PENETRATION TESTS	FINISH: 9.79	DATE: 25.3.80
	LL --- Liquid Limit	H --- Hard			9 (2,3,4)	SHEET 1 OF 2	
	PL --- Plastic Limit				Total blows for 0.3m (in 0.1m increments)		

PROJECT: NORTHEAST TRANSIT CORRIDOR PROJECT - FOUNDATION INVTGN. LOCATION OR CO-ORDS: Government Domain 185m north of North Terrace SEC. HD.				DEPARTMENT OF MINES AND ENERGY - SOUTH AUSTRALIA ENGINEERING DIVISION LOG OF FOUNDATION HOLE EL Surface EL ref. point Datum				HOLE NO. KW 10A UNIT/STATE NO: 6628 41a EW IIIIO SERIAL NO: FOLDER NO.																
GEOLOGICAL DESCRIPTION OF CORE			HOLE Dia	DEPTH m	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 30 cm		SOIL TEST PENETROMETER Units *							
															4	8	16	32	64	1	2	3	4	
HALLETT COVE SANDSTONE MASSIVE AND RUBBLY SANDSTONE INTERLAYED WITH ORANGE SANDS			10 11 12			Highly weathered rock - GM.	SAND, orange and SAND-STONE layers																	
E.O.H. 12.5m.																								

WATER LEVELS	MOISTURE CONTENT	CONSISTENCY (Clays)	COMPACTNESS (Sils)	RELATIVE DENSITY (Sands)	TYPE OF SAMPLE	* Penetrometer value X100 = unconfined compressive strength in kPa for clay soils only	
Water level (date) 7 Dec. '66 WC Water Cut	H --- Humid	VS --- Very Soft	LS --- Loose	VL --- Very Loose	OPEN TUBE	DRILL TYPE GEMCO split tube; diamond CIRCULATION: mud	
	D --- Damp	S --- Soft	MC --- Moderately Compact	L --- Loose	SEALD TUBE WITH NUMBER		
	M --- Moist	F --- Firm	C --- Compact	MD --- Medium Dense	A 1 2 3 4 3	START: 9-79	DATE: 9-79
	W --- Wet	V.St --- Very Stiff	VC --- Very Compact	D --- Dense	STANDARD PENETRATION TESTS	FINISH: 9-79	DATE: 25-3-80
	LL --- Liquid Limit	H --- Hard	VD --- Very Dense	9 (2,3,4)	Total blows for 0.3m (in 0.1m increments)		
	PL --- Plastic Limit	50mm Diameter CONE TEST eg. 10/3.43			SHEET 2 OF 2		

DEPARTMENT OF MINES AND ENERGY — SOUTH AUSTRALIA ENGINEERING DIVISION						HOLE NO. KW 11.	
PROJECT: NORTHEAST TRANSIT CORRIDOR PROJECT - FOUNDATION INVTGN.						UNIT/STATE NO: 6628 412 EW 11111	
LOCATION OR CO-ORDS: Govt. Domain 225 m. north of North Terrace						SERIAL NO:	
SEC. HD. EL Surface EL ref. point Datum						FOLDER NO.	
GEOLOGICAL DESCRIPTION OF CORE			HOLE Dia DEPTH m	GRAPHIC LOG	GROUP SYMBOL	FIELD TEST DATA	
SOIL DESCRIPTION GROUP NAME Unified Soil Classification, USBR Earth Manual 2nd Edition 1966			WATER LEVEL	Casing MOISTURE CONTENT	Consistency	Compact Density	BLOWS PER 30 cm
			M MD	6 V PL V St	SPLIT TUBE	SOIL TEST PENETROMETER Units *	4 8 16 32 64
SANDY TOPSOIL			0	SM	SAND, SILT as loam filling.		
HINDMARSH CLAY (UPPER)	CALCRETED CLAY		1	ML	SILT, calcareous, cream-; buff coloured.		
	See KW 1.		2	CH	CLAY, light gray, red and yellow mottled.		
	TRANSITIONAL UNIT.		3	SM GM	SILTY, SAND, calcareous, white with sandstone fragments.		
HALLETT COVE SANDSTONE	RUBBLY SANDSTONE AND SAND, WHITE, CALCAREOUS WITH INTERVALS OF DARK GREY-GREEN SAND SILT SOMETIMES AS SOLUTION CAVITY INFILLING		4		SANDSTONE, SAND, calcareous, rubbly with intervals of dark green-gray silty fine sand.		
	INTERBEDDED ORANGE, GREY SILTY SAND AND HARD SANDSTONE		5				
			6				
			7				
			8				
			9				
			10				
			11				
			12				
			13				
			14				
			15				
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			100				

Water Level (date): 7 Dec. 66.

Water Cut: WC

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

CONSISTENCY (Clays): VS - Very Soft, S - Soft, F - Firm, St - Stiff, V St - Very Stiff, H - Hard

COMPACTNESS (Sands): 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

TYPE OF SAMPLE: OPEN TUBE (A Shoe, D Shoe), SEALED TUBE WITH NUMBER (A 1 2 3 4 5)

STANDARD PENETRATION TESTS: 9 (2,3,4), Total blows for 0.3m (in 0.1m increments)

* Penetrometer value X100 = unconfined compressive strength in kPa for clay soils only

DRILL TYPE GEMCO, LOGGED BY: C. Conner

CIRCULATION: mud, DATE: 24.9.79

START: 30.8.79, TRACED BY: C. J. W.

FINISH: 31.8.79, DATE: 25.3.80

SHEET 2 OF 2

PROJECT: **NORTHEAST TRANSIT CORRIDOR**
PROJECT - **FOUNDATION INVTGN.**

DEPARTMENT OF MINES AND ENERGY - SOUTH AUSTRALIA
ENGINEERING DIVISION

LOG OF FOUNDATION HOLE

LOCATION OR CO-ORDS: **Govt. Domain**
265m. north of North Terrace

EL Surface

SEC.

HD.

EL ref. point

Datum

HOLE NO. **KW 13**

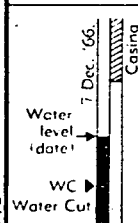
UNIT/STATE NO:

6628 412 EW 11113.

SERIAL NO:

FOLDER NO.

GEOLOGICAL DESCRIPTION OF CORE		HOLE Dia	DEPTH m	GRAPHIC LOG	GROUP SYMBOL	SOIL DESCRIPTION GROUP NAME Unified Soil Classification, U.S.B.R. Earth Manual 2nd Edition 1966	WATER LEVEL	MOISTURE CONTENT	CONSISTENCY	COMPACT DENSITY	FIELD TEST DATA								
											BLOWS PER 30 cm		SOIL TEST PENETROMETER Units *						
											4	8	16	32	64	1	2	3	4
CHINAMAN GULLY FM. TANDANYA SAND	Light grey silt or marl.	10			ML	SILT, occasional pebbles - 10mm.	W.L. 29.8-79				C								
	Fine grained to coarse grained sands	11			SM	SAND, fine grained to coarse grained, grey.					?L								
BLANCHE POINT MARL	Light grey, silt, siltstone or marl, bivalve moulds and ? glauconite grains harder with depth	12																	
		13			GM	SILT - SILTSTONE, light grey				VC									
		14																	
		15																	
16																			
						E.O.H. 16m.													

WATER LEVELS	MOISTURE CONTENT	CONSISTENCY (Clays)	COMPACTNESS (Sils)	RELATIVE DENSITY (Sands)	TYPE OF SAMPLE	* Penetrometer value X100 = unconfined compressive strength in kPa for clay soils only	
 Water level (date) WC Water Cut	H - Humid D - Damp M - Moist W - Wet S - Saturated LL - Liquid Limit PL - Plastic Limit	VS - Very Soft S - Soft F - Firm St - Stiff V St - Very Stiff H - Hard	Ls - Loose MC - Moderately Compact C - Compact VC - Very Compact	VL - Very Loose L - Loose MD - Medium Dense D - Dense VD - Very Dense	OPEN TUBE A Shoe D Shoe SEALED TUBE WITH NUMBER [A 1 2 3 4 5] STANDARD PENETRATION TESTS 9 (2,3,4) Total blows for 0.3m (in 0.1m increments)	DRILL TYPE GEMCO CIRCULATION: Water START: 27.8.79 FINISH: 28.8.79	LOGGED BY: C. Connor DATE: 25.9.79 TRACED BY: C. J. W. DATE: 26.3.80
50mm Diameter CONE TEST eg 103.43						SHEET 2 OF 2	

PROJECT: **NORTHEAST TRANSIT CORRIDOR**
PROJECT - **FOUNDATION INVTGN.**

DEPARTMENT OF MINES AND ENERGY - SOUTH AUSTRALIA

ENGINEERING DIVISION

LOCATION OR CO-ORDS: **34 m. nth of 6th end**
Victoria Sq. 8m. East of tramline

LOG OF FOUNDATION HOLE

EL Surface

EL ref. point

Datum

HOLE NO. **KW 14.**

UNIT/STATE NO:

6628 41e EW III14.

SERIAL NO:

FOLDER NO.

GEOLOGICAL DESCRIPTION OF CORE		HOLE Dia	DEPTH	GRAPHIC LOG	GROUP SYMBOL	SOIL DESCRIPTION GROUP NAME Unified Soil Classification, U.S.B.R.: Earth Manual 2nd Edition 1966	WATER LEVEL	MOISTURE CONTENT	CONSISTENCY	COMPACTNESS	RELATIVE DENSITY	TYPE OF SAMPLE	FIELD TEST DATA	
			m										BLOWS PER 30 cm	SOIL TEST PENETROMETER UNITS *
													4 8 16 32 64	1 2 3 4
SAND MEMBER	ALLUVIUM or FILL		0		SM	SAND, silty, fine, dark brown Increasing silt content Minor clay								
	UNIFORM, STIFF to HARD MOTTLED CLAY		1											
			2			CH	CLAY, pale cream-brown to pale green, faint mottling. About 10% fine-medium grained sand. Calcareous, some concretions. Gray-green and yellow brown mottled. Decreasing lime content to 3.5m. No lime, < 5% fine-medium grained sand. Some slickensided joints at various angles 10°-45° to axis Very small seepage along a joint. Some red mottling Curving joint 20°-70° to axis Strong red and yellow staining							
	DENSE FINE SAND		10		SC	SAND, light gray, fine to medium grained. Some clay. Orange and red ferruginous patches.								

WATER LEVELS	MOISTURE CONTENT	CONSISTENCY (Clays)	COMPACTNESS (Silt)	RELATIVE DENSITY (Sands)	TYPE OF SAMPLE	* Penetrometer value X100 = unconfined compressive strength in kPa for clay soils only	
 Water level (date) _____ WC Water Cut	H - Humid D - Damp M - Moist W - Wet S - Saturated LL - Liquid Limit PL - Plastic Limit	VS - Very Soft S - Soft F - Firm St - Stiff V St - Very Stiff H - Hard	Ls - Loose MC - Moderately Compact C - Compact VC - Very Compact	VL - Very Loose L - Loose MD - Medium Dense D - Dense VD - Very Dense	OPEN TUBE A Shoe D Shoe SEALED TUBE WITH NUMBER STANDARD PENETRATION TESTS 9 (2,3,4) Total blows for 0.3m (in 0.1m increments)	DRILL TYPE CT-B CABLE TOOL CIRCULATION: nil START: 3-9-79 FINISH: 3-9-79	LOGGED BY: P. Johnson DATE: 3-9-79 TRACED BY: C.J.W. DATE: 26-3-80

50mm Diameter CONE TEST eg. 10.3,4.3

DEPARTMENT OF MINES AND ENERGY — SOUTH AUSTRALIA

PROJECT: NORTHEAST TRANSIT CORRIDOR
PROJECT - FOUNDATION INVTGN.

ENGINEERING DIVISION

LOCATION OR CO-ORDS: 34m. Nth. of 5th. end
of Victoria Bq. 0m. East of tramline.

LOG OF FOUNDATION HOLE

EL Surface

EL ref. point

Datum

HOLE NO. KW 14

UNIT/STATE NO:

6628 41a EW 11114

SERIAL NO:

FOLDER NO.

GEOLOGICAL DESCRIPTION OF CORE		HOLE Dia DEPTH m	GRAPHIC LOG	GROUP SYMBOL	SOIL DESCRIPTION GROUP NAME Unified Soil Classification, U.S.B.R. Earth Manual 2nd Edition 1966	WATER LEVEL	MOISTURE CONTENT	CONSISTENCY	COMPACT DENSITY	FIELD TEST DATA			
										BLOWS PER 30 cm	SOIL TEST PENETROMETER Units *		
										4 8 16 32 64	1 2 3 4		
HINDMARSH CLAY (lower)	DENSE FINE SAND	10		SC SM	SAND, minor clay with rounded pebble size gravel. Light grey, some red and orange mottling. minor sand.								
	UNIFORM HARD MOTTLED CLAY	11		CH	CLAY, gray green. Minor fine sand (<2%) yellow and mottled.								
		12											
		13											
		14			Some black mottling								
HALLETT COVE SANDSTONE		15		CH	High fine sand content (20-30%) cream-pink lime concretions								
	TRANSITIONAL UNIT	16		SM SP	SAND, fine, white, silty, uncon- solidated.								
				CL	CLAY, gray, sandy, white lime patches. Increasing lime content.								
					CARBONATE concretions with patches of gray clay.								
					End of hole 16.75m.								

WATER LEVELS	MOISTURE CONTENT	CONSISTENCY (Clays)	COMPACTNESS (Silt)	RELATIVE DENSITY (Sands)	TYPE OF SAMPLE	* Penetrometer value X100 = unconfined compressive strength in kPa for clay soils only	
	H - Humid	VS - Very Soft	LS - Loose	VL - Very Loose	OPEN TUBE	DRILL TYPE	LOGGED BY:
	D - Damp	S - Soft	MC - Moderately Compact	L - Loose	A Shoe	CABLE TOOL CTB	P. Johnson
	M - Moist	F - Firm	C - Compact	MD - Medium Dense	D Shoe	CIRCULATION: nil	DATE: 3-9-79
	W - Wet	St - Stiff	VC - Very Compact	D - Dense	SEALED TUBE WITH NUMBER	START: 3-9-79	TRACED BY: C. J. W.
	S - Saturated	V St - Very Stiff		VD - Very Dense	STANDARD PENETRATION TESTS	FINISH: 3-9-79	DATE: 27-5-80
WC - Water Cut	LL - Liquid Limit	H - Hard			9 12, 3, 4 Total blows for 0.3m (in 0.1m increments)	SHEET 2 OF 2	
	PL - Plastic Limit						

APPENDIX B

Water analyses from Quaternary Aquifer

SAMPLE ID. 3918-79 KW 3

JOB NO. 1357-80

CHEMICAL COMPOSITION

DERIVED AND OTHER DATA

REMARKS

		MILLIGRAMS PER LITRE MG/L	MILLIEQUIVS. PER LITRE ME/L
CATIONS			
CALCIUM	(CA)	178	8.9
MAGNESIUM	(MG)	370	30.4
SODIUM	(NA)	4025	175.1
POTASSIUM	(K)	51	1.3
IRON	(FE)		

ANIONS

HYDROXIDE	(OH)		
CARBONATE	(CO3)		
BICARBONATE	(HCO3)	453	7.4
SULPHATE	(SO4)	635	13.2
CHLORIDE	(CL)	6615	186.6
BROMIDE	(BR)		
FLUORIDE	(F)		
NITRATE	(NO3)	1	.0
PHOSPHATE	(PO4)		

CONDUCTIVITY (E.C.)
MICRO-S/CM AT 25 DEG. C 20494.

TOTAL DISSOLVED SOLIDS

A. BASED ON E.C.
B. CALCULATED (HCO3=CO3) 12098.
C. RESIDUE ON EVAP. AT 180 DEG. C 12800

MILLIGRAMS
PER LITRE
MG/L

HINDMARSH SAND
KING WILLIAM ST

TOTAL HARDNESS AS CaCO3 1967.
CARBONATE HARDNESS AS CaCO3 371.
NON-CARBONATE HARDNESS AS CaCO3 1596.
TOTAL ALKALINITY AS CaCO3 371.
FREE CARBON DIOXIDE (CO2)
SUSPENDED SOLIDS
SILICA (SiO2)
BORON (B)

TOTALS AND BALANCE

CATIONS (ME/L)	215.7	DIFF =	8.5
ANIONS (ME/L)	207.2	SUM =	422.9

DIFF*100.
= 2.0 %
SUM

REACTION - PH
TURBIDITY (JACKSON)
COLOUR (HAZEN)

UNITS

7.9

SODIUM TO TOTAL CATION RATIO (ME/L) 81.2 %

NAME- DEPT OF MINES
ADDRESS-SOUTH AUST

HUNDRED-
SECTION-
HOLE NO-
SUPPLY-
SAMPLE COLLECTED BY-

WATER CUT-
WATER LEVEL-
DEPTH HOLE-

DATE COLLECTED 17/09/79
DATE RECEIVED

WATER ANALYSIS REPORT

AMDEL COMPUTER SERVICES

SAMPLE ID. 3919-79 KW 2

JOB NO. 1357-80

CHEMICAL COMPOSITION

DERIVED AND OTHER DATA

REMARKS

		MILLIGRAMS PER LITRE MG/L	MILLIEQUIVS. PER LITRE ME/L
CATIONS			
CALCIUM	(CA)	34	1.7
MAGNESIUM	(MG)	112	9.2
SODIUM	(NA)	2575	112.0
POTASSIUM	(K)	26	.7
IRON	(FE)		

ANIONS			
HYDROXIDE	(OH)		
CARBONATE	(CO3)	98	3.3
BICARBONATE	(HCO3)	940	15.4
SULPHATE	(SO4)	526	11.0
CHLORIDE	(CL)	3137	88.5
BROMIDE	(BR)		
FLUORIDE	(F)		
NITRATE	(NO3)	<1	
PHOSPHATE	(PO4)		

TOTALS AND BALANCE

CATIONS (ME/L)	123.6	DIFF =	5.5
ANIONS (ME/L)	118.1	SUM =	241.7

DIFF*100.

SUM

2.3 %

CONDUCTIVITY (E.C.)
MICRO-S/CM AT 25 DEG. C 9554.

TOTAL DISSOLVED SOLIDS

A. BASED ON E.C.
B. CALCULATED (HCO3=CO3)
C. RESIDUE ON EVAP. AT 180 DEG. C

MILLIGRAMS
PER LITRE
MG/L

6971.

TOTAL HARDNESS AS CaCO3 546.
CARBONATE HARDNESS AS CaCO3 546.
NON-CARBONATE HARDNESS AS CaCO3 <1.
TOTAL ALKALINITY AS CaCO3 934.
FREE CARBON DIOXIDE (CO2)
SUSPENDED SOLIDS
SILICA (SiO2)
BORON (B)

UNITS

REACTION - PH 8.8
TURBIDITY (JACKSON)
COLOUR (HAZEN)

SODIUM TO TOTAL CATION RATIO (ME/L) 90.6 %

HINDMARSH SAND
VICTORIA SQUARE

NAME- DEPT OF MINES
ADDRESS-SOUTH AUST

HUNDRED-
SECTION-
HOLE NO-
SUPPLY-
SAMPLE COLLECTED BY-

WATER CUT-
WATER LEVEL-
DEPTH HOLE- 12.5 M

DATE COLLECTED 17/09/79
DATE RECEIVED



Neg. 31525

PLATE 1

Dept. Mines and Energy gemco Rig. drilling
W3 outside Town Hall, looking towards Victoria
Square and the proposed light rail terminus.

PLATE 2

HOLE KW1: from 0-14.8 m

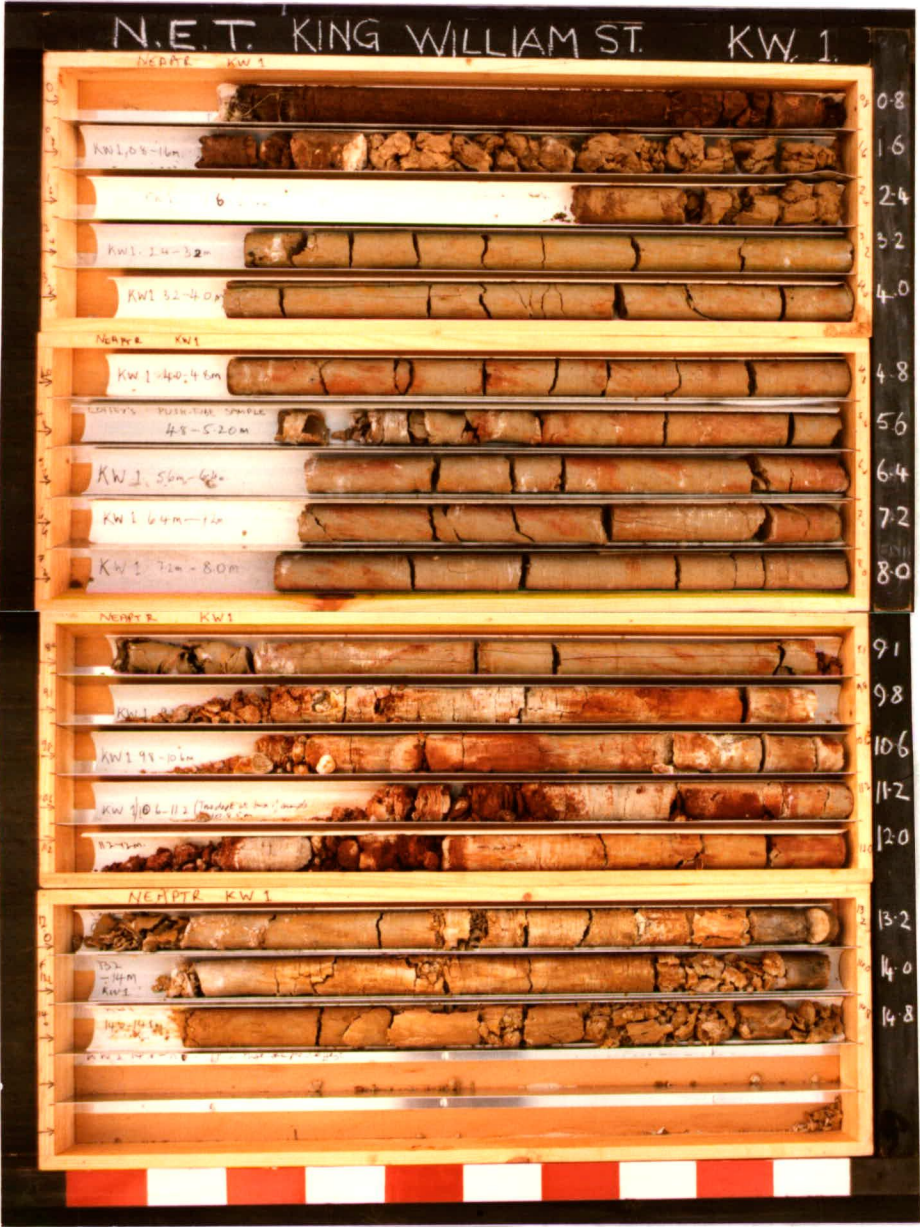


PLATE 3

HOLE KW2: from 0-20.4 m



PLATE 4 (sheet 1)

HOLE KW3: From 0-16.75 m



PLATE 4 (sheet 2)

HOLE KW3: From 16.75 m - 30.0 m



PLATE 5

HOLE KW 4: From 0-13.8 m



PLATE 6 (Sheet 1)

HOLE KW5: From 0-16 m



PLATE 6 (Sheet 2)

HOLE KW5: From 16.70 m - 31.65 m



PLATE 7

HOLE KW 6: From 0-21.3 m



PLATE 8

HOLE KW 7: From 0-22.3 m



PLATE 9

HOLE KW 8: From 0-19.2 m



PLATE 10

HOLE KW9: From 0-12.7 m



PLATE 11

HOLE KW11: From 0-13.9 m



PLATE 12

HOLE KW12: From 0-10.4 m

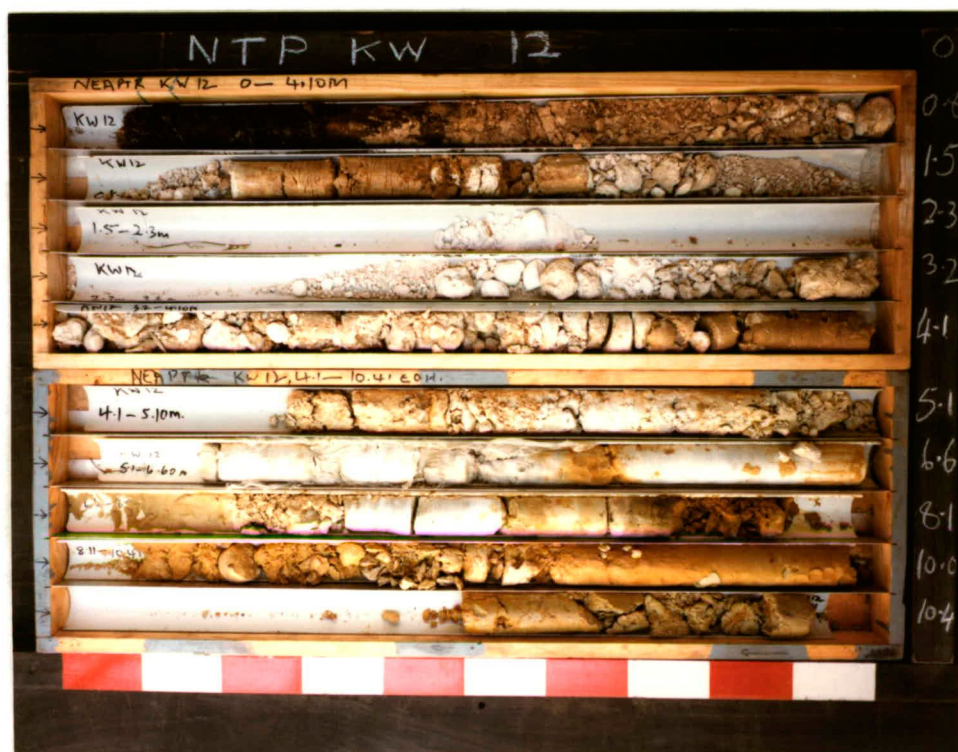
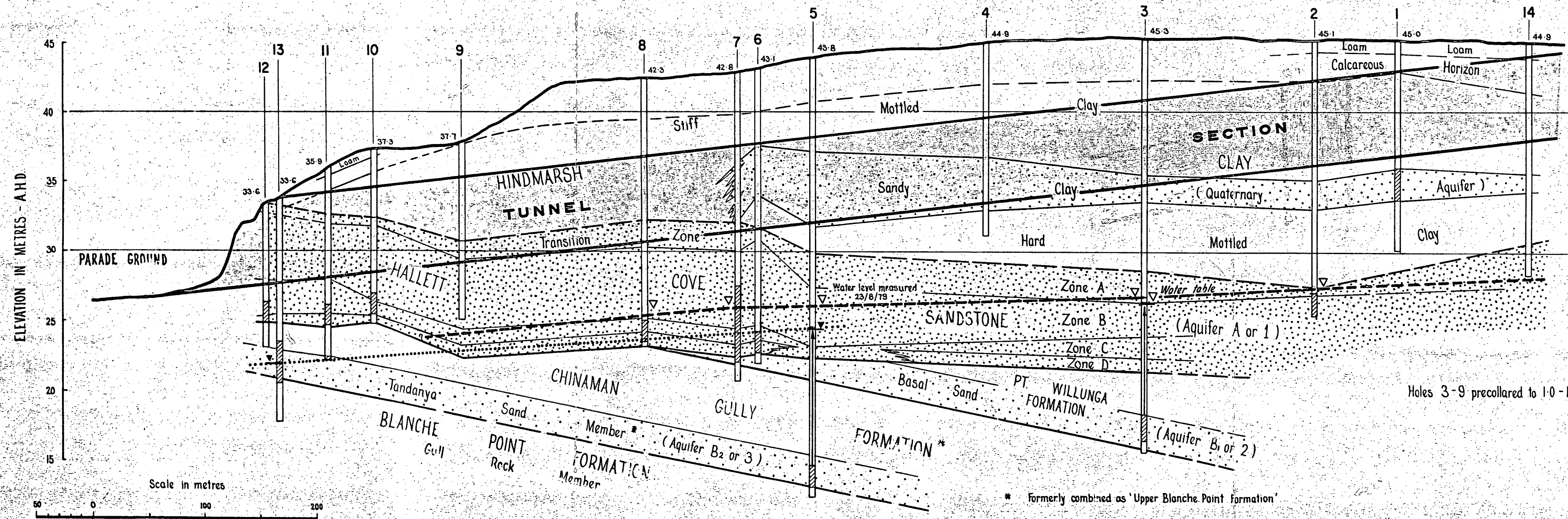
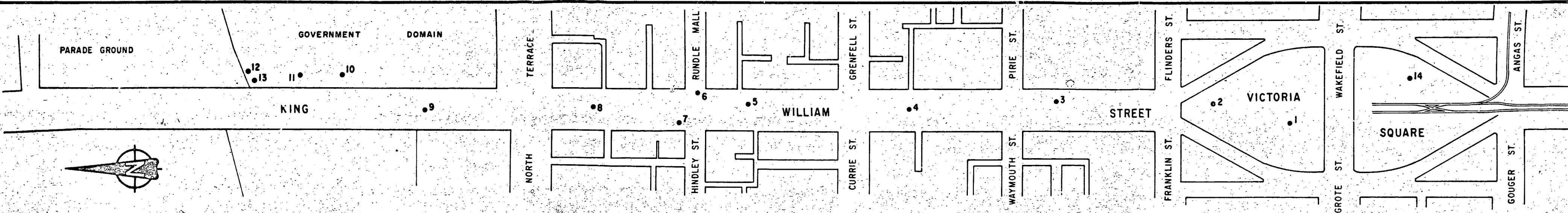


PLATE 13

HOLE KW13: From 0-16.0 m





LEGEND

- HINDMARSH CLAY
 - Upper stiff clay (calcareous at top) (CH)
 - Sand Member (SC)
 - Lower hard clay (CH)
 - HALLETT COVE SANDSTONE
 - Transition Zone, Zone A (GC)
 - Massive calcareous sandstone, Zone B
 - Mainly sand with some sand lenses, Zone C
 - Shelly sandstone & occasional sand, Zone D
 - PT. WILLUNGA FORMATION
 - Sandy silty clay (ML)
 - Silty sand (SM)
 - CHINAMAN GULLY FORMATION
 - Silt/marl (ML)
 - Tandanya Sand Member (SW, SP)
 - BLANCHE POINT FMN.
 - Silt and siltstone (CH)
- Unified Soil Classification Symbol
- Water level as at 1/11/79 in Hallett Cove Sandstone and Port Willunga Formation
- Water level in Tandanya Sand Member
- Slotted casing interval

Fig. 1

DEPARTMENT OF MINES AND ENERGY SOUTH AUSTRALIA		SCALE: As shown
COMPILED C.H.H.C., D.A.		DATE: Jan. 1980
DRN: M.R.	CKD:	PLAN NUMBER
NORTHEAST TRANSIT PROJECT KING WILLIAM STREET TUNNEL WELL LOCATIONS AND GEOLOGICAL SECTION		80-22

* Formerly combined as 'Upper Blanche Point Formation'