DEPARTMENT OF MINES
SOUTH AUSTRALIA

GEOLOGICAL SURVEY

ENGINEERING DIVISION

WATER TREATMENT WORKS - ATHELSTONE
GEOLOGICAL INVESTIGATIONS. PROGRESS REPORT NO. 1
FEASIBILITY STAGE

Section 5660, Hundred of Adelaide

- Engineering & Water Supply Department-

by

J.P. TRUDINGER
ASSISTANT SENIOR GEOLOGIST
ENGINEERING GEOLOGY SECTION

Rept.Bk.No. 70/106

15th July, 1970

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SOUTH AUSTRALIA

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DEPARTMENT OF MINES
SOUTH AUSTRALIA

Rept.Bk.No. 70/106
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WATER TREATMENT WORKS - ATHELSTONE
GEOLOGICAL INVESTIGATIONS. PROGRESS REPORT NO. 1

FEASIBILITY STAGE

Client: Engineering & Water Supply Department

SUMMARY AND CONCLUSIONS

The site for a proposed Water Treatment Works in a disused gravel quarry near Athelstone was explored by a single cable tool hole 18.5 ft. deep. The hole penetrated a succession of 7.4 ft. of slopewash gravels overlying weak to medium strong sandstone. The hole terminated in very strong rock, probably quartzite bedrock.

All the materials penetrated appeared to have high density and bearing capacities.

Existing vertical faces in the quarry appear stable. However any permanent batters associated with construction works should be excavated at 45^{o} (1 on 1).

The site is close to the Eden Fault along which movements have been recorded in recent times.

INTRODUCTION

As part of the feasibility investigations for Water Treatment Works in the Adelaide Metropolitan Area, the Engineering and Water Supply Department on 5th May 1970, requested subsurface geological investigations of a site near Athelstone.

The proposed Athelstone Treatment Works are to be located in a disused quarry approximately ½-mile south-east of the suburb of Athelstone. (Fig. 1).

The quarry floor is fairly flat, but contains numerous small depressions and heaps of spoil.

The site was explored by means of a single cable-tool hole, 18.5 ft. in depth. (Fig. 1). Sample recovery from this hole was very low, and periscope observations of the sides of the hole were used to supplement the drilling information.

SITE GEOLOGY

Topography

The site is located approximately 700 ft. above sea level, in the lower part of the escarpment which occurs at the base of the main Mt. Lofty Range. The natural ground surface in the vicinity of the site, slopes towards the north-west at about 10^{0} (1 on 6). The slopes steepen to about 25^{0} (1 on 2.4) on the foothills of the main range, immediately to the east of the site.

The disused quarry is situated across a natural south-east trending gully.

Geological Succession

The walls of the quarry are up to 20 ft. high and expose boulders, cobbles and gravels in matrixes of sand and clayey sand (GP, GW, GC in the Unified Classification System - U.S.B.R. 1966). Clay content is commonly less than 10%. The walls of the quarry are near-vertical with no evidence of major instability, although near-surface collapse occurs in places.

The geological succession below the quarry floor is shown in detail on Fig. 2 and is tabulated below.

DEPTH (FT.) From	To	THICKNESS (FT.)	GEOLOGICAL DESCRIPTION	ENGINEERING DESCRIPTION
0.0	7.4	7.4	SLOPEWASH GRAVELS Quartzite fragments up to 2 ft. diameter in a clayey sand matrix.	GRAVEL, poorly graded, (GP). Matrix is clayey sand (SC). Clay content is less than 15%.
7.4	17.9	10.5	FERRUGINOUS SANDSTONE. Mainly quartz sand with ferruginous and argillaceous fines cementing the grains.	Rock, weak to medium strong.
17.9	18.5	More than 0.6ft.	QUARTZITE Quartz grains cemented by silica.	Rock, chemically weathered, strong or very strong.

Seismicity

Records of earthquake shocks in South Australia suggest that small movements are still occurring along the faults which formed the St. Vincent Gulf and Mt. Lofty Ranges. One of these faults, the Eden Fault, passes through the site area (Fig. 1). An earthquake of Intensity 8 on the Modified Mercalli Scale, which occurred in 1954, is believed to have been caused by small movements at shallow depth along this fault. Further minor events and possibly some major events, are likely to occur along this fault line.

DISCUSSION

The geological succession as described is based on an interpretation of the following:-

.....tube samples recovered between 5.7 and 7.4 ft.

.....sludge pump samples recovered between 0 and 5.7 ft. and between 7.4 and 18.5 ft.

.....rate of penetration of the chisel-type drill bit.

.....observations of material in the walls of the holes using a "down-the-hole" periscope.

The latter technique clearly indicated the boundary between the slopewash gravels and the underlying sandstone. However, no observations could be made below a depth of 10 ft., and the occurrence of quartzite at the base of the hole is inferred from the extremely slow drilling rate and the change in colour of the sludge pump samples from brown to off-white.

Although it was not possible to obtain samples of most of the materials penetrated by the cable tool hole, the fact that the drilling rate was very slow indicates that the materials are very dense and hence that their bearing capacities are high.

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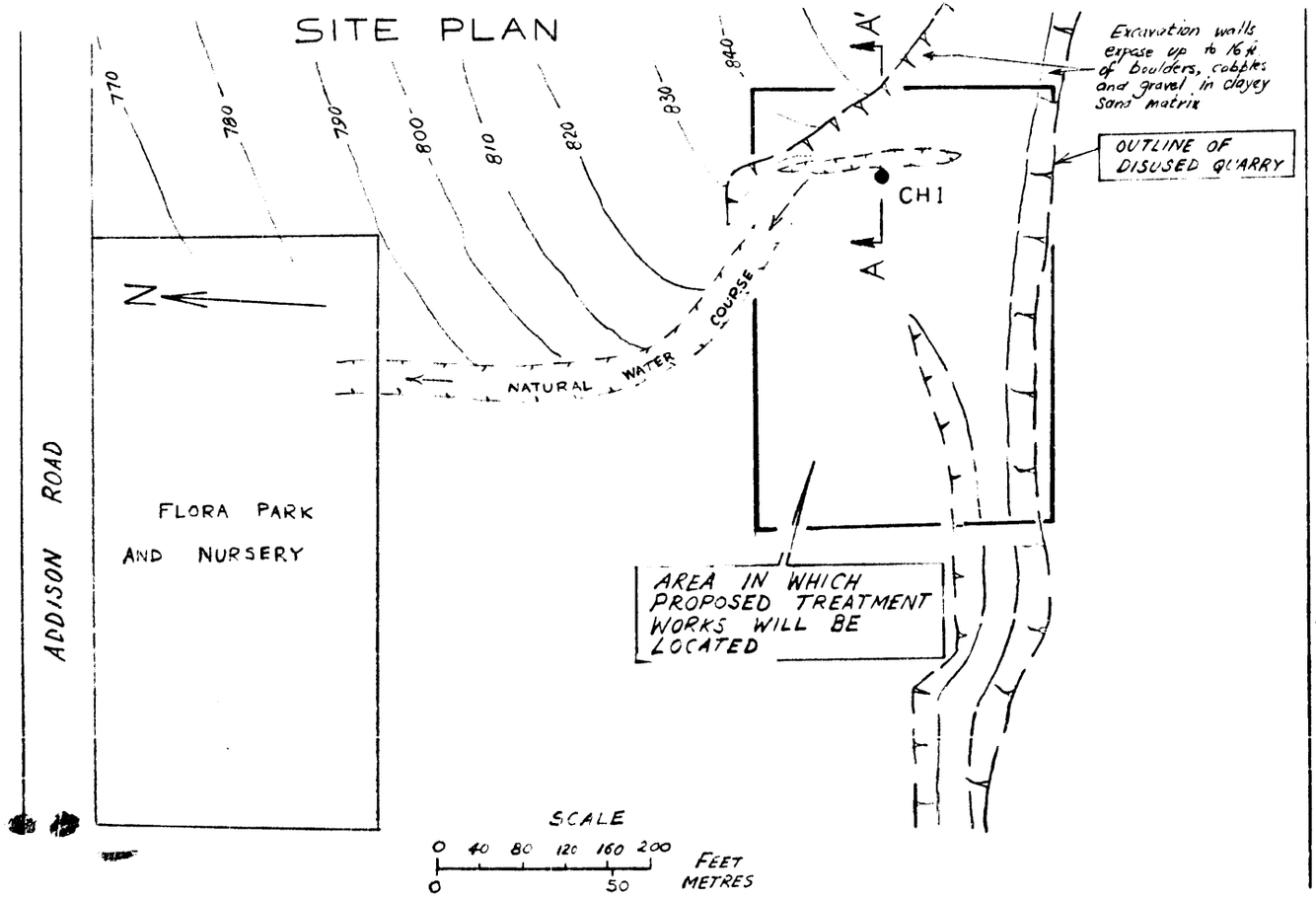
JPT:PMM:FdA
15.7.70

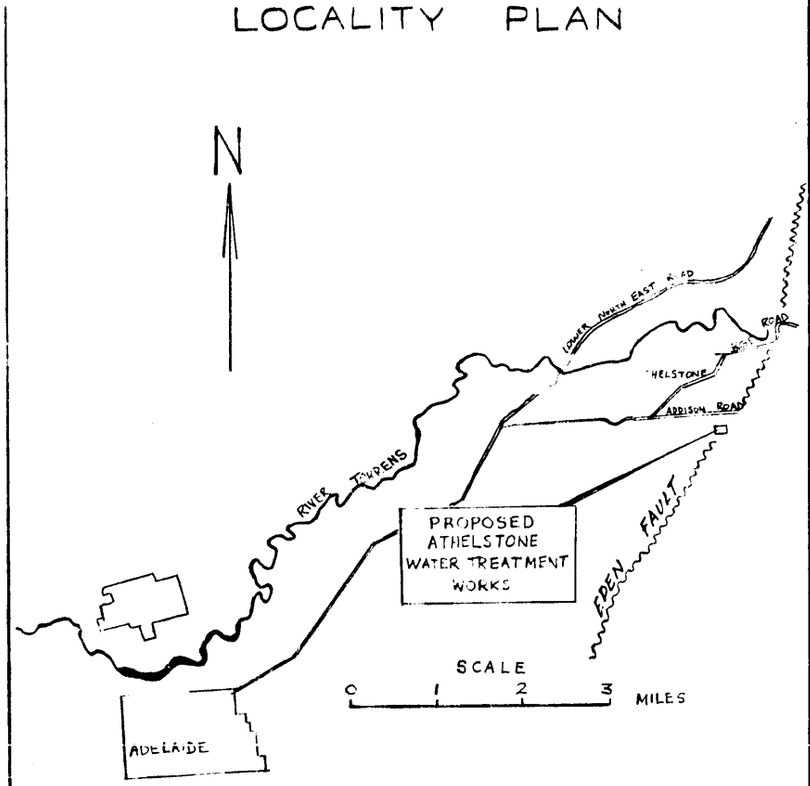
REFERENCE

UNITED STATES DEPT. OF THE INTERIOR, Bureau of Reclamation Earth Manual, Second Edition, 1966.

SITE PLAN



LOCALITY PLAN



SECTION (DIAGRAMMATIC IN PART)

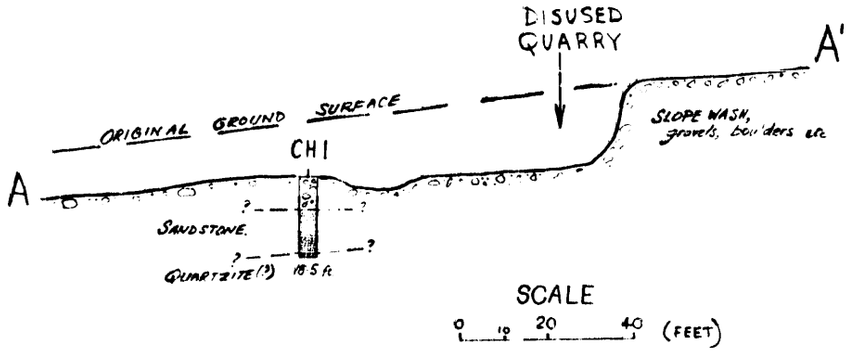


FIG. 1

DEPARTMENT OF MINES — SOUTH AUSTRALIA			
WATER TREATMENT WORKS — ATHELSTONE Hd. Adelaide Sec. 5660 PLAN AND GEOLOGICAL SECTION			
ENGINEERING GEOLOGY SECTION	GEOLOGIST	Drn. J.P.T.	SCALE: AS SHOWN
		Tcd. J.P.T.	70-635 Hg 6
Director of Mines	SENIOR GEOLOGIST	Chd.	
		Exd.	DATE: 10 JULY 1970

DEPARTMENT OF MINES · SOUTH AUSTRALIA

LOG OF CABLE TOOL HOLE

HOLE CH 1

SERIAL No

PROJECT. WATER TREATMENT WORKS – ATHELSTONE

SECTION 5660

FEATURE FOUNDATION

HUNDRED. ADELAIDE

LOCATION. Floor of abandoned quarry

CO-ORDS Not obtained

R.L. Surface. 826 FT.

R.L. Collar 826 FT.

Datum LWOST-100FT.

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.	FIELD TEST DATA: BLOWS PER FOOT 20 40 60 80	FIELD TEST DATA: SOILTEST P.T.R.METER Units 1 2 3 4
QUATERNARY Slopewash gravels. Gravel and sand consist mainly of quartzite fragments, angular to subrounded. Clayey fines are ferruginous - mainly red-brown.	5		GP to SP	GRAVEL, poorly graded, very sandy, up to 15% clay fines. Fragments up to 20cm. diameter.	No Water Met.		Not Known	Not Known	SLUDGE PUMP SAMPLES (pale brown)	
			SC	SAND, medium to coarse grained, excess clay. Some gravel.						More than 100 blows
TERTIARY Terrestrial Sandstone. Sand grains with ferruginous cement and argillaceous matrix. Brown to white, some quartzite gravel, some limonite concretions.	10		ROCK	Rock, weak to medium strong.					SLUDGE PUMP SAMPLES (yellow brown)	
	15									More than 100 blows.
Quartzite, (?) off-white				Rock, strong.					Sludge off white	
				END OF HOLE 18.5 ft. R.L. 807.5 ft.						

NOTE: This log is interpreted from sludge pump samples, tube samples and periscope observations.

FIG. 2.

TYPE OF SAMPLE	CONSISTENCY (Clays)	COMPACTNESS (Silts)	RELATIVE DENSITY (Sands)	MOISTURE CONTENT
A Shoe (SA) D " (SD) E " (SE) G " (SG) Sealed Tube - A Shoe - SAL Standard Penetration Test - SPT	VS. — Very Soft S — Soft F — Firm St. — Stiff V. St. — Very Stiff H. — Hard	Ls — Loose MC — Moderately Compact C — Compact V C — Very Compact	VL — Very Loose L — Loose M D — Medium Dense D — Dense VD — Very Dense	H — Humid D — Damp M — Moist W — Wet S — Saturated 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. 24

TYPE DM. 500

DRILLER Phillips

START 28 May '70

FINISH 29 May '70

LOGGED BY J. Trudinger

DATE 29 May '70

TRACED D.W.W.

CHECKED L.V.W.

SHEET 1 OF 1

DRG No. S7761 Ha6

PF No. S6676 MB