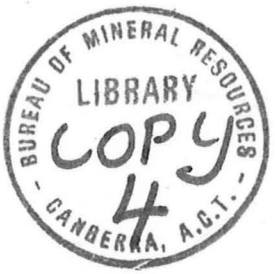
DEPARTMENT OF
MINERALS AND ENERGY

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

Record 1975/36



ENGINEERING GEOLOGY AND ENVIRONMENTAL FACTORS OF PROPOSED JERRABOMBERRA INDUSTRIAL ESTATE, A.C.T.

by

P.D. Hohnen

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CONTENTS

SUMMARY

The area of the proposed Jerrabomberra Industrial Estate is mostly underlain by transported and residual soils which are generally several metres thick and overlie weathered Silurian rocks. There are some bedrock outcrops which are mainly of strong volcanic rocks which will be difficult to excavate. Irregular weathering of the bedrock indicates the necessity for detailed site investigations for large structures. Confined groundwater aquifers have been intersected by drilling in both soil materials and fractured rock. Some areas of organic silts and clays, and of alluvium and slopewash will require drainage before building construction is begun.

INTRODUCTION

On 11 September 1972, the Bureau of Mineral Resources (BMR) was requested by the National Capital Development Commission (NCDC) to provide the following geotechnical information on the Jerrabomberra area:

(a) identification of any special geological features that might constitute development constraints;

(b) location of deposits of natural resources;

(c) soil depths and depth to rock, specifying lithology;

(d) groundwater conditions and the effect of earthworks on them;

(e) recommendations for further investigations in the area, if necessary.

The area of 27 km^2 is about 9 km long and averages 3 km wide and a preliminary report was submitted to NCDC on 19 March 1973. This report included a 1:25 000 scale soils map which was compiled from air-photo interpretation and soil logs, and contained tables listing generalized soil properties.

Subsequent field work has led to the revision of the soils map (Pl. 1) which now shows only soils with significantly different properties. Rock outcrops and areas with abundant boulders at the surface have also been mapped. Creek banks and excavations have been inspected and some augering has been done to verify the mapped units and determine their thickness. Thirteen power-auger holes were drilled and piezometers were installed at four locations to monitor groundwater levels of aquifers in soils. Logs of the auger holes are given in Appendix 1.

SOILS

The soils in the Jerrabomberra area are as follows:

(a) Transported soils, which are mostly slopewash with some alluvium,

TABLE 1 - SOIL PROPERTIES

	SOIL NAME	APPROXIMATE THICKNESS (metres)	CLASSIFICATION (UNIFIED-SCHEME)	EXPECTED BEHAVIOUR AS FOUNDATION FOR LIGHT STRUCTURES	STABILITY OF EXCAVATIONS		EASE OF EXCAVATION	PERMEABILITY
					VERTICAL CUTS	2:1 (27°) BATTERS		
RESIDUAL SOILS	Prairie Soils	less than 1.5	OL,SC	Good	Unstable	Stable	Easily excavated by bulldozer	Moderate
	Red Earths	1-3	SC,CL	Fair to good	Unstable	Stable	"	Moderate
	Red Podzolics	2-5	CL,CH	Fair (well drained) to poor (frequent wetting & drying)	Cuts up to 1 m will stand for short periods	Stable	"	Very low
	Skeletal Soils	less than 1	GM,SM	Good	Unstable	Stable only if drained	"	Moderate
	Organic Silts and Clays	1-3	OL, OH	Very poor	Unstable	Stable	"	Very low
TRANSPORTED SOILS	Coarse Talus	very variable	GW	Unsuitable (natural slopes too steep)	Unstable	Stable	"	High
	(cemented)	2-6	SC	Very good	Stable (berms advisable for cuts above 2m)	Stable	Generally rippable; might require light blasting in places	Low
	Slopewash (uncemented)	2-6	SC-SW	Fair to poor (will consolidate)	Unstable	Stable (only if drained)	Easily excavated by bulldozer	Aquifer - very high
	Stratified Alluvium (Silt & Clay)	1-3	SP,OL,OH	Poor	Unstable	Stable (only if drained)	"	Moderate
	Stratified Alluvium (Sand, Silt & Clay)	more than 3	GP,OL,OH	Very poor	Unstable	Stable (good drainage advisable)	Equipment might bog if not well drained.	Very high (aquifer)

and are derived mainly by erosion of volcanic rocks from the southwest and southeast of the area. These soils have not undergone extensive weathering since their deposition.

(b) Residual soils, which are mostly sandy red earths and red podzolics, derived by the extensive weathering in place of detritus derived from the erosion of volcanic rocks and porphyry.

The engineering properties related to each soil type are shown in Table 1.

BEDROCK GEOLOGY

The sparse rock outcrops in the area are mostly of slightly to moderately weathered, strong volcanic rocks. The outcrops are rounded projections of rock that commonly reach 1 to 1.5 m above the ground surface. Outcrops cover about 1 percent of the area and occurrences of abundant boulders on the surface occupy a similarly restricted area.

The volcanic rocks and porphyry of broadly similar mineralogy underlie the soil beneath about 90 percent of the area. The volcanic rocks overlie Middle Silurian sedimentary rocks (Fairbairn Group) that are exposed or underlie soils in a small area to the northwest (Pl. 1). These sedimentary rocks are predominantly shale, tuffaceous shale, and thinly bedded limestone; they are generally closely jointed and weak in the weathered state and exposures do not project much above the ground surface; fresh and slightly weathered calcareous shale and limestone do not crop out but would be tough and strong.

GROUNDWATER HYDROLOGY

There are three water bores within the area and detailed water-level data are available for one bore (Fig. 1). Some data are also available for three water bores within 1 km of the boundary of the area (Pl. 1).

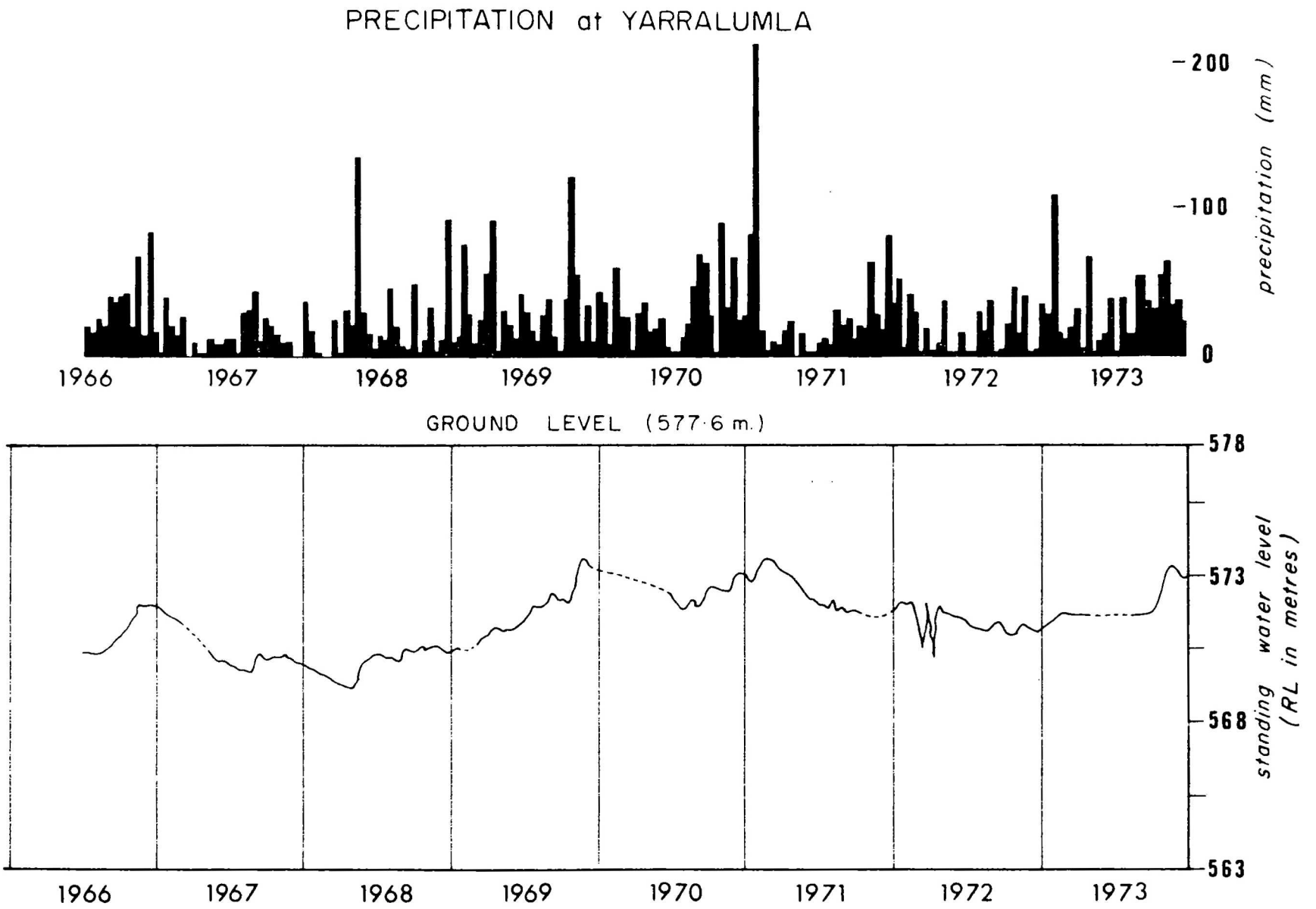

Fig. 1 GROUNDWATER LEVELS in OBSERVATION BORE C13

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TABLE 2

GROUNDWATER BORE DATA, JERRABOMBERRA AREA

Bore No.	C2	C13	W1	W2	Q4	Q5
Soil and rock types intersected	Mt Painter Porphyry	Alluvium, Ainslie Volcanics	0-13.2m clay; 13.2-15.9m sandy clay; 15.9-24.7 volcanics	Deakin Volcanics	N/A	N/A
Depth of bore (metres)	18.9	154	24.7	39.6	21.3	23.5
Groundwater yield (m^3/h)	1.8 (400gph)	45.4 (10 000 gph)	dry	7(1500 gph)	1.4(300gph)	1.4(300gph)
Standing water level (metres below ground level)	1	3.8 to 8.4	-	8	N/A	N/A
Probable depth of aquifer(s) (metres)	8.4	55-60; 80-86	-	14-20	N/A	N/A
Elevation of top of casing (metres)	594	579	620	600	625	610

CHEMICAL ANALYSES (ppm)

Bore No.	C2	W2	Q4	Q5
Ca	47	117		
Mg	22	34		
Na	33	110		
K	3	20		
HCO_3	260	348		
Cl	46	217		
SO_4	-	102		
Total dissolved solids	390	961	760	800

These data are summarized in Table 2 and give some indication of the characteristics of fractured-rock aquifers at depth.

Of the thirteen auger holes that were drilled, six intersected groundwater in soil materials at depths ranging between 1.2 and 4.5 m. In the southeast part of the area in holes J3 and J5, water was intersected within 2 m of the surface in a coarse-grained clean sandy aquifer and rose to ground level. In the northwest of the area in holes J8 and J9, water was intersected at depths of 3.0 and 4.5 m respectively, and water levels rose to 2.5 and 4.2 m, at which depths they have remained for several months. In the southwest of the area, hole J6 intersected water at a depth of 2.3 m and the water level in this hole has stabilized at about 0.6 m below ground level.

PREDICTION OF ENGINEERING CONDITIONS

EXCAVATIONS

Excavations in soil or highly weathered rock will be possible with hydraulic rippers or by bulldozer. Moderately weathered to fresh volcanic rocks will require blasting as these are strong rocks with widely spaced joints. Sedimentary rocks of the Fairbairn Group should generally be rippable to depths of 2 m. Floaters of strong volcanic rock up to 3 m across are expected to occur in most soil types.

The stability of cuts in soils is predicted in Table 1. Excavations in weathered volcanic rocks are generally expected to be stable in the short term, e.g. for construction of deep foundations. Deep, permanent cuts in fairly fresh volcanic rocks should require minimal benching, but stability will depend locally on the orientation of joints. Some clay-filled shears are to be expected, but cannot be predicted at any locality; where present they may provide local instability of batters. Stability of cuts in sedimentary rock will depend on the orientation of bedding

planes and joints, and will generally be predictable during project investigation.

FOUNDATIONS

The foundation characteristics of soils in the area are listed in Table 2.

Deeper foundations and foundations for multi-storied buildings may encounter difficulties due to variability of material in the weathered profile. Large boulders of fresh volcanic rock up to 3 m across may occur within more extensively weathered rock or soil, and rock outcrops are commonly surrounded by soil several metres deep. Thus, while bearing strengths are expected to be generally adequate for light structures, careful foundation location is advisable for buildings with higher bearing pressures to avoid differential settlement within the foundation material.

GROUNDWATER

Groundwater is expected to occur in fractured-rock aquifers throughout the area at depths generally greater than 9 m. Should such aquifers be intersected during excavation, groundwater may rise close to ground level in lower areas, but the potentiometric surface of fractured rock aquifers is generally about 8 m below ground surface.

Groundwater will probably be intersected by some excavations deeper than 1.5 m in alluvium, in organic silts and clays, and in uncemented slopewash deposits. Aquifers within these deposits could occur at any depth, and in the southeast of the area potentiometric levels are likely to be close to ground level, at least during the winter months. The potentiometric surface for aquifers in soil materials appears to be slightly deeper towards the north of the area and water levels are not expected to rise above 2 m below ground level there. In the central part of the area, only one piezometer has been installed, but potentiometric levels of aquifers in soil are expected to be generally more than 1 m

below ground level in that area.

DRAINAGE

Most soils in the Jerrabomberra area are well drained and the installation of normal stormwater drains should keep them so. Localized areas of organic silts and clays with poor drainage (Pl. 1) require a well designed, deep drainage system to intersect the aquifers so as to maintain adequate bearing strengths and stability of cuts.

The alluvium has high permeability in the horizontal plane but low permeability in the vertical plane owing to the presence of organic clay layers. Special treatment will be required where roads are to cross these deposits.

Uncemented slopewash varies markedly in permeability in both the horizontal and the vertical plane owing to variations in clay content. Drains about 2 m deep will be required to adequately drain saturated slopewash along ephemeral watercourses; such areas are localized and perhaps construction upon such deposits can be avoided.

NATURAL RESOURCES

SAND AND GRAVEL

Considerable reserves of sand and gravel occur in the stratified alluvial deposits along the Molonglo River and along Jerrabomberra Creek. However, the latter deposits, which are the more extensive, include finer-grained material such as silt and organic clays which would preclude their use at present. Deposits of river sand and red wind-blown sand occur mainly on the right bank of the Molonglo River in the northernmost part of the area mapped. These deposits have been worked previously in the north of this area. Some slopewash is a coarse-grained poorly graded sand. Workable deposits of this material might occur within the area, but an extensive augering program would be required to locate suitable

deposits.

ROAD GRAVEL

Uncemented slopewash is worked for road gravel of low plasticity at Tralee, just across the border in N.S.W. Similar deposits are unlikely within the Jerrabomberra area because slopes are more gentle and slopewash deposits correspondingly finer-grained.

SANDSTONE

A small area of sandstone within the Deakin Volcanics crops out about 300 m south of the Monaro Highway/Jerrabomberra Avenue/Tharwa Road intersection. The sandstone is strong, thickly bedded, and mainly white and quartzose with some buff and mauve lithic sandstone. The true thickness of the sandstone deposit that is exposed is about 4 m and it crops out for about 15 m along the strike of the beds. The component quartz grains are of a narrow size range of about 1 to 2 mm and are sub-rounded. The deposit might be workable in the future as a source of sandstone or even of sand, if crushing the rock was economically feasible. The exposed area of the sandstone is insufficient to warrant exploitation but rotary drilling might prove a much larger deposit.

AGGREGATE

Much of the area is underlain by volcanic and porphyritic rocks that would probably include rock suitable for aggregate. Hills that would allow drainage and some degree of screening of quarry operations occur about 600 m north of "Woden" and about 500 m north of the A.C.T./N.S.W. border on the Tharwa Road (Pl. 1).

DESIGN CONSTRAINTS

Geological constraints upon design can be summarized as follows:

(1) Poorly drained areas such as organic silt and clays and some areas of alluvium that will require construction of drainage

works before development can proceed.

(2) Subsurface excavation that will require some blasting in areas of outcrop, scattered outcrop, and boulders; some areas of cemented slopewash; and possibly also in some areas of skeletal soils.

(3) Foundations of large structures will require detailed site investigations.

CONCLUSIONS

1. There are no special geological conditions that constitute a major constraint on development.

2. Groundwater inflows into excavations could occur in places from shallow aquifers in soil materials. Flows will be small, but could cause instability of cuts in soil.

3. During development, the sediment trap on Jerrabomberra Creek should be emptied frequently to prevent excessive amounts of sediment entering Lake Burley Griffin.

4. Consideration should be given to the control of storage and disposal of wastes and petrochemicals near or in Jerrabomberra Creek to prevent pollution of the Creek, Lake, and groundwater in the area.

5. Urban development of the south Queanbeyan area will increase runoff because of lawn-watering and the reduction of infiltration of precipitation. The sediment load that Jerrabomberra Creek will be capable of transporting will be increased and additional sediment traps may be required.

APPENDIX 1

JERRABOMBERRA INDUSTRIAL ESTATE

LOGS OF AUGER HOLES

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Geological Log of Auger Hole

Project: Jerr. Ind. Est. Hole: J1 Date: Logged by: P.D.H

DEPTH (metres)	LOG	ENGINEERING SOILS DESCRIPTION (Text, plast., OM)	Unified symbol	COLOUR Pale or dark Comb. col. R-B, Y-B	Moisture D, M > PL, W	Relative density (CG) VL, L, MD, D, VD	Boundary G or S cement	Consistency Ton/Sq. ft. 0 1 2 3 4 5 kg/cm² VS, SF, ST, V, ST, H	Massive Porous Crumb etc. Structure	Sampling method	Casing water	GEOLOGICAL PEDOLOGICAL DESCRIPTION [Eolian Residual, Alluvial Colluvial, Decomposed rock, Horizon A, B, C, Buried soil]
		Sandy silt.	OL	Dark yellowish brown.	D	L	S		P			
		Sandy silt.	OL	Dark greyish brown.	D	L	S		P			
		cw ROCK.	SC	Yellowish brown	D	V.D.	S	H	M	UNDISTURBED AUGER SAMPLES.		
1		AUGER REFUSAL 1.0 M.										
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Geological Log of Auger Hole

Project: Jerr. Ind. Est. **Hole:** J2 **Date:** 23-3-73 **Logged by:** P.D.H

DEPTH (metres)	LOG	ENGINEERING SOILS DESCRIPTION (Text, plast, OM)	Unified symbol	COLOUR Pale or dark Comb. col. R-B, Y-B	Moisture D, M > PL, W	Relative density (CG) VL, L, MD, D, VD	Boundary Gor S cement	Consistency Ton/Sq. ft. 0 1 2 3 4 5 KgSqcm VS, SF, ST, V, ST, H	Massive Porous Crumb etc.	Sampling method	Casing water	GEOLOGICAL PEDOLOGICAL DESCRIPTION [Eolian Residual Alluvial Colluvial Decomposed rock Horizon A, B, C Buried soil]
		Yellowish brown sandy silt	SM		SL M			SF				
		grades into yellowish red sand silt mixture.	SM									
			SM		D			SF				
		Yellowish red gravel-sand-clay.	SP		D			VS	P			
		Red to cream, cemented coarse sandy slopewash	SP									
		Cream, well consolidated, cemented sandy slopewash	SW		D				M			
1		Mottled yellow red and pale brown, fine to coarse sandy, cemented slopewash	SW		D			H	M	SAMPLES.		
		As above but very well consolidated (will require blasting)	SW									
		very well consolidated, cemented slopewash, or moderately weathered lithic tuff. Blasting required from about 1m to 4.5m below surface. Brown clayey sand with some gravel layers, slightly moist from 1.5 – 4.5 m.	SW		D			H	M	UNDISTURBED AUGER		
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Geological Log of Auger Hole

Project: Jerr. Ind. Est. **Hole:** J3 **Date:** 23-3-73 **Logged by:** P.D.H

DEPTH (metres)	LOG	ENGINEERING SOILS DESCRIPTION (Text., plast., OM)	Unified symbol	COLOUR Pale or dark Comb. col. R-B, Y-B	Moisture D, M > PL, W	Relative density (CG) VL, L, MD, D, VD	Boundary G or S content	Consistency Tons/Sq. ft. 0 1 2 3 4 5 Kg/Sqcm VS, SF, ST, V, ST, H	Massive Porous Crumb etc.	Sampling method	Casing water	GEOLOGICAL PEDOLOGICAL DESCRIPTION [Eolian Residual Alluvial Colluvial Decomposed rock Horizon A, B, C Buried soil]
		Plastic clay	OH	very dark grey	M					AUGER		
		Slopewash	SW	light grey	D							
1		silt-sand-gravel mixture (cemented)	SW		D							
		Friable sand silt mixture (slopewash)	SM	light brownish grey	M							
		Clayey sandy slopewash	SC	Mottled grey & dk yellowish brn	M							
		Poorly graded (coarse sandy slopewash)	SP	light brownish grey	W				P	UNDISTURBED		} Aquifer
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Geological Log of Auger Hole

Project: Jerr. Ind. Est. **Hole:** J4 **Date:** 28-3-74 **Logged by:** P.D.H

DEPTH (metres)	LOG	ENGINEERING SOILS DESCRIPTION (Text, plast, OM)	Unified symbol	COLOUR Pale or dark Comb. col. R-B, Y-B	Moisture D, M > PL, W	Relative density (CO) VL, L, MD, D, VD	Boundary Gen S cement	Consistency Tons/sq. ft. 0 1 2 3 4 5 kg/sqcm VS, SF, ST, V, ST, H.	Massive Porous Crumb etc.	Sampling method	Casing water	GEOLOGICAL PEDOLOGICAL DESCRIPTION [Eolian Residual Alluvial Colluvial Decomposed rock Horizon A, B, C Buried soil]
		Slightly Sandy Silt.	SM	Dk greyish brown	D				C			A Horizon
		Sandy Silt.	SM	Greyish brown	D				C			Slopewash.
		Clay - silt - Sand	CL	mottled brownish grey minor yellow.	M				M			Slopewash.
		Fine - coarse - Sand	SP	Pale brown.	W				P			Slopewash.
		Auger Refusal.										
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Geological Log of Auger Hole

Project: Jerr. Ind. Est. **Hole:** J5 **Date:** 29-3-73 **Logged by:** P.D.H

DEPTH (metres)	LOG	ENGINEERING SOILS DESCRIPTION (Text, plast. OM)	Unified symbol	COLOUR Pale or dark Comb. col. R-B, Y-B	Moisture D, M > PL, W	Relative density (CO) VL, L, MD, D, VD	Boundary G or S common	Consistency Ten/Sq. ft. 0 1 2 3 4 5 6 S.Sf. ST. V. ST. H.	Massive Structure Porous Crumb etc.	Sampling method	Casing water	GEOLOGICAL PEDOLOGICAL DESCRIPTION [Eolian Residual Alluvial Colluvial Decomposed rock Horizon A, B, C Buried soil]
1		Gravel - Sand - silt mixture (slopewash containing MW volcanic rock fragments)	SW	Greyish brown	D				P	SAMPLES		Colluvial
		Silt (some coarse sand & clay)	ML	Pale brown with yellowish & greyish mottles.	M				M	AUGER		Colluvial
2		Coarse, poorly graded sandy slopewash	SP	Light brownish grey.	W				P			Aquifer (Colluvial)
3		Well consolidated clay (some Sand & silt)	CL	Banded and mottled, yellowish brown & grey	M				M	UNDISTURBED		Decomposed Rock
4		Well consolidated silt.	ML	Light grey.	M							Decomposed Rock
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Geological Log of Auger Hole

Project: Jerr. Ind. Est. **Hole:** J6 **Date:** 30/1/74 **Logged by:** P.D.H

DEPTH (metres)	LOG	ENGINEERING SOILS DESCRIPTION (Text. plast. OM)	Unified symbol	COLOUR Pale or dark Comb. col. R-B, Y-B	Moisture D, M > PL, W	Relative density (CG) VL, L, MD, D, VD	Boundary G or S cement	Consistency Ton/Sq. ft. 0 1 2 3 4 5 Kg/Sqcm VS. SF. ST. V. ST. H.	Massive Porous Crumb etc.	Sampling method	Casing water	GEOLOGICAL PEDOLOGICAL DESCRIPTION [Eolian Residual Alluvial Colluvial Decomposed rock Horizon A, B, C Buried soil]
0		Fine sandy silt, topsoil.	SM	Pale greyish brown	M	MD						Colluvial (A horizon)
		Fat sandy clay		mottled grey-brown & yellow brown → orange		D						
1		moderately heavy clay flecked with sand sized feldspars & qtz.	CH	mottled yellow-& greyish yellow	M	VD						In situ weathered colluvium.
		Friable well graded, coarse sandy to silty slopewash, lightly cemented in places. Constituent grades are rock fragments.	SW	Yellowish & greyish brown	SATURATED	L					AQUIFER.	Colluvial possibly alluvial.
2												
		Hard (when dry) strongly consolidated, lean clay.		Pale grey	M	D						
3		Compacted (probably by augering process) strong, (dry) fairly lean clay with some sandy patches		Mottled yellow rusty and pale yellow-ish-grey.	M	D						'B' horizon of buried soil possibly P_8.
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Geological Log of Auger Hole

Project: Jerr. Ind. Est. **Hole:** J7 **Date:** 30/1/74 **Logged by:** P.D.H

DEPTH (metres)	LOG	ENGINEERING SOILS DESCRIPTION (Text, plast, OM)	Unified symbol	COLOUR Pale or dark Comb. col. R-B, Y-B	Moisture D, M > < PL, W	Relative density (CG) VL, L, MD, D, VD	Boundary Gor S comm	Consistency Tenacity fi. 0 1 2 3 4 VS, SF, ST, V, ST, H.	Massive Structure Porous Crumb etc.	Sampling method	Casing water	GEOLOGICAL PEDOLOGICAL DESCRIPTION Eolian Residual Alluvial Colluvial Decomposed rock Horizon A, B, C Buried soil
1		Sandy silt topsoil with minimal organic mater	SM	Pale brown	M	L	G		Porous	SPLIT TUBE + CORE BARREL.	AQUIFER.	Residual soil development on alluvium.
		Moderately graded coarse to fine sand consisting mostly of rock frags, some quartz.	SW	brownish yellow.	M	L			"			
2		Poorly graded coarse sand comprising clasts 0.2mm to 4mm of qtz and rock fragments.	SP	brownish yellow	SATURATED	L	G		"			Alluvial possibly some slopewash.
		clayey silt.	OL	very dark grey.	W	D	S		Massive compact.			
3		Moderately well graded lithic sand clasts break down to fine grades on working.	SW	greyish brown.	↑	MD	G		Porous	SPLIT TUBE	AQUIFER.	
			SP	greyish and yellowish	SATURATED	L	S		"			
4		Poorly graded medium to coarse lithic sand with layers to 20cm thick of organic clayey silt & mottled orange and grey CH clay.	OH SP CH SP OH	brown with bands of very dark grey or mottled orange	↓	D L D L D	S S S S S		massive porous massive Porous massive		MULTIPLE	
			SP	and grey.		L	S		porous.			
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Geological Log of Auger Hole

Project: Jerr. Ind. Est. **Hole:** J8 **Date:** 31/1/74 **Logged by:** P.D.H

DEPTH (metres)	LOG	ENGINEERING SOILS DESCRIPTION (Text. plast. OM)	Unified symbol	COLOUR Pale or dark Comb. col. R-B, Y-B	Moisture D, M > < PL, W	Relative density (CG) VL, L, MD, D, VD	Boundary G or S cement	Consistency Ton/Sq. ft. 0 1 2 3 4 5 kg/cm² VS, SF, ST, V, ST, H.	Massive Porous Crumb etc.	Sampling method	Casing water	GEOLOGICAL PEDOLOGICAL DESCRIPTION [Eolian Residual Alluvial Colluvial Decomposed rock Horizon A, B, C Buried soil]
		Fine sandy silt	ML	Yellowish brown	D	MD						Slopewash or alluvium.
		organic silt	OL	Dark grey	M	D						(Alluvial
1		organic silty clay	OH	Very dark grey	M	D						flood deposits)
		organic fat clay	OH									
		transition zone (OH - CH)										
2		Heavy sandy clay	CH	medium grey mottled pale grey & orange	>PL	D						In situ weathering of slopewash or alluvium
3		Fine, slightly clayey mod graded sand with some coarse sand layers and pebbles.	SW	Pale greyish and yellowish brown	W	MD						Alluvium aquifer.
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Checked by:

BUREAU OF MINERAL RESOURCES, GEOLOGY & GEOPHYSICS

Geological Log of Auger Hole

Project: Jerr. Ind. Est. **Hole:** J9 **Date:** 5/2/74 **Logged by:** P.D.H

DEPTH (metres)	LOG	ENGINEERING SOILS DESCRIPTION (Text, plast, OM)	Unified symbol	COLOUR Pale or dark Comb. col. R-B, Y-B	Moisture D, M, <PL, W	Relative density (CO) VL, L, MD, D, VD	Boundary Gor S comment	Consistency Tor Sq. H. 0 1 2 3 4 5 kg/cm² VS, SF, ST, V, ST, H.	Massive Porous Crumb etc. Structure	Sampling method	Casing water	GEOLOGICAL PEDOLOGICAL DESCRIPTION [Eolian Residual, Alluvial Colluvial, Decomposed rock, Horizon A, B, C, Buried soil]
		NO RECOVERY										
		Fine sandy silt	ML	Med. grey-br	D	L	G	VS				
		Silty coarse sand	SW		SL.M	L	G	VS				
		" " " (well graded)	SC		SL.M	L		VS				
		clayey sand (low P.I)	SC		SL.M	L	G	VS				
		Very coarse, well graded sand.	SW		SL.M	L	G	VS	POROUS, MOD → PERMEABILITY			
1		Slightly clayey, v. coarse sand to f. gravel	GC		SL.M	L	G	V.S				
		Mottled grey sand	CL		M	MD	S	F				
		Yellow lean clay			M	"		"				
		containing some very fine			M	"		"				
		sand and red mottled medium			M	"		"				
2		grey (slightly yellow) clay of mod.			<PL	"		ST				ALLUVIAL
		plasticity with scattered brownish	CL		<PL	"		"				
		red mottled root traces.			>PL	"	V	"				
						"	G	"				
3		Heavy grey clay with shrinkage cracks.	CH			"		"				
						"		"				
						D		"				
						"		"				
4		5cm thick sand layer.	SW			"		"				
		sandy clay.	SC			"		"				
		med. dk. grey heavy clay	CH			"		"				
		clean sand aquifer 55cm thick	SP		WET	"		"	DENSE, LOW PERMEABILITY	UNDISTURBED AUGERING		Aquifer
		Yellow grey heavy clay.			Moist	"		"				
5		dark grey organic clay becoming darker with depth.	OH		WET	"		"				
		AUGER REFUSAL.			MOIST	"		"				
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BUREAU OF MINERAL RESOURCES, GEOLOGY & GEOPHYSICS

Geological Log of Auger Hole

Project: Jerr. ind. Est. **Hole:** J10 **Date:** 11-2-74 **Logged by:** P.D.H

DEPTH (metres)	LOG	ENGINEERING SOILS DESCRIPTION (Text. plast. OM)	Unified symbol	COLOUR Pale or dark Comb. col. R-B, Y-B	Moisture D, M > PL, W	Relative density (CG) VL, L, MD, D, VD	Boundary G or S cement	Consistency Tons/Sq. ft. 0 1 2 3 4 5 kg/sqcm VS, SF, ST, V, ST, H.	Massive Structure Porous Crumb etc.	Sampling method	Casing water	GEOLOGICAL PEDOLOGICAL DESCRIPTION [Eolian Residual Alluvial Colluvial Decomposed rock Horizon A, B, C Buried soil]
		coarse silty sand with organic matter.	ML	Medium grey brown. banded and mottled.	↑	L	G	S	Friable porous	AUGERING		Soil.
		Lean clay with much sand.	CL to SC	Yellow grey & red, mostly yellow & red.								
1		NO RECOVERY			DRY	D		V.ST		UNDISTURBED		Residual
		Completely weathered rock comprising coarse sand, silt and lean clay.		Grey - brown. yellowish brown reddish and yellowish grey.	↓	↓	↓	↓	Dense, non-porous			
2		Auger refusal										
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GEOLOGY & GEOPHYSICS

Geological Log of Auger Hole

Project: Jerr. Ind. Est. **Hole:** J 11 **Date:** 11/2/74 **Logged by:** P.D.H

DEPTH (metres)	LOG	ENGINEERING SOILS DESCRIPTION (Text, plast, OM)	Unified symbol	COLOUR Pale or dark Comb. col. R-B, Y-B	Moisture D, M > PL, W	Relative density (C) VL, L, MD, D, VD	Boundary G or S comment	Consistency Ton/Sq. ft. 0 1 2 3 4 5 Kg/cm² VS, SF, ST, V, ST, H	Massive Porous Crumb etc.	Sampling method	Casing water	GEOLOGICAL PEDOLOGICAL DESCRIPTION [Eolian Residual Alluvial Colluvial Decomposed rock Horizon A, B, C Buried soil]
		Silty sand	ML	Med grey brown	D	L	G	VS		UNDISTURBED AUGERING.		Residual weathering of quartz-biotite-feldspar porphry
		clayey silty sandy	CL	Dk yellowish grey brown.	SL M	L	G	F				
		sandy, heavy clay	CH	Brownish grey	D	M.D	S	ST				
		well graded coarse sand	SW	speckled grey/yellowish, white/brown.	D	D/V.D		H				HW Porphyry.
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Checked by:

BUREAU OF MINERAL RESOURCES, GEOLOGY & GEOPHYSICS

Geological Log of Auger Hole

Project: Jerr. Ind. Est. **Hole:** J12 **Date:** 11/2/74 **Logged by:** P.D.H

DEPTH (metres)	LOG	ENGINEERING SOILS DESCRIPTION (Text. plast. OM)	Unified symbol	COLOUR Pale or dark Comb. col. R-B, Y-B	Moisture D, M > < PL, W	Relative density (CO) VL, L, MD, D, VD	Boundary Gor S cement	Consistency Ton/Sq. ft. 0 1 2 3 4 5 Kg/Sqcm VS SF. ST. V. ST. H.	Massive Structure Porous Crumb etc.	Sampling method	Casing water	GEOLOGICAL PEDOLOGICAL DESCRIPTION [Eolian Residual Alluvial Colluvial Decomposed rock Horizon A, B, C Buried soil]
		Topsoil (silt, some sand + gravel)	ML	med grey brown pale cream.	D	L		2-3			UNDISTURBED AUGERING.	Residual weathering
		Sandy clay to	SC	Pale brown	"	VD		5				HW Porphyry
		clayey sand (well graded)	SC	Mottled brown & yellow	"	VD		5				"
		Refussal in HW Porphyry										
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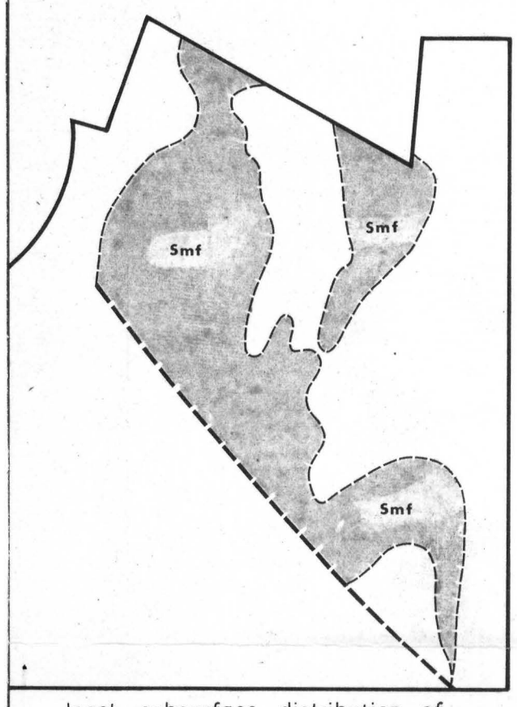
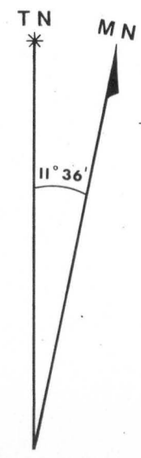
Checked by

OUTCROP GEOLOGY AND REGOLITH OF JERRABOMBERRA INDUSTRIAL ESTATE



Inset – subsurface distribution of Fairbairn Group

LOCALITY MAP



Q5 Q4

Transported Soils

- *Slopewash or hillwash, comprising well graded mixtures of silt and sand, which have weathered in some places to lean sandy clays, and which are cemented in other places* **(SC, SW)**
- *Coarse talus, comprising angular rock fragments of sand, gravel and boulder size* **(GW)**
- *Stratified alluvium, comprising poorly graded deposits of sand, silt and organic silt and clay, as well as cobble layers* **(GP, OL, OH)**
- *Stratified alluvium, comprising organic silts and clays with red sand* **(SP, OL, OH, SM, SC)**
- *Interstratified slopewash and alluvium* **(SP)**

Residual Soils

- *Prairie soil, comprising organic silts and sands overlying completely weathered volcanic rock* **(OL, SC)**
- *Skeletal soils, comprising lean clay, silt, minor sand and abundant rock fragments up to boulder size* **(GM, SM)**
- *Organic silts and clays, sometimes saturated by seepage of soil-water* **(OL, OH)**
- *Red podzolics and red earths, comprising lean to heavy, in places sandy, clays* **(SC, CL, CH)**
- *Truncated podzolics and red earths* **(CL, CH)**

Scattered outcrop and boulders of volcanic rocks and porphyry

Ainslie Volcanics (Dla) — *Outcrop of agglomerate, welded tuff and porphyritic dacite (rocks project up to 1·5 metres above groundsurface)*

Mugga Mugga Porphyry (Sum) — *Outcrop of welded tuff (rocks project up to 1 metre above groundsurface)*

Mount Painter Porphyry (Sup) — *Outcrop of porphyry (rocks project up to 1·5 metres above groundsurface)*

Deakin Volcanics (Sud) — *Outcrop of welded tuff, tuff, lithic sandstone and quartzose sandstone (rocks at, or slightly above groundsurface)*

Fairbairn Group

- (Smf) *Exposure at groundsurface of shale and limestone*
- (Smf) *Rocks of Fairbairn Group are expected to occur beneath soil cover*

——— Soil or rock/soil boundary, position approximate

------ Geological boundary, position approximate

----- Fault, position approximate

Strike and dip of bedding of Sud and of banding in Dla

Quartz vein

J13 *Auger hole (see Appendix 1 for logs)*

Rk *Possible site for aggregate quarry*

C13 *Water bore (see Table 2 for data)*

Black numbered lines indicate the 1000 yard Transverse Mercator Grid, Zone 8

Scale 1 : 25 000

500 0 1000 2000 metres

500 0 1000 2000 yards

PLATE 1

AMENDMENTS			
No.	Description	Author	Checked
A1			
A2			
A3			
A4			
A5			

SCALE 1:25000

BASE MAP ENLARGED CANBERRA 1:50000

SOILS BY P. D. HOHNEN

Compiled and checked P.D.H. Project geologist

Checked and approved Senior geologist

Supervising geologist

COMMONWEALTH OF AUSTRALIA
BUREAU OF MINERAL RESOURCES
CANBERRA, A.C.T.

TITLE OUTCROP GEOLOGY AND REGOLITH OF JERRABOMBERRA INDUSTRIAL ESTATE

PROJECT JERRABOMBERRA INDUSTRIAL ESTATE

To accompany Record	Drawn by	Drawing no.
1975/36	J.F.S.	155/A16/1138