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1988/12. Final report on the geological mapping and soil auger-drilling of the Meander Irrigation Channels

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INTRODUCTION

Field work began on 10 March 1987 and was completed on 23 July 1987. The intention was to produce representative soil and bedrock descriptions and permeability values along the line of the proposed channels. Base maps, created by the Department of Lands, indicated the channel positions, and these were marked in the field by red tape markers.

The solid bedrock geology, as indicated by published geological maps (Quamby and Frankford sheets) was checked in the field. Soil information was derived from power-auger drilling to a depth of two metres at about half or one kilometre intervals. Soil samples have been retained and described, and selected holes were used for field permeability tests.

The soils described in a later section developed in association with rocks of the following types.

SOLID GEOLOGY

Precambrian quartzite, quartz mica schist, and phyllite.

These old, metamorphosed, and highly indurated rocks consist of well-cemented sand and mica. Beds of quartzite 500 mm thick alternate with 500 mm thick beds of mica schist. The rocks are usually steeply dipping and are well fractured. They are a moderate to good aquifer, and an unlined channel might show high permeability, but only a very short section of the channel crosses these rocks. In Hole 70 the Precambrian rocks are deeply weathered to produce ML clayey silt, and highly impermeable soils were found.

The Precambrian rocks occur only in limited areas to the north of Native Hop Hill.

Cambrian phyllite, slate and sandstone

The Cambrian rocks are also indurated, but not as strongly as the Precambrian. A low grade of metamorphism has produced a cleavage in the more muddy rocks but has affected the sandstones little. The rocks dip steeply, roughly parallel with the older rocks, are fractured, and are elsewhere known as one of the State's best aquifers. They occupy much of the high ground between Deloraine and Golden Valley, and constitute a major barrier that has to be crossed by the channel south of the Deloraine Siphon.

Ordovician conglomerate and limestone

The Cambrian rocks are followed by Ordovician conglomerate and the Gordon Limestone. The conglomerate consists of strongly-cemented quartzite

gravel, and forms a strong topographic feature in the southern face of Native Hop Hill. Again the rocks are fractured, but their surface extent is not locally great enough to form a significant aquifer. The Gordon Limestone is not seen or mapped along the line of the channel, and it only occurs in limited areas. The limestone may well be concealed beneath surface soils, and there is indirect evidence in the form of an unfillable dam to show that it could be a hazard. The limestone is cavernous, and even a minor intersection by the channel could drain the entire system, but nowhere in the drilling programme was the limestone seen, and no consequent high permeabilities were measured. Special investigations may be required to delineate the limestone problem during the construction phase.

Permian sediments

The Permian rocks are unmetamorphosed, are indurated, and generally lie horizontally in beds up to 500 mm thick. The sediments consist of grey mudstone, shale, sandstone and minor limestone lying low down in the main Western Tiers escarpment. The rocks also contain quartzite pebbles ('dropstones'), indicative of their glacial origin. The Permian rocks are major aquifers, but the local rocks in the Meander area are only moderately good in this respect.

Triassic sediments

Triassic sandstone and mudstone follows logically up the geological sequence, but only four auger holes on Osmaston Road encountered soils on this rock. Sandstone predominates, with lesser siltstone, mudstone and shale.

Jurassic dolerite

Dolerite has been intruded into the Permian and Triassic rocks, but in this area it appears to generally lie as a thick slab on top of these sediments. Here and there faulting has disturbed this apparently simple situation, and the strong topographic expression of the dolerite in a major escarpment has produced streams of broken dolerite talus in a more-or-less weathered condition, lying over the older rocks. The dolerite is a heavy, dark grey crystalline igneous rock, and may occur, even in talus, in fragments weighing many tonnes. It is not regarded as a reliable aquifer, and is chiefly noted for its extremely variable physical properties under the influence of chemical and physical weathering. The dolerite weathers relatively easily, and may be represented by brown bouldery clays.

Tertiary basalt

The basalt lies horizontally over many of the lower parts of the irrigation area. It has a composition not dissimilar to the dolerite, and like it, weathers easily. The topographic expression is much less strong, forming only low, rounded hills. The fresh rock is a black, finely crystalline lava, but this is rarely seen, and the basalt is generally represented by red gravelly clay. The basalt is an excellent aquifer, being well fractured and readily permeable, and because of its position on hills causes lines of springs in mid-slope.

Quaternary alluvium

The alluvium which forms the floors of the plains is an ill-defined mixture of organic and inorganic clay, sand, gravel, till and peat, lying thinly

over the older rocks and concealing them. Some geological work may be necessary during construction of the channel lines, and ultimately in the irrigation area, to reveal the bedrock nature.

NATURE OF THE SOILS

The properties of the soils are to an extent controlled by the rocks from which they are derived.

The Precambrian rocks develop soils having properties in the range SW, ML, and SC, the last being in areas of weathered mica schist.

The Cambrian rocks, which cover a greater area, produce CL-ML soils where sandstone predominates, and MH-CH-CL soils on slate.

The Ordovician rocks give mainly SM soils. On steeper slopes an absence of fines gives a GC soil, while on lower slopes ML overlying CH at one metre depth is possible.

The Permian rocks cover a range of soil types, as they also have a greater areal extent. CL overlying CH is common, as is ML. Where bedrock is close GC-CL soils occur.

Dolerite, where it produces any thickness of soil, shows mainly CH and CL soil. Elsewhere, rock or talus is close to the surface where boulders and slabby float are in a sparse matrix of CH clay.

The Tertiary basalt everywhere produces CL clay with CH usually at one to two metres depth. Occasionally, where the channel crosses watercourses, SC soil is recorded.

Alluvial soils are not common, except in the flood plain of Warners Creek. OH and SC soils are seen in watercourses, with SM and CH common.

RESULTS

The results of auger drilling, sampling, description, soil testing and permeability measurement are given in the accompanying table. The geology and sample locations are shown on the accompanying geological map and overlay.

Auger holes, drilled with a tractor-mounted proline screw auger, were put down to 2.1 m, thus being greater than the notional depth of the irrigation channels. Soil descriptions were made on site, samples of each soil type were taken, and check descriptions made in the laboratory. Hole numbering was serial, but discontinuous, not every hole resulting in a description. This choice was made by the geologist in the field on the basis of the observed geology, so that the boreholes included in the table are, as far as possible, representative of their surroundings, and unnecessary repetition is avoided.

Map references are given in a nine figure form, the middle figure always being 5. This avoids the necessity of including the 100 km square identification letters. Leave out the 5 and a normal eight figure reference results.

The symbols are those used on the geological map.

The grade column represents the horizontal distance upslope or downslope of the hole location from the channel line. This may be occasioned by local obstructions, but a hole is generally preferred on the upslope side as this gives a more complete section of the soil profile - 'gr' indicates 'on grade'.

The USC column indicates the description of the soil in terms of the Unified Soil Classification. Vertical variations are indicated by more than one entry vertically in the column, but the depth at which this change occurs is not indicated, it being of little significance in a hole only 2 m deep. Mixed or marginal classifications are indicated by two symbols separated by a slash.

Material descriptions include name, colour, estimate of plasticity ('plas') and additional variations, and occasionally mention auger refusal if this occurred.

The geology column indicates that division correspondingly shown on the geological map.

The soil mechanics Atterberg limit values are shown in the liquid limit (LL) and linear shrinkage (LS) columns.

Permability was measured basically by filling the hole with water and observing the fall in water level over time ('falling head method'). If a large fall was observed then the hole was refilled and the measurement made after resaturation, this being a better model for a flooded channel. In impermeable soils sufficient water often remained after one filling and this is described as '1st saturation'.

Some additional permeabilities were measured by the Constant Head Method but this proved cumbersome to arrange on a repeated basis, and to have no particular advantages.

No significant difference in results was noted.

Emerson classes defined the tendency of soil to disperse in water. The classes are defined in AS1289.C.8.1 - 1980. Classes 1-6 are slaking soils of decreasing tendency, while Classes 7 and 8 are non-slaking soils. The lower class numbers are the more dispersive.

CONCLUSIONS

The geology of the area as it affects the proposed irrigation channel has proved benign and the soils derived from the rock materials are generally of low permeability.

[25 July 1988]

MEANDER IRRIGATION SCHEME: RESULTS OF SOIL AUGER DRILLING

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LOCATION	HOLE NO	MAP REF	DATE	SYM	GRADE	USC	MATERIAL	GEOLOGY	LL	LS	PERMEABILITY	REMARKS
Beginning of line past Meander River Siphon	12A	469053885	1/4/87	Qg	gr	CH	Clay brn high plas auger refused at 1.3m on talus boulder	Dolerite talus				
Meander right bank	13A	469453886	2/4/87	Pm	+3m	CL/ML	Clayey silt lt brn Clay with mudstone cobbles	Dolerite talus over Perm	35	4	1.3x10-7	dolerite talus overlying Permian Emerson class 4
West side of rape field	17	469653890	31/5/87	Pg	+3m	ML/CL	Clayey silt lt brn/or	Permian			4x10-7	Saturated
South side of E. Meander Rd	18	469753892	31/3/87	Pg	+5m	ML	Silt (rock flour) grey Clay or/brn Mudstone grey	Permian			1.3x10-8	Saturated Emerson class 4
North side E. Meander Rd	18A/1	469753893	31/3/87	Pg	+3m	ML/CL	Clayey silt or/brn grading to dark soil with depth	Permian			<4.5x10-7	Saturated
Just below shearing hut -Dalco	19	469853894	31/5/87	Pg	+5m	ML/CL	Clayey silt, lt brn mudstone frags and occ qrtzt 5-8mm	Permian occ dropstones			6x10-7	Saturated Emerson class 4
Northern boundary Dalco prop	22	469853901	31/5/87	Pg	+3m	ML/CL	Clayey silt or/brn some ang frag and fine gravel	Permian			1.2x10-8	Saturated. Increased moisture and clay with depth Emerson class 4
Above gravel quarry on spur in woods	23	469953902	31/5/88	Pg	+3m	CL/ML	Silty clay yellow/brn trace sand patches mudst low-mod plas	Dolerite talus Perm mudsts	41	10.5	1.6x10-7	Saturated. Hole dry
Above spur facing Nuttings Rd	24	470053093	31/3/87	Pg	+3m	CH	clay lt brn clay lt brn tr sand and silt	Dolerite talus Permian mudsts	73	17	3x10-7	Saturated. Holding at 14/4/87
Along fence line above Nuttings Rd	25	470253093	1/4/87	Pg	+3m	GC	Gravelly clay. HW to EW ang frag, round qtzt stones. High plas Clay lt brn	Dolerite talus over Permian	40	8.8	1.8x10-7	Saturated (200mm loose fill) Emerson class 3
Above gravel pit access off Nuttings Rd	26	470453096	2/4/87	Pg	+3m	CH	Clay lt brn high plas Ang mudst HW sandst, some silt and sand	Permian			1.5x10-8	Saturated. Holding 14/4/87
Farm access south of Nuttings Rd	30	471353899	1/4/87	Pg	+3m	CH	Clay lt brn high plas	Dolerite talus Permian mudst	95	22	1.5x10-7	Saturated. Holding 14/4/87
On roadside near new house	32	471453903	2/4/87	Pq	+3m	CL	Gravelly clay low plas lt brn ang mudst HW some silt	Dolerite talus Permian mudst			1.9x10-7	Saturated
South of new house (150 m)	33	471753906	1/4/87	Pg	+3m	ML/CL CH	Silty clay lt brn rock frags Clay, mott or/grey/brn, silt	Dolerite talus Permian mudst	108	22		Emerson class 3
End Nuttings Rd	34	471853096	1/4/87	Qtd	+3m	ML CH	Silt, lt brn, some sand Clay, lt brn, or/grey mott, some sand, silt high plas	Dolerite talus Permian mudst	41	11	1x10-8	Saturated. Holding at 14/4/87

MEANDER IRRIGATION SCHEME: RESULTS OF SOIL AUGER DRILLING

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LOCATION	HOLE NO	MAP REF	DATE	SYM	GRADE	USC	MATERIAL	GEOLOGY	LL	LS	PERMEABILITY	REMARKS
Forestry track off Nuttings Rd	35	472253905	1/4/87	Qtd	+3-10m	ML	Sandy siltstone, lt brn	Dolerite talus over Permian			2x10-7	Saturated
Forestry Rd	37A	472253908	1/4/87	Qtd	+6-8m	CH	Silty clay, lt brn, some silt, sand, ang mudst frag, cobbles boulders	Dolerite talus Permian mudst	37	7		Holding 15/4/87, some rain
Forestry Rd off Nuttings Rd	38	472253909	1/4/87	Qtd	+5m	SP	Sand, or clean fat, 10% clay sandstone frags	Dolerite talus Permian mudst				
North along Forestry Track off Nuttings Rd	41	472253912	1/4/87	Qtd	+3m	SP	Clayey sand, lt brn/or, some sdst frags	Dolerite talus Permian mudst			4x10-7	1st saturation
Watley Prop clearing	44	472953920	1/4/87	Pg	+3m	ML	Silt, yellow brn, some clay	Dolerite talus			4.8x10-7	Saturated, Emerson class 4
Watley Property House	46	473253920	2/4/87	Pg	-3m	GC	Gravelly clay, grey, low plasticity some fine sand,silt, ang frags	Dolerite talus Permian mudst	50	6	2x10-7	Emerson class 8
East end Native Hop Hill	49	473853924	10/6/87	Oo	+3m	CH	Clay, or/brn, high plas 10% gravel	Owen congl			1.7x10-8	450mm sludge Emerson class 8
Native Hop Hill	51	472053940	10/6/87	Oo	+3m	SM	Sandy silt, lt brn, ang frag 7%	Owen congl			6x10-7 2x10-6	1st saturation, hole dry Saturated,holding 17/6/87 Emerson class 8
Native Hop Hill	52	471353941	2/4/87	Oo	gr	SW	Gravelly sand, some clay ang frags 20%	Owen congl	20	5		Emerson class 5
Top end Taylors Property	56	470553984	1/4/87	Css	+3-8m	MH/CH	Silty clay, lt brn, some ang gravel, sand, ex weathered phyllite	Cambrian slates			4.5x10-8	Saturated
Taylors, 800m from 56	57	471153984	1/4/87	Css	+1-2m	MH/CH	Silty clay,lt brn, sand silt	Cambrian slates	20	10	High permeabil	Emerson class 4
						MH/CH	Silty clay or/brn,sand,ang frags, phyllites					
Near Taylors Cut	58	471253978	1/4/87	Css	gr	ML/CL	Silty clay, pink/brn,ang frags phyll some sand	Cambrian slates			5.3x10-8	Saturated, topped up
Spur nr Taylors Cut	60	471853977	1/4/87	Css	+3m	CL	Silty clay, pink brn,ang slate frags	Cambrian slates			2x10-7	Saturated, resaturated twice
North west of Taylors Cut	61	471153974	1/4/87	Css	+3m	CL	Silty clay or/brn graded gravel to 10mm, some sand and silt	Cambrian slates				1st saturation
						CL	Silty clay red/brn graded gravel to 25mm					
						CH	Clay red/brn high plas. weath.slate	Cambrian slates			6x10-8	1st saturation
Gully west of Taylors Cut	62	471253971	1/4/87	Css	-30m	CH	Clay or/grey mottl. silt, h-mod plas.	Cambrian slates	17	92		Emerson class 3
Forestry rd sth west of Taylors Cut	63	471253970	1/4/87	Css	+3m	CL	Silty clay red/or/brn, gravel of weathered slates and mudst to 20 mm, some silt	Cambrian slates ex weathered			1.7x10-7	Resaturated, Emerson class 4

MEANDER IRRIGATION SCHEME: RESULTS OF SOIL AUGER DRILLING

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LOCATION	HOLE NO	MAP REF	DATE	SYM	GRADE	USC	MATERIAL	GEOLOGY	LL	LS	PERMEABILITY	REMARKS
Forestry rd west of Taylors Cut	65	470453967	1/4/87	Css	+10m	CL/ML SP	Silty clay or/brn high plas some sand Sandy silt yel/wht, some fine sand	Cambrian slates	21	2	2.75x10-7	Resaturated Emerson class 8
Cubits Sugarloaf	70	470353953	11/4/87	pCp	gr	ML ML ML	Clayey sily yel/brn Clayey silt grey/grn Clayey silt lt brn. Low plas.Some sand, qtz and mica frags to 3mm	pre Cambrian			Highly imperm	1st saturation
Bass Highway'Pleasant View'	80	468354052	15/4/87	Tb	+2m	CH	Clay red/brn high plas. some silt	Basalt			1.1x10-7	Resaturated
Pleasant View' Bass Hwy Deloraine	83	468054049	15/4/87	Tb	+3m	CH	Clay red/brn some fine silt	Basalt			2x10-7	Resaturated
Pleasant View' West boundary	84	467854048	15/4/87	Tb	+3m	ML SC CL/ML	Silt red/brn Sandy silt, brn, some clay fines of low plas.	Basalt			3.3x10-7	Resaturated
2 Km along Hole Creek Rd	85	467454045	15/4/87	Tb	+2m		Silty sand sandy silt pink/brn Sandy clay wh/brn, mod high plas.	Basalt	34	8	3.9x10-7	Resaturated, Emerson class 8
Green Hills Mole Creek Rd	86	466554045	15/4/87	Tb	+3m	ML/CL	Silty clay red/brn	Basalt			<7.1x10-7	
Fern Ridge off Bengeo Rd	88	465954041	7/4/87	Tb	+4m	CH	Clay red/brn, some silt high plas. Clay red/or some grey mottl. high plas.	Basalt			1.5x10-7	1st Saturation Emerson class 6
Fern Ridge off Bengeo Rd	89	465654043	7/4/87	Tb	+3m	CH	Clay or/red some fine silt, red/brn below 1m	Basalt			2.3x10-7	1st Saturation
Mt Pleasant Cut Deloraine	91	466454057	16/4/87	Tb	gr	CH	Clay red/brn	Basalt	68	13	3.5x10-7	Resaturated, Emerson class 4
Mt Pleasant boundary	92	465954059	16/4/87	Tb	+3m	ML CL CH	Silty clay or/brn, gravel frags Clay or/brn some sily mod plas Clay or/brn high plas	Basalt	92	22.4	3.7x10-7	Resaturated, Emerson class 4
Fern Ridge (north)	93	468854059	28/4/87	Tb	+1m	CL CH	Clay red/brn some silt mod plas Clay or/brn some silt high plas	Basalt	139	26	2.7x10-7	Resaturated, Emerson class 6
South side of siphon across Bass Hwy Deloraine	94	467654059	28/4/87	Tb	+3m	CL CL	Clay red/brn mod plas some silt Clay yel/brn some fine gravel, mod plas	Basalt			6x10-7	1st saturation
Bengeo Rd Rail Crossing Deloraine	95	465454041	29/4/87	Tb	+3m	CL ML	Clay or/brn mod plas some fine silt, fine gravel Silty clay grn/brn mod plas some fine gravel	Basalt				
New house Cox's Rd Lemana	96	464954043	29/4/87	Tb	gr	CH	Clay lt brn mod high plas some fine silt auger refused at 1.8m	Basalt	78	8.5	4.4x10-8	1st saturation
Corner Lemana and Bengeo Rds	97	465554034	29/4/87	Tb	+3m	ML/CL ML/CL	Silty clay red/brn low-mod plas Silty clay/clayey silt	Basalt				
End Cox's Rd lemana	99	463454040	29/4/87	Tb	+3m	ML CH	Clayey silt low plas, red/brn Clay or/brn some fine silt and gravel	Basalt	84	15		Emerson class 3

MEANDER IRRIGATION SCHEME: RESULTS OF SOIL AUGER DRILLING

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LOCATION	HOLE NO	MAP REF	DATE	SYM	GRADE	USC	MATERIAL	GEOLOGY	LL	LS	PERMEABILITY	REMARKS
Near large dam end of Cox's Rd Lemana	100	462954044	29/4/87	Tb	-3m	ML	Clayey silt yel/brn mod plas trace fine gravel	Basalt	100	21	2.9x10-7	Resaturated, Emerson class 4
						CL	Silty clay yel/brn mod plas					
End Elmer's Rd Dunorlan South	101	462854050	29/4/87	Tb	+3m	ML	Sandy silt wh/brn some fine gravel	Basalt	57	14	1.53x10-7	Resaturated, Emerson class 3
						CL	Silty clay lt brn mod plas, some fine gravel, sand					
Basalt Quarry Dunorlan South	103	461354050	29/4/87	Tb	+3m	ML	Clayey silt red brn auger refused 0.5m	Basalt				
Carr south boundary Dunorlan	104	461054053	29/4/87	Tb	+3m	ML	Clayey silt dk brn low-mod plas basalt boulder at 0.5m	Basalt	110	27		Emerson class 4
						MH/CH	Silty clay red/brn high plas					
Carr north boundary Dunorlan	105	460654056	29/4/87	Tb	+5m	ML	Clayey silt red/brn mod plas					
						CL/ML	Clayey silt silty clay	Basalt			1.8x10-7	Resaturation
Before Siphon Dunorlan	106	460754067	29/4/87	Tb	+3m	CH	Silty clay lt brn high plas fine gravel <2mm	Basalt			7x10-8	1st saturation
Dunorlan Railway Station	107	461254075	30/4/87	Tb	gr	CH	Clay lt brn some fine sand, gravel				7.3x10-7	Resaturated, Emerson class 2
Dunorlan Rd Dunorlan	108	461054080	30/4/87	Tb	+3m	CH	Clay brn high plas some fine sand, fine to med gravel auger refused at 1.8m	Basalt	53	10	1.3x10-7 2.2x10-8	Resaturated Emerson class 2
Griffin property, Dunorlan	110	460854091	30/4/87	Tb	+3m	CH	Silty clay or/brn high plas	Basalt			6.3x10-8	Resaturated
						CH	Silty clay grn/brn high plas some fine sand fine gravel				3.4x10-8	
Griffin property, Dunorlan. Siphon end	111	461554090	30/4/87	Tb	+1m	CH	Clay lt brn high plas some fine silt, fine gravel	Basalt	53	15	2x10-7 6x10-6	Resaturated, Emerson class 2
Bass Hwy before Christmas Hills Rd	113	467854061	19/5/87	Tb	+3m	CH	Clay red/brn,some silt,gravel high plas	Basalt			2.7x10-6	Resaturated
						CH	Clay brn, grey/or mottl, silt, gravel high plas					
Bass Hwy before Christmas Hills Rd	114	467554066	19/5/87	Tb	+3m	MH	Silty clay or/brn some fine sand mod plas	Basalt			Highly impermeable	
						CH	Clay or/brn, high plas some fine to med gravel, silt					
Bass Hwy before Christmas Hill Rd	115	476054070	19/5/87	Tb	+3m	CH	Clay red/brn high plas some silt	Basalt			4.7x10-7	Resaturated
						CH	Clay lt brn greymottl some sand silt high plas				8.7x10-7	Resaturated
End of line nr Christmas Hills Rd	116	466854072	9/6/87	Tb	+3m	CH	Clay red/brn, high plas some fine silt, some gravel,silt	Basalt			7.9x10-7	Resaturated
						CH	Clay or/brn high plas ex weathered lithic frags, some gravel, sand					

MEANDER IRRIGATION SCHEME: RESULTS OF SOIL AUGER DRILLING

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LOCATION	HOLE NO	MAP REF	DATE	SYM	GRADE	USC	MATERIAL	GEOLOGY	LL	LS	PERMEABILITY	REMARKS
Off Railton Rd, Moltema	118	462154098	13/5/87	Tb	+2m	CH	Clay red/brn mod plas	Basalt	37	7.2	4x10-7	Resaturated, Emerson class 3
						MH	Silty clay lt brn low plas some gravel					
						CH	Clay brn high plas some gravel,sand					
Wooded area above dam Elizabeth Town	120	462354103	13/5/87	Tb	+2m	MH	Silty clay red/brn high plas	Basalt	135	26	1.3x10-8	Resaturated, Emerson class 2
						CH	Clay red/brn high plas some gravel,silt					
						CH	Clay or/grey mottl high plas					
West off Bass Hwy Elizabeth Town	122	462354110	13/5/87	Tb	+3m	CH	Clay brn/grn high plas some gravel silt	Basalt	41	10	2.6x10-7	Resaturated, Emerson class 3
						ML/CL	Clayey silt lt brn, high and mod plas some gravel, sand					
South boundary "Eddington" Elizabeth Town	125	462654120	13/5/87	Tb	+3m	CH	Clay brn high plas, incr clay w depth, some fine silt	Basalt	50	10	1.5x10-7	Resaturated, Emerson class 4
						CL	Silty clay lt brn mod plas some fine gravel, sand					
Nr "Eddington" Elizabeth Town	126	463054133	14/5/87	Tb	+3m	MH	Clay brn/blk, mod-high plas, some fine gravel	Basalt			9.4x10-7	Redrilled, resaturated, Emerson class 4
						CH	Clay brn high plas, some fine sand, gravel					
Off Bennets Rd Elizabeth Town	126	463054140	14/5/87	Tb	+3m	CH	Clay brn high plas some silt,gravel	Basalt	53	14	6.8x10-8	Resaturated, Emerson class 2
						GC/CH	Gravelly clay high plas fines well graded gravel					
Below Gannons Hill Bass Hwy	128	462454145	14/5/87	Tb	+3m	MC/CL	Silty clay red/brn, mod plas	Basalt	115	18	2.3x10-8	Resaturated, Emerson class 4
						CH	Clay brn, some fine gravel					
						CH	Clay yel/brn high plas, some fine silt,gravel					
Rubicon line end 400m	129	461554150	14/5/87	Tb	+3m	ML/CL	Silt, sandy clay low mod plas	Basalt	80	17	1.2x10-7	Resaturated, Emerson class 4
						CH	Clay brn high plas, some silt, sand					
Red Hills Deloraine - silage	131	465354028	9/6/87	Tb	gr	CH	Clay brn high plas some gravel,silt	Basalt	90	21	2x10-7	Resaturated, raining, Emerson class 4
						CH	Clay brn high plas					
Red Hills Deloraine	133	464754025	9/6/87	Tb	+2m	CH	Clay brn high plas ex weathered frags, silt	Basalt			3.5x10-8 1.7x10-7	Raining Dry hole resaturated
End line Cassidy's Rd	136	464654019	10/6/87	Csp	+3m	CH	Clay yel/brn high plas, some silt gravel	Cambrian phyllite				
Deloraine Golf Course	138	47434000	11/6/87	Tb	gr	CH	Clay yel/brn highplas,some fine gravel	Basalt			1.3x10-7	Resaturated
						CH	Clay grey high plas					
End line Osmaston Rd Deloraine	139	474354010	11/6/87	Tb	+1m	CH	Clay red/brn high plas, some fine gravel	Basalt	133	26	3.3x10-7	Dry hole resaturated Emerson class 4
						CH	Clay or/brn high plas					

MEANDER IRRIGATION SCHEME: RESULTS OF SOIL AUGER DRILLING

10/14

LOCATION	HOLE NO	MAP REF	DATE	SYM	GRADE	USC	MATERIAL	GEOLOGY	LL	LS	PERMEABILITY	REMARKS
Track off Davies Rd	141	473353987	16/6/87	Csp	+3m	CL	Clay or/brn lpw plas, graded gravel med-coarse, fine sand	Cambrian ex weath slates	39	17	3x10-7	Resaturated, Emerson class 7
Davies Rd	142	473253984	16/6/87	Csp	+10m	GC	Gravelly clay or/brn low plas some sand, silt	Cambrian ex weath slates	56	19	2.4x10-8	Resaturated, Emerson class 7
Gate "Glen Ross"	144	473453979	16/6/87	Csg	+1m	CL	Silty clay or/brn mod plas some fine gravel	Cambrian wacke				
						GC	Gravelly clay grn/grey, 50% gravel, auger refused 1.3m					
Siphon south side "Glen Ross"	145	473153975	16/6/87	Css	gr	GC	Clayey gravel to 10mm, highly weathered lithic frags, cobbles auger refused at 1m	Cambrian greywacke, cong slates				
End Davies Rd	146	472553978	17/6/87	Css	+3m	GC	Clayey gravel 20%, low plas fine silt, sand	Cambrian Greywacke, cong, slates	40	19	3.6x10-8	Resaturated, Emerson class 7
						CL	Gravelly clay low plas or/brn gravel frags to 15mm, some sand					
Cresswell property Osmaston Rd	148A	474853998	17/6/87	Tb	gr	CH	Clay red/brn some fine silt	Basalt				
						CH	Clay or/brn high plas, some fine lithis frags EW basalt					
Osmaston Rd (Turkeys Nest)	149	475553993	17/6/87	Tb	gr	CH	Clay red/brn high plas, some fine silt	Basalt			2.8x10-7	Ist saturation
						CH	Clay brn high, some fine gravel fine silt					
Siphon Bogans Rd	153	476953983	17/6/87	Jd	+2m	CH	Clay brn high plas, trace fine gravel	Dolerite	66	14		Emerson class 7
						CL	Clay yel/brn some fine sand, mod plas fines, lithic frags					
Bogan Rd House	153A	477253985	17/6/87	Jd	+10m	CH	Clay brn high plas trace gravel	Dolerite				
						CH	Clay yel/brn, ex weath lithic frags					
Osmaston Rd Osmaston	154	477853991	17/6/87	Tr	+1m	SP	Sand, brn some clay fines	Triassic sandstone and shale	32	5	1.7x10-7	Resaturated
						CH	Clay				1x10-6	Ist saturation Emerson class 7
						SP	Sand or/brn clean fat sand					
Bend on Osmaston Rd	155	478353987	18/6/87	Tr	+3m	SM	Grey sand loam	Triassic sandstone and shale			3x10-8	Ist saturation
						SP	Sand or/brn clean fat sand					
						CH	Clay some sand grey high plas					
Osmaston Rd fringe of trees	158	479353983	18/6/87	Tr	+3m	SP	Sandy loam grey	Triassic sandstone and shales	81	24	8x10-8	Ist saturation Emerson class 2
						CH	Clay lt brn high plas, sand, silt lithic frags					
Osmaston Rd small siphon	159	479853982	18/6/87	Tr	gr	SM	Sandy loam grey	Triassic sandstone and shales				
						SC	Sandy clay grey/or mott					
						GC	Grey shaly frags bedrock at 1.5m					

MEANDER IRRIGATION SCHEME: RESULTS OF SOIL AUGER DRILLING

11/14

LOCATION	HOLE NO	MAP REF	DATE	SYM	GRADE	USC	MATERIAL	GEOLOGY	LL	LS	PERMEABILITY	REMARKS
Left of Fernbank Rd	160	480553981	18/6/87	Pb	+3m	SC	Clayey sand yel/or Sandy clay low plas bedrock at 1m	Permian mudstone				
Siphon Donovans Rd	160	481253973	18/6/87	Pb	+3m	SM CH GC	Sandy loam grey Clay grey/or mott high plas some sand fine silt Gravelly clay mod plas, EW-HW mudstones	Permian mudstones	54	20	3.6x10-9	Ist saturation Emerson class 9
Cluan property Cluan	165	486253957	1/7/87	Jd	gr	SP CH	Sand brn fine Clay or/brn/red/grey mott high plas, some fine med gravel weath ironstone	Dolerite talus				
Access road "Cluan" property	170	486453955	1/7/87	Jd	gr		Clayey sand lt brn Sandy clay Clay red/brn mott high plas some ironstone gravel Clay brn high plas some sand	Dolerite talus w ironstones			1.6x10-8	Resaturated
Pine Park Cut Cluan Rd	171	487553953	1/7/87	Jd	gr	CH CH	Clay yel/brn mod plas Clay brn mod plas, some sand , cobbles, lithic frags	Dolerite talus				
Corner Cluan and Glenore Rds	174	487853942	2/7/87	Jd	gr	CH CH	Clay brn high plas, some sand some gravel to 5mm Clay or/brn high plas, some fine silt some gravel	Dolerite talus				
Cluan Rd	174A	488253937	2/7/87	Jd	gr	SP SC CH	Clayey sand brn Sandy clay brn Clay yel/brn w grey mott high plas, incr moisture at 1.8m	Dolerite talus				
Cluan Rd "San Michelle"	175	486953955	1/7/87	Jd	gr	SP CH	Sand, 10% clay Clay red/brn grey mott high plas some fine gravel to 10mm	Dolerite	122	30	2.4x10-8	Resaturation, Emerson class 8
Cluan "Cricket Ground"	176A	486853949	1/7/87	Jd	gr	CH	Clay yel/brn high plas some silt	Dolerite talus				
Pine Park Cluan Rd Cluan	177	487853948	1/7/87	Jd	+3m	SM CH CH	Silty sandy loam Clay or/brn grey mott high plas Clay or/brn high plas EW lithic frags	Dolerite	76	19	8.1x10-8	Ist saturation, Emerson class 5
Glenore Rd Cluan	178	488853950	2/7/87	Jd	gr	SP GL/SW CH GC	Sandy loam grey Med gravel plas fines Clay brn hod-high plas Gravelly clay yel/brn graded gravel to 10mm, high plas fines	Dolerite talus				

MEANDER IRRIGATION SCHEME: RESULTS OF SOIL AUGER DRILLING

12/14

LOCATION	HOLE NO	MAP REF	DATE	SYM	GRADE	USC	MATERIAL	GEOLOGY	LL	LS	PERMEABILITY	REMARKS
End Adelphi Rd Cluan	179A	490953947	2/7/87	Jd	gr		Sandy loam some clay fines	Dolerite				
						CH	Clay grey/brn high plas, graded gravel to 10mm	talus				
North end Fermer property	180	484253975	1/7/87	Jd	gr	CH	Clay or/brn high plas, red grey mott, some fine sand	Dolerite				
North boundary "Cluan" property Cluan Rd	181	484953973	19/6/87	Jd	gr	ML	Clayey silt low plas	Dolerite				
						CH	Clay or/brn nott, high plas	talus				
						CH	Clay lt brn, lithic frags					
Cluan property opp. Westbury Tip	181	485553967	19/6/87	Jd	+2m	M	Sandy loam	Dolerite	35	8		Emerson class 2
						CH	Clay high plas	talus				
						CH	Clay lt brn, some fine -med gravel, sand					
Property "Koorana" Westbury	184	485553993	2/7/87	Ts	+2m	CH	Clay red/brn high plas	Tertiary	112	22	4x10-8	Ist saturation
						CH	Clay lt brn high plas	sediments				
Bramblewick Farm Westbury	186	487353994	2/7/87	Ts	+3m	M	Sandy loam grey	Tertiary			8.7x10-8	
						CH	Clay red/brn high plas, some silt	sediments				
Meander Rd Meander (West Channel)	537	467553882	8/7/87	Pg/Pq	+3m	M	Grey loam, qtz frags	Permian	55	14	Highly imperm	Ist saturation Emerson class 4
						CH	Clay or/brn w grey mott high plas	mudstone				
						ML/CL	Silty clay or/brn some fine sand					
Meander Rd Meander (West Channel)	539	466953881	8/7/87	Pq	gr	CH	Clay or/brn high plas, some sand,silt EW siltstone, dropstones	Permian mudstone			Highly imperm	
Huntsman Rd Meander	544	466853876	8/7/87	Pq	+3m	CL	Clay or/brn mod plas, some silt,sand dropstones	Permian mudstones			1x10-7	Resaturated
South end Barbers Rd Meander	550	466053873	8/7/87	Pq	+3m	M	Loamy sand blk	Permian			Highly imperm	Resaturated, rain
						CL	Clay or/brn/grey low plas	mudstone				
						CH	or/brn high plas, trace sand					
End Barbers Rd Meander	556	465453882	8/7/87	Pq	+3m	CL	Silty clay mod-high plas, some sand	Permian mudstone	50	10	1.7x10-7	Resaturated Emerson class 4
Reiffers Rd Meander	564	465653893	8/7/87	Pq	-3m	ML/CL	Silty clay lt brn low plas, frags EW/HW siltstone, some sand	Permian mudstone	52	10	Highly imper	Resaturated, heavy rain Emerson class 4
Forestry operations Reiffers Rd Meander	600	464653896	8/7/87	Pg	gr	CH	Clay brn high plas	Permian			Highly imperm	Resaturated heavy rain
						ML/CL	Silty clay or/brn mod plas, some HW EW mudstone, some sand	mudstones				
Forestry Operations Quarry	601	464353903	8/7/87	Pq	gr	CH	Clay grey/or/brn mott high plas some silt	Permian mudstones			Highly imperm	Heavy rain
Cheshunt Rd Western Creek	606	46385908	9/7/87	Pg	+3m	CH	Clay lt brn mod-high plas some silt,sand	Permian mudstones			Highly imperm	Ist saturation

MEANDER IRRIGATION SCHEME: RESULTS OF SOIL AUGER DRILLING

13/14

LOCATION	HOLE NO	MAP REF	DATE	SYM	GRADE	USC	MATERIAL	GEOLOGY	LL	LS	PERMEABILITY	REMARKS
Dam and Siphon Cheshunt Rd Meander	623	462853910	15/7/87	Pg	+2m	CL/GC	Silty clay yel/brn Gravelly clay ang siltstone frags auger refused at 2m	Permian mudstones	50	8	Highly omperm	Heavy rain, Emerson class 3
Cheshunt Rd Western Creek	625	462453915	15/7/87	Pg	gr	GC CL	Gravelly clay or/brn mod-high plas siltstone gravel Clay lt brn mod plas, weathered siltstone gravel	Permian mudstones	51	9	5.9x10-8	Resaturated, Emerson class 4
Cheshunt Rd "Montleigh" West Channel	632	461653918	22/7/87	Pg	gr	M CL/ML	Sandy silty loam blk Silty clay yel/brn grey mott, graded gravel EW-HW siltstone and qtz cobble at 1.8m	Permian mudstones			1.2x10-8	Ist saturation
Cheshunt Rd "Montleigh" West Channel	633	461753923	22/7/87	Pg	gr	GC/CL	Silty gravelly clay yel/brn low plas w 20% gravel of 20mm siltstones	Permian mudstones			1.7x10-7	Ist saturation
Creeleys Creek Rd Western Creek	635	461053923	22/7/87	Pg	gr	CL	Silty clay low-mod plas, 5% gravel of siltstone	Permian mudstones			1.1x10-7	Resaturated
Cheshunt Rd "Montleigh" Western Creek	636	460453912	22/7/87	PgPq	gr	CL	Silty gravelly clay lt brn low plas gravel 20% siltstone to 3mm w 20mm cobbles of qtz sandstone	Permian mudstones	43	17	4x10-6	Resaturated, Emerson class 4
Cheshunt Rd 1.5 Km east of Western Creek	645	459353909	22/7/87	Qa	gr	SM CL/CH	Loam blk Clay yel/brn low plas, some sand and silt	Quaternary talus and till			1.1x10-8	Ist saturation
Corner Cheshunt and Dairy Plains Rd	648	458053913	22/7/87	Qa	gr	CH	Clay lt brn high plas, masses of boulders to 250mm dolerite auger refused at 1.2m in talus	Quaternary talus and till				
Richies Plains Western Creek Rd	650	456953915	24/7/87	Qa	gr	CH	Clay or/brn high plas, some silt occ dolerite cobbles and boulders auger refused at 1.2m	Quaternary talus and till				
Bush Area Western Creek Rd	656	455953919	22/7/87	Pq	gr	CL/ML	Silty clay yel/brn low plas	Permian and Dolerite talus			4.3x10-8	Ist saturation
Robinsons Property, Fernleigh Rd Caveside	664	454653921	23/7/87	Pq	+1m	M CH CH	Silty sandy loam blk Clay lt brn high plas some silt Gravelly clay, gravel to 20mm 10% water table at 0.55m	Permian mudstones				
Robinson Property Fernleigh Rd Caveside	667	453353926	23/7/87	Pq	+3m	M CH	Loam blk Clay red/brn high plas, gravel of EW dolerite? 5%	Permian mudstone and talus?				

MEANDER IRRIGATION SCHEME: RESULTS OF SOIL AUGER DRILLING

LOCATION	HOLE NO	MAP REF	DATE	SYM	GRADE	USC	MATERIAL	GEOLOGY	LL	LS	PERMEABILITY	REMARKS
						CH	Clay or/brn high plas, some fine silt, fine gravel of EW dolerite auger refused at 1.9m					
End Western Channel	669	452553922	23/7/87	Pq	+3m	CH	Sandy clay high plas, masses of dolerite cobbles and boulders auger refused at 1m repeatedly, in talus	Quaternary talus over Permian mudstones				