



Tasmania

DEPARTMENT of
INFRASTRUCTURE,
ENERGY and RESOURCES

NHT Funded Project NLP 13188



Natural
Heritage
Trust

Helping Communities
Helping Australia

The effects of waste disposal on groundwater quality in Tasmania



**Drilling & related
geotechnical
investigations of
the Jetsonville aquifer,
Scottsdale waste depot**

**Tasmanian Geological
Survey Record 2002/14**

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Drilling and related geotechnical investigations of the Jetsonville aquifer at the Scottsdale waste depot

A. R. Ezzy

Introduction

Mineral Resources Tasmania (MRT) initiated a project to investigate the effects of waste disposal on groundwater quality in Tasmania. The project was jointly funded by MRT and the Natural Heritage Trust (NHT) and included a number of sites for detailed study. The waste depot at Scottsdale (538 770 mE, 5 449 000 mN) was one of these sites.

Initial drilling at the waste depot found groundwater at an approximate depth of ten metres across the site. The Steering Committee supervising the project requested that additional drilling be undertaken at the site to identify the hydrostratigraphy of the Jetsonville aquifer in the vicinity of the depot.

Hydrogeology

Two additional environmental monitoring boreholes were rotary mud drilled, using a rock roller drill bit, between 19 and 21 November 2001. The holes were located on the northeast corner of the gravel pit to the north of the landfill footprint, with hole SWD2001/1 being drilled to 63 m and hole SWD2001/2 being drilled to 11.5 metres. Both holes had a diameter of 170 mm and 100 mm PVC casing was installed. Slotted screens with bentonite seals were installed in each hole. The holes were logged in accordance with AS1726-1993; engineering logs are presented in Appendix 1. Because of the nature of the drilling

technique, moisture contents were difficult to verify and in-flows were recorded by observations made of the drill rods and risings.

Seven inward flows at 9.0, 11.5, 14.5, 22.0, 25.0, 28.5 and 30.0 metres were identified during the drilling of SWD2001/1. Each aquifer level was underlain by an aquitard, with a main aquitard between 31 and 39 m overlying the weathered granite basement. Borehole SWD2001/1 was screened between 12.5 and 32.8 m to represent the combined hydraulic head of all the main aquifer levels, excluding the uppermost aquifer level (between 9 and 11 m). Borehole SWD2001/2 was drilled three metres east of SWD2001/1 and installation measured the hydraulic head of the uppermost aquifer level. On 21 November 2001 both holes had a standing water level of 10.80 metres.

Summary and conclusion

Drilling has confirmed that the Jetsonville aquifer exists in the area the Scottsdale waste depot between the approximate depths of 9 to 31 metres. The hydrostratigraphy of the aquifer consists of at least seven levels that appear to be all hydraulically connected. High plasticity clay, acting as a main aquitard, overlies the weathered granite beneath the Jetsonville aquifer.

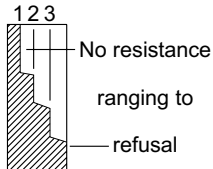
[30 May 2002]

Appendix 1

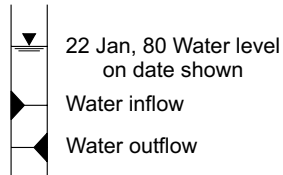
Engineering logs of boreholes

EXPLANATION SHEET FOR ENGINEERING LOGS Borehole and excavation log

Penetration



Water



Notes — samples and tests

U50	Undisturbed sample 50 mm diameter
D	Disturbed sample
N	Standard penetrometer blow count for 300 mm
N*	SPT + Sample

Material classification

Based on Unified Soil Classification System.
In Graphic Log materials are represented by clear contrasting symbols consistent for each project.

Moisture content

D	Dry, looks and feels dry
M	Moist, no free water on hand when remoulding
W	Wet, free water on hand when remoulding
LL	Liquid limit
PL	Plastic limit
PI	Plasticity index

e.g. M>PL — Moist, moisture content greater than the plastic limit

Consistency

		: hand penetrometer
VS	Very soft	<25 (kPa)
S	Soft	25 – 50
F	Firm	50 – 100
St	Stiff	100 – 200
VSt	Very stiff	200 – 400
H	Hard	>400
Fb	Friable	

Notes: X on log is test result
— is range of results

Density index

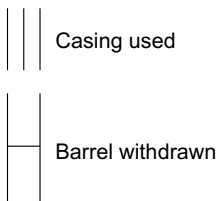
		%
VL	Very loose	0 – 15
L	Loose	15 – 35
MD	Medium dense	35 – 65
D	Dense	65 – 85
VD	Very dense	85 – 100

Fracture description

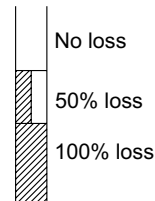
RP	Rough planar
RL	Rough irregular
SP	Smooth planar
SL	Smooth irregular

Cored borehole log

Case - lift



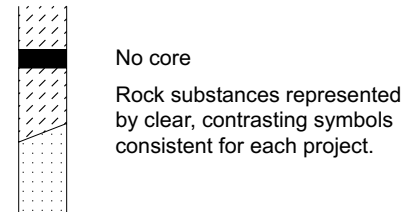
Fluid loss



Lugeons

Lugeon units (uL) are a measure of rock mass permeability. For a 46 to 74 mm diameter borehole 1 Lugeon is defined as a rate of loss of 1 litre per metre per minute. 1 Lugeon is roughly equivalent to a permeability of 1×10^{-4} mm / sec.

Graphic log



Weathering

Fr	Fresh
SW	Slightly weathered
HW	Highly weathered
EW	Extremely weathered

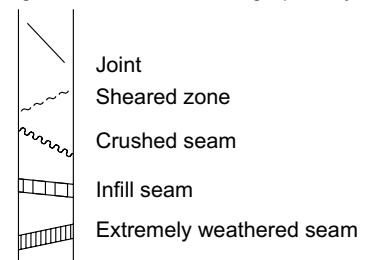
Strength

		point load strength index $1_{5(50)}$ (MPa)
EL	Extremely low	< 0.03
VL	Very low	0.03 – 0.1
L	Low	0.1 – 0.3
M	Medium	0.3 – 1
H	High	1 – 3
VH	Very high	3 – 10
EH	Extremely high	>10

Notes: X on log is test result.

Significant defects


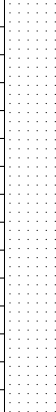
Significant defects shown graphically



ENGINEERING LOG - BOREHOLE

Borehole no.
SWD 2001/1
Sheet 1 of 13

Project	Scottsdale waste depot	Location	Bridport Road, Scottsdale		
Co-ordinates	55 538769 mE 5449020 mN	Drill type	Tri cone, Rock roller	Hole commenced	19 November 2001
		Drill method	Rotary	Hole completed	21 November 2001
R.L.		Drill fluid	Drillers mud	Drilled by	KMR Drilling Pty Ltd
Inclination	Vertical			Logged by	Mr Andrew Ezzy
Bearing				Checked by	Mr Adrian Waite

penetration 1 2 3	support water	notes samples, tests	metres		graphic log	classification symbol	material soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency density index	structure, geology
			R.L.	depth						
		D Sample ID 1		0.5		CH	CLAY - high plasticity, white, sandy	M	F	Tertiary sediments
	Cement		1.0							
	No screen			1.5		SP	SAND - medium, brown		L	Tertiary sediments
	Back in fill	D Sample ID 2		2.0						
				2.5						
				3.0						
				3.5						
				4.0						
				4.5						

ENGINEERING LOG - BOREHOLE

Borehole no.
SWD 2001/1
 Sheet 2 of 13

Project	Scottsdale waste depot	Location	Bridport Road, Scottsdale		
Co-ordinates	55 538769 mE 5449020 mN	Drill type	Tri cone, Rock roller	Hole commenced	19 November 2001
		Drill method	Rotary	Hole completed	21 November 2001
R.L.		Drill fluid	Drillers mud	Drilled by	KMR Drilling Pty Ltd
Inclination	Vertical			Logged by	Mr Andrew Ezzy
Bearing				Checked by	Mr Adrian Waite

penetration	support	water	notes	metres	graphic log	classification	material	moisture	consistency	structure, geology
1 2 3			samples, tests	R.L. depth		symbol	soil type: plasticity or particle characteristics, colour, secondary and minor components.	condition	density index	
							(As sheet 1)			
				5.5						
				6.0						
				6.5						
				7.0						
				7.5						
				8.0						
				8.5						
				9.0		SW	SAND - medium, brown		VL	Tertiary sediments - 1st aquifer level (1A)
				9.5						

No screen
 Back in fill

D
 Sample ID
 3

ENGINEERING LOG - BOREHOLE

Project	Scottsdale waste depot	Location	Bridport Road, Scottsdale		
Co-ordinates	55 538769 mE 5449020 mN	Drill type	Tri cone, Rock roller	Hole commenced	19 November 2001
		Drill method	Rotary	Hole completed	21 November 2001
R.L.		Drill fluid	Drillers mud	Drilled by	KMR Drilling Pty Ltd
Inclination	Vertical			Logged by	Mr Andrew Ezzy
Bearing				Checked by	Mr Adrian Waite

penetration	support	water	notes	metres	graphic log	classification	material	moisture	consistency	structure, geology
1 2 3			samples, tests	R.L. depth		symbol	soil type: plasticity or particle characteristics, colour, secondary and minor components.	condition	density index	
							(As sheet 2)			
			Back in fill	10.5						
			S.W.L. 21/11/01	11.0		CL	CLAY - iron oxide hard pan, gravel		VD	Tertiary sediments, Aquiclude
			Bentonite	11.5		GW	GRAVEL - approximately 85% quartz, brown, coarse sand, 5% quartz with iron oxide skins		VL	Tertiary sediments 2nd aquifer level (2A)
			No screen	12.0						
			D Sample ID 4	12.5						
			Screen	13.0						
			3 mm triple washed sand	13.5						
				14.0						
				14.5		GW	GRAVEL - approximately 95% quartz, 5% coarse sand, brown		VL	Tertiary sediments 3rd aquifer level (2B)
			D Sample ID 5							

ENGINEERING LOG - BOREHOLE

Borehole no.
SWD 2001/1
 Sheet 4 of 13

Project	Scottsdale waste depot	Location	Bridport Road, Scottsdale		
Co-ordinates	55 538769 mE 5449020 mN	Drill type	Tri cone, Rock roller	Hole commenced	19 November 2001
R.L.		Drill method	Rotary	Hole completed	21 November 2001
Inclination	Vertical	Drill fluid	Drillers mud	Drilled by	KMR Drilling Pty Ltd
Bearing				Logged by	Mr Andrew Ezzy
				Checked by	Mr Adrian Waite

penetration	support	water	notes samples, tests	metres R.L. depth	graphic log classification symbol	material soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency density index	structure, geology
1 2 3						(As sheet 3)			
	Screen		3 mm triple washed sand	15.5 16.0 16.5 17.0 17.5 18.0 18.5 19.0 19.5					

ENGINEERING LOG - BOREHOLE

Borehole no.
SWD 2001/1
Sheet 5 of 13

Project	Scottsdale waste depot	Location	Bridport Road, Scottsdale		
Co-ordinates	55 538769 mE 5449020 mN	Drill type	Tri cone, Rock roller	Hole commenced	19 November 2001
		Drill method	Rotary	Hole completed	21 November 2001
R.L.		Drill fluid	Drillers mud	Drilled by	KMR Drilling Pty Ltd
Inclination	Vertical			Logged by	Mr Andrew Ezzy
Bearing				Checked by	Mr Adrian Waite

penetration	support	water	notes	metres	graphic log	classification	material	moisture	consistency	structure, geology
1 2 3			samples, tests	R.L. depth		symbol	soil type: plasticity or particle characteristics, colour, secondary and minor components.	condition	density index	
							(As sheet 3)			
				20.5						
				21.0		CL	CLAY - brown		VD	Tertiary sediments Aquiclude
				21.5						
				22.0		GW	GRAVEL - medium, quartz		VL	Tertiary sediments 4th aquifer level (2C)
			D Sample ID 6	22.5						
			Screen 3 mm triple washed sand	23.0						
				23.5						
				24.0		CL	CLAY - gravelly, brown		H	Tertiary sediments Aquiclude
				24.5						

ENGINEERING LOG - BOREHOLE

Borehole no.
SWD 2001/1
Sheet 6 of 13

Project	Scottsdale waste depot	Location	Bridport Road, Scottsdale		
Co-ordinates	55 538769 mE 5449020 mN	Drill type	Tri cone, Rock roller	Hole commenced	19 November 2001
R.L.		Drill method	Rotary	Hole completed	21 November 2001
Inclination	Vertical	Drill fluid	Drillers mud	Drilled by	KMR Drilling Pty Ltd
Bearing				Logged by	Mr Andrew Ezzy
				Checked by	Mr Adrian Waite

penetration	support	water	notes	metres	graphic log	classification	material	moisture	consistency	structure, geology
1 2 3			samples, tests	R.L. depth		symbol	soil type: plasticity or particle characteristics, colour, secondary and minor components.	condition	density index	
			D Sample ID 7	25.5		GW	GRAVEL - very coarse, quartz		VL	Tertiary sediments 5th aquifer level (3A)
				26.0						
				26.5						
				27.0						
				27.5						
				28.0						
				28.0		CL	CLAY - gravelly, brown		H	Tertiary sediments Aquiclude
			D Sample ID 8	28.5		GW	GRAVEL - very coarse, quartz		VL	Tertiary sediments 6th aquifer level (3B)
				29.0						
				29.5						
				29.5		CL	CLAY - gravelly, brown		H	Tertiary sediments Aquiclude

ENGINEERING LOG - BOREHOLE

Borehole no. SWD 2001/1
Sheet 7 of 13



Project	Scottsdale waste depot	Location	Bridport Road, Scottsdale		
Co-ordinates	55 538769 mE 5449020 mN	Drill type	Tri cone, Rock roller	Hole commenced	19 November 2001
		Drill method	Rotary	Hole completed	21 November 2001
R.L.		Drill fluid	Drillers mud	Drilled by	KMR Drilling Pty Ltd
Inclination	Vertical			Logged by	Mr Andrew Ezzy
Bearing				Checked by	Mr Adrian Waite

penetration	support	water	notes	metres	graphic log	classification	material	moisture	consistency	structure, geology
1 2 3			samples, tests	R.L. depth		symbol	soil type: plasticity or particle characteristics, colour, secondary and minor components.	condition	density index	
			D Sample ID 9	30.5		GW	GRAVEL - very coarse, quartz		VL	Tertiary sediments 7th aquifer level (3C)
			D Sample ID 10	31.0		CL	CLAY - gravelly, brown		H	Tertiary sediments Aquiclude (Base of high permeability hydro-stratigraphy section of Jetsonville aquifer)
			D Sample ID 11	33.0		CH	CLAY - high plasticity, grey, white, sandy, coarse gravel		F	Tertiary sediments Aquiclude
				34.5		GC	CLAY - gravelly, brown		H	Tertiary sediments Aquiclude

ENGINEERING LOG - BOREHOLE

Borehole no.
SWD 2001/1
 Sheet 8 of 13

Project	Scottsdale waste depot	Location	Bridport Road, Scottsdale		
Co-ordinates	55 538769 mE 5449020 mN	Drill type	Tri cone, Rock roller	Hole commenced	19 November 2001
R.L.		Drill method	Rotary	Hole completed	21 November 2001
Inclination	Vertical	Drill fluid	Drillers mud	Drilled by	KMR Drilling Pty Ltd
Bearing				Logged by	Mr Andrew Ezzy
				Checked by	Mr Adrian Waite

penetration	support	water	notes	metres	graphic log	classification	material	moisture	consistency	structure, geology
1 2 3			samples, tests	R.L. depth		symbol	soil type: plasticity or particle characteristics, colour, secondary and minor components.	condition	density index	
				35.5		GC	GRAVEL - very coarse, quartz		VL	Tertiary sediments (no detectable inflows after 35 metres)
				36.0		CL	CLAY - gravelly, brown		H	Tertiary sediments Aquiclude
				36.5						
				37.0						
				37.5						
				38.0						
				38.5						
				39.0						
				39.5						

ENGINEERING LOG - BOREHOLE

Borehole no.
SWD 2001/1
 Sheet 9 of 13

Project	Scottsdale waste depot	Location	Bridport Road, Scottsdale		
Co-ordinates	55 538769 mE 5449020 mN	Drill type	Tri cone, Rock roller	Hole commenced	19 November 2001
		Drill method	Rotary	Hole completed	21 November 2001
R.L.		Drill fluid	Drillers mud	Drilled by	KMR Drilling Pty Ltd
Inclination	Vertical			Logged by	Mr Andrew Ezzy
Bearing				Checked by	Mr Adrian Waite

penetration	support	water	notes	metres	graphic log	classification	material	moisture	consistency	structure, geology
1 2 3			samples, tests	R.L. depth		symbol	soil type: plasticity or particle characteristics, colour, secondary and minor components.	condition	density index	
							(As sheet 8)			
				40.5						
				41.0						
				41.5						
				42.0		CL	CLAY - orange, gravel		H	Tertiary sediments
			D Sample ID 12	42.5						
	Back in fill	Back in fill		43.0						
				43.5						
				44.0						
				44.5						

ENGINEERING LOG - BOREHOLE

Borehole no.
SWD 2001/1
 Sheet 10 of 13

Project	Scottsdale waste depot	Location	Bridport Road, Scottsdale		
Co-ordinates	55 538769 mE 5449020 mN	Drill type	Tri cone, Rock roller	Hole commenced	19 November 2001
		Drill method	Rotary	Hole completed	21 November 2001
R.L.		Drill fluid	Drillers mud	Drilled by	KMR Drilling Pty Ltd
Inclination	Vertical			Logged by	Mr Andrew Ezzy
Bearing				Checked by	Mr Adrian Waite

penetration	support	water	notes	metres	graphic log	classification	material	moisture	consistency	structure, geology
1 2 3			samples, tests	R.L. depth		symbol	soil type: plasticity or particle characteristics, colour, secondary and minor components.	condition	density index	
							(As sheet 9)			
			D Sample ID 13	45.5 46.0 46.5		CL	CLAY - orange, white, approximately 10% gravel		VD	Tertiary sediments
	Back in fill	Back in fill		47.0 47.5 48.0 48.5						
			D Sample ID 14	49.0 49.5		CL	CLAY - orange, white, approximately 20% gravel		H	Tertiary sediments

ENGINEERING LOG - BOREHOLE

Project	Scottsdale waste depot	Location	Bridport Road, Scottsdale		
Co-ordinates	55 538769 mE 5449020 mN	Drill type	Tri cone, Rock roller	Hole commenced	19 November 2001
		Drill method	Rotary	Hole completed	21 November 2001
R.L.		Drill fluid	Drillers mud	Drilled by	KMR Drilling Pty Ltd
Inclination	Vertical			Logged by	Mr Andrew Ezzy
Bearing				Checked by	Mr Adrian Waite

penetration	support	water	notes	metres	graphic log	classification	material	moisture	consistency	structure, geology
1 2 3			samples, tests	R.L. depth		symbol	soil type: plasticity or particle characteristics, colour, secondary and minor components.	condition	density index	
							(As sheet 10)			
				50.5						
				51.0						
				51.5						
				52.0						
			D Sample ID 15	52.0		GC	GRAVEL - clayey		L	Tertiary sediments
	Back in fill	Back in fill		52.5						
				53.0						
				53.5						
				54.0						
				54.5						

ENGINEERING LOG - BOREHOLE

Project	Scottsdale waste depot	Location	Bridport Road, Scottsdale		
Co-ordinates	55 538769 mE 5449020 mN	Drill type	Tri cone, Rock roller	Hole commenced	19 November 2001
R.L.		Drill method	Rotary	Hole completed	21 November 2001
Inclination	Vertical	Drill fluid	Drillers mud	Drilled by	KMR Drilling Pty Ltd
Bearing				Logged by	Mr Andrew Ezzy
				Checked by	Mr Adrian Waite

penetration	support	water	notes	metres	graphic log	classification	material	moisture	consistency	structure, geology	
1 2 3			samples, tests	R.L. depth		symbol	soil type: plasticity or particle characteristics, colour, secondary and minor components.	condition	density index		
							(As sheet 11)				
	Back in fill	Back in fill		55.5							
				56.0							
				56.5							
				57.0							
				57.5							
				58.0							
				58.5							
			D Sample ID 16				CL	CLAY - grey, gravelly		VD	Decomposed granite
				59.0							
				59.5							

ENGINEERING LOG - BOREHOLE

Project	Scottsdale waste depot	Location	Bridport Road, Scottsdale		
Co-ordinates	55 538769 mE 5449020 mN	Drill type	Tri cone, Rock roller	Hole commenced	19 November 2001
R.L.		Drill method	Rotary	Hole completed	21 November 2001
Inclination	Vertical	Drill fluid	Drillers mud	Drilled by	KMR Drilling Pty Ltd
Bearing				Logged by	Mr Andrew Ezzy
				Checked by	Mr Adrian Waite

penetration	support	water	notes	metres	graphic log	classification	material	moisture	consistency	structure, geology
1 2 3			samples, tests	R.L. depth		symbol	soil type: plasticity or particle characteristics, colour, secondary and minor components.	condition	density index	
	Back in fill	Back in fill		60.5			(As sheet 12)			
				61.0						
				61.5						
				62.0						
				62.5						
			D Sample ID 17	63.0						
								End of hole		

ENGINEERING LOG - BOREHOLE

Borehole no.
SWD 2001/2
Sheet 1 of 3

Project	Scottsdale waste depot	Location	Bridport Road, Scottsdale		
Co-ordinates	55 538772 mE 5449020 mN	Drill type	Tri cone, Rock roller	Hole commenced	20 November 2001
R.L.		Drill method	Rotary	Hole completed	21 November 2001
Inclination	Vertical	Drill fluid	Drillers mud	Drilled by	KMR Drilling Pty Ltd
Bearing				Logged by	Mr Andrew Ezzy
				Checked by	Mr Adrian Waite

penetration	support	water	notes	metres	graphic log	classification	material	moisture	consistency	structure, geology
1 2 3			samples, tests	R.L. depth		symbol	soil type: plasticity or particle characteristics, colour, secondary and minor components.	condition	density index	
				0.5		CH	CLAY - high plasticity, white, sandy	M	F	Tertiary sediments
			Cement	1.0						
			No screen Back in fill	1.5						
				2.0						
				2.5						
				3.0						
				3.5		SP	SAND - medium, brown		L	Tertiary sediments
				4.0						
				4.5						

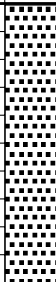

ENGINEERING LOG - BOREHOLE

Project	Scottsdale waste depot	Location	Bridport Road, Scottsdale		
Co-ordinates	55 538772 mE 5449020 mN	Drill type	Tri cone, Rock roller	Hole commenced	20 November 2001
		Drill method	Rotary	Hole completed	21 November 2001
R.L.		Drill fluid	Drillers mud	Drilled by	KMR Drilling Pty Ltd
Inclination	Vertical			Logged by	Mr Andrew Ezzy
Bearing				Checked by	Mr Adrian Waite

penetration	support	water	notes	metres	graphic log	classification	material	moisture	consistency	structure, geology
1 2 3			samples, tests	R.L. depth		symbol	soil type: plasticity or particle characteristics, colour, secondary and minor components.	condition	density index	
							(As sheet 1)			
			Bentonite	5.5						
			No screen	6.0						
			3 mm triple washed sand	6.5						
				7.0						
				7.5						
				8.0						
				8.5						
				9.0		SW	SAND - medium, brown		VL	Tertiary sediments - 1st aquifer level (1A)
			Screen	9.5						

ENGINEERING LOG - BOREHOLE

Borehole no.
SWD 2001/2
 Sheet 3 of 3

Project		Scottsdale waste depot			Location		Bridport Road, Scottsdale			
Co-ordinates		55 538772 mE 5449020 mN		Drill type		Tri cone, Rock roller		Hole commenced		20 November 2001
				Drill method		Rotary		Hole completed		21 November 2001
R.L.				Drill fluid		Drillers mud		Drilled by		KMR Drilling Pty Ltd
Inclination		Vertical						Logged by		Mr Andrew Ezzy
Bearing								Checked by		Mr Adrian Waite
penetration	support	notes	metres	graphic log	classification	material	moisture	consistency	structure, geology	
1 2 3	water	samples, tests	R.L. depth		symbol	soil type: plasticity or particle characteristics, colour, secondary and minor components.	condition	density index		
	Screen	3mm triple washed sand				(As sheet 2)				
		S.W.L. 21/11/01	10.5							
			11.0		CL	CLAY - iron oxide hard pan, gravel		VD	Tertiary sediments, Aquiclude	
			11.5			End of hole				