



Division of Mines and Mineral Resources — Report 1991/26

Groundwater conditions at a CCA treatment mill near Scottsdale

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Abstract

A CCA treatment mill site near Scottsdale is underlain by clayey sediments to a depth of at least 9.7 metres. The main near-surface aquifer or groundwater-bearing horizon beneath the mill site occurs at a depth of about 7.4 m and is probably confined. The groundwater has a low salinity of 87 mg/L of total dissolved solids.

There appears to be a low risk of any CCA leachate reaching the groundwater, providing surface drainage is maintained and monitored. There are no known groundwater bores in the immediate area. The main potential risk of contamination is from runoff draining to nearby streams.

Copper, chromium and arsenic levels in the groundwater were all below the detectable limits for the analysis method. It is advised that groundwater samples be analysed on a six-monthly basis.

INTRODUCTION

French Enterprises initially requested an opinion concerning the groundwater conditions beneath a mill site at Ling Siding [AMG 5462 mE, 54407 mN], approximately 3.5 km southeast of Scottsdale. The mill is used for CCA treatment of radiata pine, and the Company was concerned about the potential for groundwater pollution beneath the site.

An opinion was provided and subsequently a 10 m deep auger hole was drilled at the site. Casing was installed in the hole in order to monitor the groundwater chemistry.

GEOLOGY

The *Geology of the Scottsdale Basin* map sheet (Moore, 1990) shows that the site is underlain by alluvium of Quaternary age. Granite, or more particularly adamellite, is shown to occur approximately 300 m to the east and south. The granite is part of the Scottsdale Batholith.

The auger hole drilled in the mill yard found that clay, sandy and gravelly clay, and clayey and sandy gravel underlies the site to a depth of at least 9.7 metres. The auger hole log is presented as Appendix 1.

In summary the auger hole showed yellow-brown and grey, high plasticity clay and gravelly clay extending to a depth of about 3.3 m from the ground surface. Between about 3.3 and 7.4 m dull yellow and grey sandy and gravelly clay containing approximately 45% sand and fine gravel was encountered. Dull yellow clayey and gravelly sand occurred between 7.4 m and the end of the hole at 9.7 metres.

Muscovite mica was present in the material below about 3.3 metres. This indicates that the material may be extremely weathered *in-situ* granite, or sediment which has been derived from weathered granite and deposited very close to its source.

GROUNDWATER HYDROLOGY

The approximate location of the nearest known water bore is shown in Figure 1. This hole was drilled to 37.5 m in clay. No water was struck and the bore was abandoned. No details of the clay are available and therefore it is not possible to state if the clay is weathered granite or sediments of Tertiary age.

The auger hole was drilled in order to determine the groundwater conditions at the site. Moist and soft to very soft material was found at a depth of approximately 4.5 metres. Below about 7.2 m the clayey and gravelly sand was very soft and wet, extending to 9.7 m where the hole was stopped. This material is therefore the main near-surface aquifer.

Slotted PVC casing, 50 mm in diameter, was installed in the hole to a depth of 7.9 metres. The slotted section extended from 4 to 7.9 m from the ground surface and this section of the hole was gravel packed. A bentonite seal was placed around the pipe at a depth of three metres.

Water was encountered during drilling at a depth of approximately 5.8 metres. Most water was associated with the wet material below 7.4 metres. The standing water level after drilling was 3.4 m, and by the next morning the water level had risen to 1.1 m below ground surface. This indicates that the water in the clayey and gravelly sand aquifer is probably confined or at least semi-confined, possibly at a pressure equivalent to a head of 6.3 m of water. Samples of water were taken for chemical analysis.

GROUNDWATER CHEMISTRY

A water sample from the monitoring bore has been chemically analysed. The analysis is presented in Table 1.

Registration No.	911175
pH	6.7
Conductivity ($\mu\text{S}/\text{cm}$)	96
<i>Item (mg/L)</i>	
CO ₃	<5
HCO ₃	26
Cl	14
SO ₄	<5
Ca	7.1
Mg	1.2
Fe	0.1
Al	0.3
K	0.7
Na	9.0
F	<0.3
NO ₃	<10
NO ₂	-
Cu	<0.1
Cr	<0.01
As	<0.03
TDS	87
Hardness-Permanent	4
Hardness-Temporary	21
Alkalinity	21
Cation total	0.90118
Anion total	0.82733

The groundwater is of extremely good quality with a Total Dissolved Solids (TDS) content of 87 mg/L. The water is predominantly sodium chloride and calcium and magnesium bicarbonate type. The levels of copper, chromium and arsenic were lower than the detectable limits of the analysis method. The groundwater is therefore not contaminated by leachate from the CCA treatment plant.

The low groundwater salinity indicates that the water has probably not been in the ground for very long. Therefore the aquifer recharge area may be in close proximity. The possibility that some groundwater recharge may originate from a nearby dam cannot be discounted.

CONCLUSIONS

The main near-surface aquifer or groundwater-bearing horizon beneath the mill site occurs at a depth of about 7.4 m and is probably confined. Immediately below the ground surface is approximately 3.3 m of stiff to very stiff clay and gravelly clay. These high plasticity clays are likely to act as an aquiclude or seal, preventing surface water from infiltrating to the aquifer below. If fissuring is present in the clays then some slow downward infiltration of surface water may occur. The presence of fissuring is impossible to determine from disturbed auger samples.

There appears to be a low risk of any CCA leachate reaching the groundwater, providing surface drainage is maintained and monitored. There are no known groundwater bores in the immediate area. The main potential pollution risk is from runoff draining to nearby streams.

The groundwater chemistry has been determined, indicating a low salinity of 87 mg/L of total dissolved solids. It is considered that the low groundwater salinity indicates recharge may occur reasonably close to the mill. Groundwater recharge from the dam cannot be discounted. Careful attention to preventing the contamination of surface drainage is therefore recommended.

Copper, chromium and arsenic levels in the groundwater were all below the detectable limits for the analysis method. It is advised that groundwater samples be analysed on a six-monthly basis.

REFERENCES

MOORE, W. R. 1990. *Geology of the Scottsdale Basin*. Dep. Res. Energy. Tasm.

[20 December 1991]

ENGINEERING LOG - BOREHOLE

4/4

project **FRENCH ENTERPRISES** location **LINGS SIDING, SCOTSDALE**

co-ordinates R.L. **140m approx** drill type **Triefus** hole commenced **27/11/91**
 inclination **Vertical** drill method **Auger Screw** hole completed **27/11/91**
 bearing drill fluid **-** drilled by **BC.**
 checked by **DJS.**

penetration	support	water	notes	metres	graphic log	classification	material	moisture	consistency	hand	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	penetr-ometer kPa	
										25 50 100 200 400	
				10		CH	CLAY: High plasticity, bright yellowish brown. Trace fine quartz gravel and sand to 5mm.	M _L	PL	VST	EXTREMELY WEATHERED GRANITE?
				2.0		GC	GRAVELLY CLAY: High plasticity, light grey with dull yellowish orange mottles. 20% quartz gravel to 5mm. Some fine sand				
				3.0		CH	CLAY: High plasticity, light grey. Some fine gravel (quartz) and sand to 4mm dia	M _L	PL	ST	
				4.0		GC	SANDY + GRAVELLY CLAY: Moderate plasticity. 45% fine gravel and sand to 6mm. Light grey. Some muscovite mica. Approx 15% gravel.				
				5.0		GC	As above, light yellow	M		S	
				6.0		GC	SANDY + GRAVELLY CLAY: Moderate-high plasticity fines. Dull yellow. Approx 45% fine gravel (quartz) and sand to 6mm. Some muscovite mica. Approx 25% gravel.	M		VS	
				7.0		GC					
				8.0		SC	CLAYEY + GRAVELLY SAND: Moderate-high plasticity fines. Medium-fine sand with 20% fine gravel and approx 25% clay. Dull yellow. Some muscovite mica.	W		VS	
				9.0		SC					
							END OF HOLE 9.7m		5 cm		

W.L. 9m 28/11

W.L. after drilling 27/11

Bentonic Seal

← SLOTTED PVC CASING - 50mm dia.