1953/91

COMMONWEALTH OF AUSTRALIA

DEPARTMENT OF NATIONAL DEVELOPMENT

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS.

RECORDS

1953/91

RECORDS [redacted]

[redacted]

[redacted]

[redacted]

A STUDY OF UNDERGROUND WATER AT WAVE HILL STATION, NORTHERN TERRITORY.

by

D.M. TRAVES

Record No. 1953/91.

CONTENTS.

A STUDY OF UNDERGROUND WATER AT WAVE HILL STATION, NORTHERN TERRITORY.

General

Wave Hill Station, a cattle station in the north-western portion of the Northern Territory, is situated between the 15 in. and 20 in. isohyets of annual rainfall. This Station has a large area of grassland on volcanic downs which cannot be fully utilised because of the lack of surface waters: supplies of underground water are essential for the expansion of the pastoral industry in this area. Bore records up to 1949 show that at least 30 bores have been sunk of which more than half are useless and only a very few produce a sufficient yield.

Geology

The regional geology of the area is shown on the accompanying sketch map.

The oldest rocks in the area are sediments of Victoria River Group of Upper Proterozoic age, consisting of sandstone, limestone, and shale, broadly folded into synclines and anticlines. The Antrim Plateau Volcanics of Lower Cambrian age overlie the Victoria River Group with an erosional unconformity. The Volcanics consist of basalt, vesicular basalt, dolerite, and some tuffs and agglomerates. The greatest measured thickness of this unit is over 3000 feet at a locality north-west of Turner Station but it is thought that the maximum thickness in the Wave Hill area is approximately 1000 ft.

To the east of Wave Hill, Antrim Plateau Volcanics are overlain by Montejinni Limestone of Middle Cambrian age, which consists of up to 120 ft. of grey crystalline limestone. This in turn is overlain by a thin veneer of Cretaceous sediments of Mullaman Group. The plateau to the south and east of Wave Hill is capped by Tertiary laterite.

As shown by the map, the major portion of Wave Hill Station lies on rocks of Antrim Plateau Volcanics whose attitude in this area is mostly sub-horizontal.

Bore Records

The following are the bore records obtained from Wave Hill Station in 1949:-

Bore No.	Total depth.	Static Water Level.	Pump Depth.	Yield by pumping g.p.h.
1.	72'	35'	70'	1200
2.	254'	30'	70'	1200
3.	105'	30'	90'	1200
4.	62'	30'	47'	300-400
5.	62'	30'	60'	300
5A.	219'	26'		300
6.	198'	30'	70'	800
7.	82'	20'		1200
8.				
9.	600'			
10.				
11.	73'			
12.	71'	35'	70'	700-800
13.				
14.	288'	40'	110'	1800
15.	93'	20'		300
16.	85'	20'		600
17.	155'	30'	100'	750

cont'd next page.

Bore No.	Total depth.	Static Water Level.	Pump Depth.	Yield by pumping g.p.h.
18*	237'	62'		1000
19*	268'			1450
20.	218'			-
21.				-
22.	71'			1500
23.				
24.				
25.	125'			good
26.				
27.				
28.	35'			
29.	74'	17'	73'	2400
Post Office Bore	50'			small

* Bores 18 and 19 are situated 84 and 90 miles west of Wave Hill and are not included in the discussion of underground water at Wave Hill.

Although the above records are very incomplete, they do provide some interesting information.

A study of the total depths shows that the average bore is from 70 - 80 ft. deep and that the static water level in most cases is approximately 30 ft.

This indicates that most of the Wave Hill bores tap shallow ground-water which yields supplies ranging from 1500 to zero gallons per hour. Bore 29 is the exception, and although it is only 74 ft. deep, with a static water level at 17 ft., it produces 2,400 gallons per hour.

Two bores have been sunk deeper than 270 ft. No. 9 bore was drilled to a depth of 600 ft., and apparently did not give a satisfactory yield, and Bore No. 14, sunk to a depth of 288 ft., yielded, under test, 1800 gallons per hour. The driller's log records that the water supply came from the bottom of this bore and that the water rose to 40 ft. This may indicate that sub-artesian water was encountered; but also, as the static level of most of the other bores is approximately 30 ft., this level may be maintained by a small supply from the shallow ground water.

A rather unusual incident occurred at one of the Wave Hill Bores. This bore, when completed, yielded approximately 1,000 gallons per hour but, after two weeks, the supply diminished to 3 gallons per hour. Another bore was sunk close to the first site and during drilling the tools became jammed so a charge of explosive was set off to shift the tools. After the explosion it was discovered that the original supply had returned in the first bore. This indicates that if a bore in the Volcanics does not yield a good supply it is well worth setting off an explosion in the hole in an attempt to open up cracks to a supply of water.

No records are available for the bore at the Police Station which was artesian when drilled but now fluctuates from artesian to sub-artesian. This bore was sunk to a depth of 700 ft. in sediments of Victoria River Group, close to the Victoria River. It shows that artesian water is procurable from suitable structures in these sediments but the thick mantle of Volcanics which covers these sediments in most of the Wave Hill area almost precludes the use of waters from these beds.

Conclusions and Recommendations

Unless very deep bores are drilled in the Wave Hill area to tap the sediments of the Victoria River Group, the supply of

underground water must be obtained from Antrim Plateau Volcanics which contains water in joints, faults, cracks and other openings but does not contain a definite aquifer. From bores already drilled, it has been shown that shallow ground-water exists over most of the area but that the yield from this is generally not sufficient.

Three possibilities of improving the water supply at Wave Hill are:-

(1) A large number of bores which tap the shallow ground-water supply.

This method is not recommended because it is not economical to equip bores with a windmill or pump and tank for only a small yield. On the Barkly Tableland it is considered uneconomical to equip a bore unless it has a tested yield of over 2,000 gallons per hour. Also a great number of bores with small yields would make stock control more difficult.

(2) Deep bores penetrating suitable structures in the sediments or a layer of fossil soil or gravel, below the Volcanics.

This method also is not recommended because the thickness of the Volcanics is not known and it is impossible to determine the structures below at the present. However, this method would probably yield the largest supplies of underground water and possibly one test hole is warranted to find out the thickness of Volcanics.

(3) Bores of up to 600-800 ft. deep, if necessary, to intersect joints, faults, cracks or other openings in the Volcanics which would afford a sufficient supply. As the occurrence of these openings cannot be determined, the depth of the bore controls the chance of obtaining a good supply. It is suggested that Bore 14 has tapped this supply and, on other stations on the Volcanics, good yields are obtained by this method.

Although one bore - No. 9 - has been sunk to 600 ft. without water, it is recommended that bores on Wave Hill Station should be sunk to at least 600 ft., if ground water supplies are not sufficient, so that openings in the Volcanics may be intersected which will yield good supplies. Costs may be reduced by deepening existing bores with poor yields if they are in suitable condition.

GEOLOGICAL MAP

WAVE HILL STATION
N.T.

SCALE
5 0 5 10
5 Miles to 1 Inch

TRUE (Approx) N

Reference

RECENT	Qr	Alluvia
TERTIARY	Qt	Alice Springs
CRETACEOUS & TERTIARY	Kt	Lateritic &/or Mudstones Gp
MIDDLE CAMBRIAN	€m	Montejinni Limestone
LOWER CAMBRIAN	€l	Antrim Plateau Volcanics
UPPER PROTEROZOIC	Pu	Victoria River Group
	⊙5	Bore Localities

Bureau of Mineral Resources, Geology and Geophysics, August, 1953.

NT62-1