HYDROGEOPHYSICAL REPORT 82/1

COX PENINSULA RESISTIVITY SURVEY

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CONTENTS

1. Introduction
2. Survey Objectives
3. Techniques
4. Results
1. INTRODUCTION

During the period November 2 to November 13, 1981 a resistivity survey was completed on Cox Peninsula by geophysical staff of the Groundwater Section, Water Division, N.T. Department of Transport and Works.

During the 10 day's field activities a crew comprising one party leader and three field assistants completed approximately 22 line km. of pole dipole resistivity profiling distributed over 8 individual traverses. This work was completed at a station spacing of 50 metres and in all involved approximately 440 observations of apparent resistivity.
2. **SURVEY OBJECTIVES**

The present survey is essentially a continuation of the 1980 geophysical activities in the area. (See Hydrogeophysical Report 81/8). As such, the aims of the present survey are initially the same as those of the previous work. These objectives along with the geology of the area and resistivity instrumentation employed are discussed in detail in the indicated report.

Briefly, geophysics was employed on Cox Peninsula as a preliminary phase in the evaluation of the hydrogeological potential of the area. The immediate objective of the resistivity survey therefore was to outline zones of increased groundwater potential over the Peninsula prior to follow-up drilling operations.

The present work extends the area of resistivity investigation to the extreme western margin of Cox Peninsula (see plate 1 for the location of traverses). On the basis of aeromagnetic data flown by the Bureau of Mineral Resources this area showed evidence of a significant change in magnetic character from that to the East of the Peninsula.
3. TECHNIQUES

The present survey was completed entirely with a pole dipole array having a potential dipole of 50 metres and a current pole separation of 5 i.e. equivalent to 250 metres.

In all cases profiles were run with the potential dipole leading the current pole, and except for traverse 6 where conditions dictated otherwise, all traverses were completed from east to west.

In all situations the location of the remote current electrode was kept in excess of 1 km from all active or measuring electrodes. Additionally, the location of this remote electrode was accounted for in the calculation of apparent resistivities.
4. RESULTS

The results of all profiling operations are shown in plate 2. Here apparent resistivities in ohm-metres are plotted at a logarithmic ordinate scale of one decade equal to 5 cm versus the station co-ordinate in metres. In these illustrations the convention has been adopted of plotting the apparent resistivity at the mid point of the measuring potential dipole. It is also relevant to note that except for line 6 the potential dipole was always located to the (grid) west of the current pole.

A line by line description of the results follows.

Line 1

Apparent resistivities increase steadily from somewhat over 100 ohm - metres in the east to in excess of 250 ohm - metres in the west.

Anomalously low apparent resistivities observed at the eastern most stations are attributed to the effect of saltwater intrusion of the basal Cretaceous and weathered lower Proterozoic units.

Line 2

Apparent resistivities on the majority of this line (00W to 3800W) show the same trend as observed on the previous line (i.e. a steady increase from east to west).

A significant conductive anomaly appears on this line between 3800W and 4200W. Apparent resistivities to the west of this feature are marginally lower than those to the east and decrease further to the west.

The form of the conductive anomaly indicates the causative body to be a buried conductor showing a near vertical or very steep dip to the west. The horizontal co-ordinate of the eastern boundary of the conductor is approximately 3800W, however the width and depth to the top of the body are not clearly defined. It is suggested that a width of 100 - 200 metres and a depth of 50 metres would be reasonable figures.

A resistivity of substantially less than 50 ohm - metres is indicated for the causative body.

Lines 3 and 4

Lines 3 and 4 show background resistivities in the order of 100 ohm - metres over much of their length. This figure is substantially less than that observed for the background resistivity on any other profile.

Three strong conductive indications appear on these lines. These are:

1. A strong conductive anomaly on line 3 between 350 E and 200W.
2. A weaker conductive indication on line 4 between 700W and 1300W, and

3. A strong conductive indication to the extreme west on line 4.

Although appearing somewhat weaker on the more southern line, anomalies 1 and 2 are similar in character and separate a western zone of lower apparent resistivity from an eastern region of marginally higher values. These two anomalies define a conductor bearing at approximately 340°.

Of the above two anomalies the most characteristic is observed on line 3. Here the causative body appears to be a vertical feature extending from 350 E to 150 E with a very shallow depth of burial. A resistivity of approximately 5 ohm - metres is indicated for the feature.

The anomaly on line 4 is weaker and much less diagnostic of the causation. Here a western boundary of the conductor is indicated at 850 W. A probable figure for the width is again 100 to 200 metres.

It is possible but in the writer’s opinion unlikely that the above two conductors are continuous with the conductor detected on Line 2.

Conductive anomaly 3 on line 4 appears to be of no significance, reflecting saltwater intrusion into the near coast environment.

Line 5

No evidence of the above conductors is observed on Line 5. Apparent resistivities of approximately 250 ohm - metres are observed throughout except for somewhat lower values at the extreme eastern and western end. Evidence of saltwater intrusion is seen at the latter co-ordinate.

Line 6

This line shows a single strong conductive indication suggesting a shallow conductor of limited depth extent lying between 400 E and 500 E. This anomaly in conjunction with a similar indication observed during the previous survey some distance to the south (in the vicinity of the Diamond Creek Crossing) defines a strike of the causative conductor to be approximately 340°.

Lines 8 and 9

Lines 8 and 9 show similar apparent resistivity behaviour averaging approximately 150 ohm - metres.

No significant conductive indications are apparent on either line with the exception of some low values observed at the extreme west of line 8. These again appear to reflect saltwater intrusion at this location.
SUMMARY

Vertical holes located at the following co-ordinates would be most likely to intersect the most significant of the conductors mentioned above.

1. Line 2, 3850 W to 3900 W
2. Line 3, 250 E
3. Line 4, 900 W to 950 W