

971 Nos.

58-209

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REPORT ON EXAMINATION OF
TERTIARY SEDIMENTS
SPERO RIVER, NEAR ANOMALY 17N/6

58-209

Examination of Tertiary Sediments
near Spero R., near Magnetic
Anomaly 17N/8.

L.S.G. 26/3/58.

429.

26th March, 1958

To Dr. B. Scott

Report on Examination of Tertiary SedimentsSpero River, near Magnetic Anomaly 17N/8

Dates of Examination: March 3rd-13th, 1958.

Party Leader: P. Rodda

Personnel Employed: G. Seymour

Location of Camp: On river gravel beside Spero River, just to east of the Cambrian-Tertiary boundary.

Man Days in Field: 22

Means of Transport and Supply: By Djinn helicopter based at Birch and Queenstown.

Physiography of the Area

The bedrock under the Tertiaries in this area is Cambrian, of the Dundas Group; about $2\frac{1}{2}$ miles to the west of the localities examined, the Cambrian is exposed. About half a mile to the south west, however, some Dundas (LEE 359) has been found in the bed and banks of the Spero River (Report G43). It is thought that a north-south fault, west side up, raised the Dundas until the erosion of the Spero exposed it. This fault also gave the Spero its characteristics in the area - wide and fairly level with flood plains on either side, until the exposures of the Dundas: from there for half a mile the river is steep and narrow with no flats or gravel beds or bars. This gorge is in the uplifted block.

To the north of the river, the hills fall rather steeply from 2-300 feet above the river level to a river flat about 10 feet above. The

surface is quite dissected. To the south, however, there are several levels at different heights above river level. The surface is not so dissected, there being fairly large areas of these levels remaining. The top level is not reached until about $1\frac{1}{2}$ miles south of the river. The height of some of these levels has been determined.

Geological Investigations and Findings

The Tertiaries were examined mainly along a small creek, which, for the $\frac{1}{2}$ mile before it enters the Spero River, has cut a small gorge, about 10-20 feet wide and with vertical sides up to 20-30 feet high. Before that it runs only on the surface. This creek enters the Spero River at a large bend where the Spero cuts into a hill, exposing a section of Tertiaries about 75 feet thick (Localities 1 and 2).

Further sections up the creek (Locs. Pres 4 to 7 and one further upstream than 7) did not extend the thickness, but merely gave a more detailed picture of the sediments at Locs. 1 and 2 and their lateral variation. About 2-300 yards west of this creek a section 90-5 feet thick was found, using about 4 different exposures close together (heights by aneroid barometer) - Locality K.

Two other exposures were studied also - Locs. M and W. At Loc. M, conglomerate lies with an angular disconformity of 10-12°, on sands and conglomerates. The upper conglomerate appears to be flat lying. See Fig. 1. At Loc. W, which is west of the Dundas exposure near anomaly 17N/8, sections could only be seen in the river bank which was not more than 7-8 feet. The Tertiary seems to be mainly conglomerates and sandy conglomerates with sand lenses in places. The conglomerates range from pebble to boulder conglomerates, one boulder seen being about 3 feet in diameter.

No fossils were found so correlation of the Tertiaries was possible

only by lithology, or by tracing a particular bed from one exposure to another - lateral variation is so great there are no reliable marker bands. Correlation by lithology is possible only over small distances in most cases for the same reason; some correlation can be made by viewing two exposures from a distance, when possible.

The sequence at Loc. K cannot be correlated with the others without further work, though it is only 3-400 yards away. That at Loc. Pre.4, though only 40-50 feet from Locs. 1 and 3, also cannot at present be correlated. The correlation between Locs. 6 and 7 is not reliable - the sequence of Loc. 7 cannot be any lower but may be much higher - without bedding or marker bands the thickness of conglomerate at Loc. 6 cannot be found. It could conceivably be that Locs. 7 and K are in similar positions in the sequence, above the rest. However, there is no proof for or against.

The whole sequence of Tertiaries dips approximately north at about 10° . The maximum thickness is at least about 100 feet, probably 2-300 feet or more, in this area.

Lithology and Structure

Conglomerates and Sandy Conglomerates. The conglomerates comprise more than half of the rocks of the sequence, locality K being the notable exception, with most of the sequence being sands. This may lie above the conglomerate-rich sequence, in the stratigraphic column, though. The conglomerates have pebbles (LEE 361) from $\frac{1}{2}$ " in diameter to boulders up to 1-2 feet in diameter. They are mainly quartzite, white, green, black and red. There is also PreCambrian micaceous white conglomerate (LEE 357), Owen Conglomerate (red) and what is now a very fine, unguent, clay (with complete absence of quartz grains). In the bed of the Spero River, quite

a few pebbles and cobbles are stained yellow-green, some of these contain pyrite, often as cubes (LEE 358). These pebbles may have come from Tertiary conglomerate, or perhaps were eroded directly from in situ by the Spero.

The matrix, which varies in amount and size range, is sand, sand and clay, or clay. The variation in matrices was not mapped.

The amount of sorting varies. Sometimes there may be a thickness of several feet with no evidence of sorting; in other places the sorting is good. There are often thin sand layers or lenses, also a lens of pure clay, 9 feet long, was seen (Loc.3).

Sands and Pebbly Sands. The sands have, in general, a small amount of clay present, also flakes of mica in some cases; also pebbles of different sizes are scattered through it. Lenses and layers of pebbles, in some cases only one pebble thick, occur in the sands. The sands are mostly greyish though the second bed from the bottom of Loc.1. is stained reddish brown. The sands in the columns of Locs. K, 7 and upstream from 7, are pink or pink and yellow due to oxides of iron coating the quartz. The sands in some cases are sorted, with regular variation in size range of layers, as at Loc.3. The flat bedded sand has layers of grit in it, which show that it is horizontally bedded.

The composition of the sands seems to be much the same as that of the conglomerates but of course the particles are much smaller.

Beds vary considerably in thickness. The third sand bed from the bottom at Loc.1 is 1 foot thick in one spot, 6 feet away it has become 2 feet thick with 3" of pebbles in the middle.

Clays. Beds of pure clay were found in some places. One

particular bed, that at Loc.3a, seems to be rather persistent, but the others are only lenses. The lens at Loc.3. is 9 feet long and 6" thick at the middle. The clay lens at Loc.4, in the bed of sand, is 2 feet thick, comprising all the bed except 1-2" of sand in the middle. 20 feet to either side (N and S), however, the bed has become only sand. The bed of conglomerate above shows the variation in thickness - at the south end of the cliff of Loc.4. it is 7 feet thick but at the north end, about 30-40 feet away, it is 4'6" thick.

The upper clay bed at Loc.4 is 4-5 feet thick. It is a pure clay with lignitic bands in the upper half. About the middle is a thin coal seam, about $\frac{1}{8}$ " thick, containing remains of plants, and pyritic nodules up to $\frac{1}{4}$ " in diameter (LEE 360). This coal seam seems to persist at Loc.4. but is missing at Loc.3a. However, at Loc.6a a dark brown, very lignitic clay band exists in the middle of the clay bed; pyritic nodules occur in the same band.

At Loc.3. an interesting structure was found. It appeared at first sight to be a normal angular disconformity. On closer examination some puzzling features were found (Fig.2). The conglomerate "A" (pebbles up to 6" in diameter) has a clay lens "B", 9 feet long which dips at about 5° (in the plane of the cliff). The sand bed "C" lies on this conglomerate, the bedding plane is almost horizontal (dips at $1\frac{1}{4}^{\circ}$ to N). The sand is horizontally bedded - this is shown by layers of coarser sand, or grit. On this is the conglomerate "D" (pebbles $\frac{1}{2}$ ", with lenses 1-2" in diameter), dipping at about 13° to the north (in the plane of the cliff). It could not be determined, due to fallen rock, which plane is continuous - whether "D" cuts into "A" or vice versa. Lying conformably on "D" is a sand, "E",

with numerous pebble bands and lenses near the base. Lying on these with horizontal boundary is conglomerate "F" (pebbles 3-5" in diameter). The sand bed "E" was traced northwards along the cliff, which changed its bearing. The sand bed became horizontal on the cliff face, appearing to become conformable, and about 4 feet thick at the north end of Loc.3. Here it is mainly sand, with a few layers of pebbles (up to 1" in diameter), about 3 pebbles thick at most. These layers of pebbles approach the bottom of the sand bed northwards, at about $2\frac{1}{2}^{\circ}$. This sand band is the lower sand/clay bed at Loc.4, where a clay lens almost completely fills the thickness of the bed. At each end of this clay lens, the clay appears at the top of the bed, increasing in thickness downwards.

The explanation of this unusual unconformity at Loc.3. may be that beds were being laid down, then a river eroded some forming a gully, which was filled up again; where the gully was steep the sediments had an initial dip but where the gully flattened out, the sediments were disconformable with no angular disconformity. When the gully was filled normal sedimentation went on on top.

The environment of sedimentation here must have been fluvial or perhaps lacustrine. Most of the pebbles are well-rounded, also there is much evidence of sorting in some beds though none in others. Semi-arid conditions perhaps prevailed, causing the pink and yellow colours at Locs. K and 7. These sequences may ~~or may not~~ be equivalent to parts of the others or they may be above. However, the rapid variation of the type of sediment, both in time, vertically, and in space, laterally, and of the thicknesses of the beds, shows the varying conditions under which the sediments were laid down.

To the south of the Spero the country rises by steps. The

heights of some of these levels, or terraces, were determined by aneroid barometer. The succession of levels measured was that on the west (P51). The two to the east were seen to be continuations of the ones measured. The height above mean sea level is not certain due to that at the base having two conflicting heights; these are both given though.

	<u>Height above Mean Sea Level</u>	<u>Height above Base</u>	
Base (Spero Heliport)	205 ft.	273 ft.	-
	35'		
Level A	240 ft.	310 ft.	35 ft.
	110'		
Level B	345-360 ft.	415-430 ft.	140-155 ft.
	30'		
Level C	390-395 ft.	460-465 ft.	185-190 ft.
	45'		
Level D	435-445 ft.	505-515 ft.	230-240 ft.
Level E		At least 50' higher.	

These levels were seen in many places and appear to be continuous, though whether the height changes or remains constant was not determined.

Summary

The Tertiary sequence at the Spero River is a series of rapidly alternating rock types ranging from sands, to pebble and boulder conglomerates. Several clay beds and lenses occur also. As well as a rapid variation of rock type in time, there is also a rapid lateral variation, in both type of sediment and thickness of beds. Lenses are frequent. Pebbles and cobbles in the conglomerate, also particles in the sands, are mainly quartzite, though some are of Owen and PreCambrian Conglomerate, and what is now fine unguent clay. The matrix of the conglomerate varies from sand to clay. Flakes of mica are common in the sediments, presumably from erosion of Pre Cambrian rocks.

Some of the clays and sands were brown due to plant matter which is abundant in some beds. One small seam of coal ($\frac{1}{8}$ " thick) was found, with

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pyrite nodules in the same band - evidence of conditions of stagnation.

The sediments were probably laid down in fluvial or perhaps lacustrine environment; this is shown by the rapidly varying conditions of sedimentation which must have prevailed. No fossils were found.

Two unconformities were seen, one of which seems to be only local, due to gullying; the other may be local or may not.

Only a minor part of the stratigraphic column has been correlated here, so there is only definite proof of 90 feet. However, the thickness of the Tertiary at Spero River is at least twice that, perhaps 2-300 feet or more.

Peter Rodda.

009 Tertiary Sequence, Spero R.

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Near Anomaly 17N/8.

Vertical Scale: 1 inch = 10 ft.

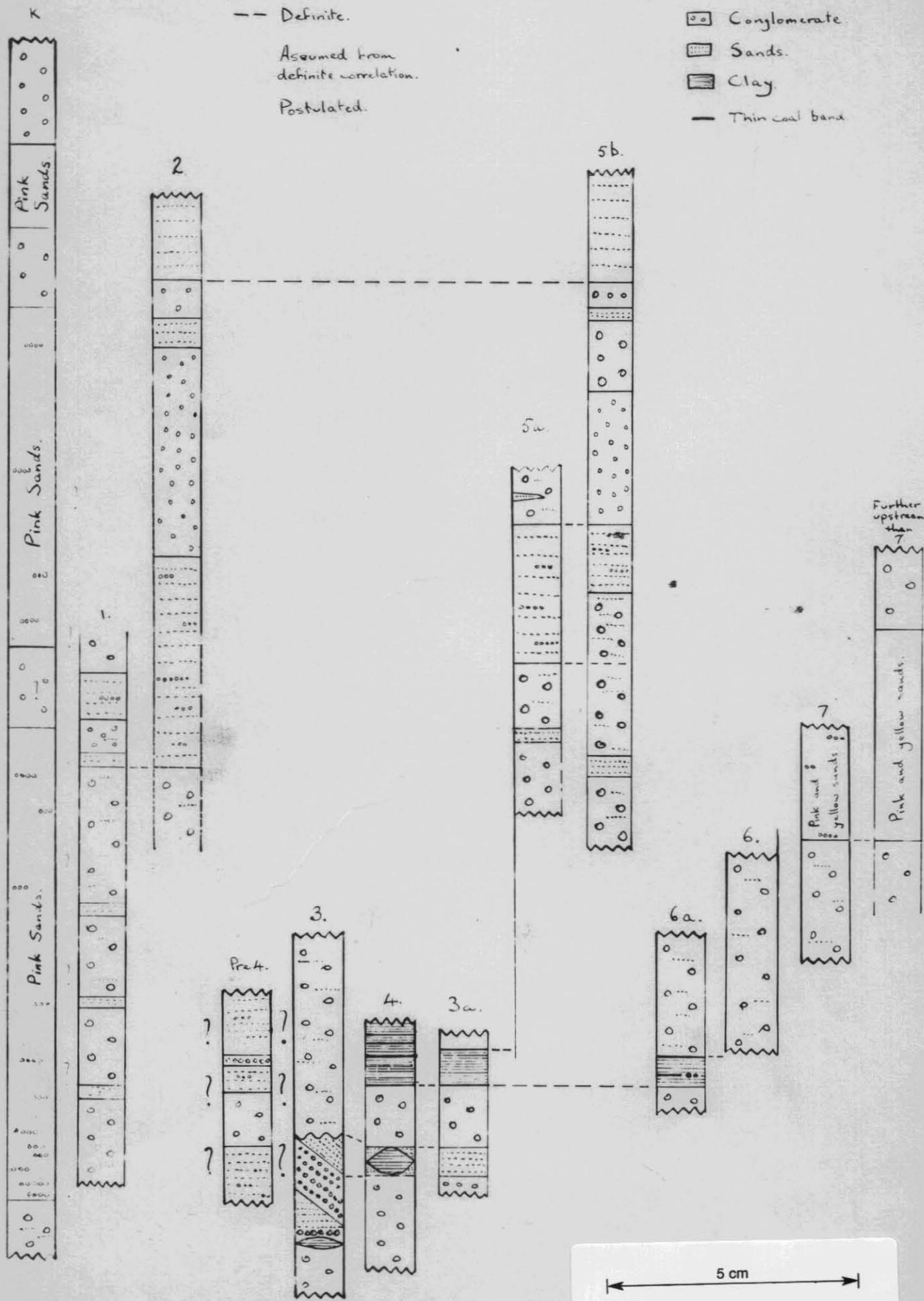
Horizontally not to scale.

CORRELATION LINES.

- Definite.
- - - Assumed from definite correlation.
- Postulated.

KEY.

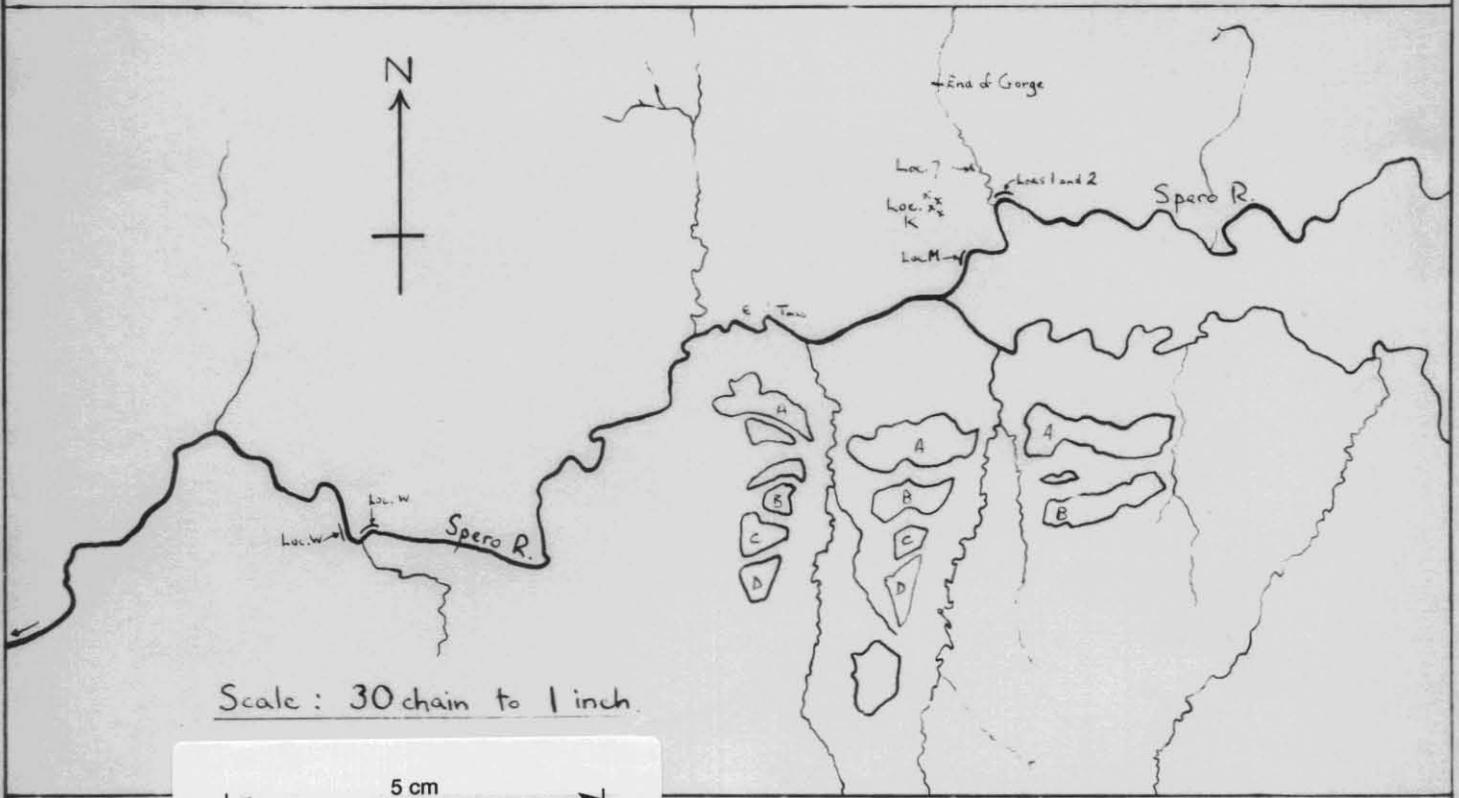
- Conglomerate
- Sands.
- Clay
- Thin coal band



008 Tertiary Sequence Localities
&
Tertiary Levels.
SPERO RIVER.

□ Level.

⌒ Cliff.



Scale: 30 chain to 1 inch.

5 cm

Sketch Map Showing Localities.

Not to Scale.

Approximate North.

