

RUTILE AND SAND IN THE CLAYTON RIVULET DISTRICT

(1 Geological Plan)

LOCATION AND ACCESS

Clayton Rivulet district is situated immediately south-east of the town of Ulverstone on the north-west coast of Tasmania. The north-western railway passes through the northern part of the area in a direction generally parallel with the coast line and at no great distance from it. The railway is succeeded further south by the main north-west coast road running east and west.

From the latter three branch roads proceed southerly, the motor road through Abbotsham to Upper Castra being the only one which persists for any distance.

The rutile bearing portions of Clayton Rivulet and its tributaries, in the area surveyed, are somewhat inaccessible, as they are some distance from the roads and are surrounded by heavy scrub and undergrowth.

PHYSIOGRAPHY

The upper reaches of Clayton Rivulet and the smaller creeks which serve it are turbulent mountain streams cutting deeply into their beds. Nearer its mouth Clayton Rivulet debouches onto a coastal plain about three quarters of a mile north of the main road and $2\frac{1}{4}$ miles east of Ulverstone.

From this point northerly the course of the main stream is very sinuous, and it is here building up sediments over its bed.

The valleys generally in the area are steep and heavily timbered. Where less timber occurs bracken fern and blackberry bushes abound, thus concealing outcrops and hindering mapping.

Viewing the district as a whole it represents a dissected plateau where later covering rocks have been denuded in the vicinity of the streams and have exposed a series of ancient sedimentary rocks below.

GEOLOGY

Pre-Cambrian - The oldest rocks in this area are represented by mica (sericite) and graphitic schists, together with quartzites which in many cases also show planes of schistosity. The structure and lithological character of these altered sediments are similar to other occurrences in this State which have in the past been ascribed to the Pre-Cambrian era, and are here classified accordingly.

The steep timbered slopes of the higher portion of the country where basalt has been denuded by the streams expose these rock types to view, and it is noticeable that where they occur very little cultivation has been undertaken.

The schist and quartzite belt occupies the greater part of the middle portion of the area examined. Bunches of quartz, which do not appear in the form of reefs, are common in the schists and quartzites. These bunches are found mostly as segregation veins and irregular patches.

Devonian - Serpentine of the Devonian period is seen intrusive into mica schist on the slope above the west bank of Clayton Rivulet half a mile above the main road on "Westwood" property, which is portion of 484 acres 2 roods granted from the Crown to W. Titley.

This altered igneous rock is said to be exposed at a number of places on the Clayton and Little Clayton Rivulets, but owing to lack of time and the thick undergrowth, it was not found possible to examine them.

Tertiary -

Pre-basaltic Gravels etc. - Resting on schists and quartzites in a few places in the district and found in small patches only, a series of fine quartz gravel, iron stained grits, shingle, and a hard quartzose conglomerate underlain by uncemented pebbles, boulders and drift, are to be seen underlying basalt. It would appear that the series represents a pre-basaltic deposit in the form of a river lead or lake deposit and in the case of the hard conglomerate that heat from the extruding basalt had the effect of cementing the materials together.

Basalt - Olivine basalt is well represented in the district and caps almost the whole tableland where erosion has not broken through to the underlying schists and quartzites. In every case the basalt is evidenced by a rich red soil which is inevitably cleared of its natural growth, and cultivated. Basalt extends over the northern, eastern and western portions of the area, and at a period prior to the dissection of the plateau covered the whole of it.

Recent - Recent sand deposits cover an area of plain country fringing the sea-shore and extending inland for about half a mile to the foot of the plateau slopes. Clayton Rivulet and Button Creek are in the process of building up alluvium and gravels over their beds in the lower portions of their courses.

ECONOMIC GEOLOGY

Where Clayton Rivulet, Little Clayton Rivulet and Orchard Creek, together with smaller unnamed creeks running into them, are flowing over schists and quartzites, rutile may be washed from the beds of those streams. Rutile is also contained in the wash, which consists mainly of waterworn quartz, quartzite, and schist pebbles with interstitial drift, to be found underlying alluvium on and adjacent to the banks of these streams. Although no rutile was actually observed in the schists and quartzites themselves, it was found in creek wash attached to quartz similar to that occurring irregularly in those rocks, and it is assumed that the rutile has been shed from the Pre-Cambrian altered sedimentaries.

East of Clayton Rivulet and on a 15 acre 1 rood lot purchased by H.O.T. Friend, near the north-east corner, and extending into 22½ acres, J.O'Keefe purchaser, and 25 acres, G. Wright purchaser, a hard quartzose conglomerate may be seen exposed at surface. This rock consists of waterworn pebbles and boulders of quartz, quartzite and schist, with here and there a little rutile, the whole being cemented with a siliceous material. A tunnel has been driven in the hill-side on the conglomerate near the north east corner of the land taken up by H.O.T. Friend. An open trench which represents the tunnel entrance has been cut on a bearing of 57° for about 60 feet and the tunnel itself continues on the same bearing for approximately 30 feet further. At the tunnel mouth a small cut has been driven for a few feet in a north-westerly direction at right angles to the tunnel.

In the tunnel the hard conglomerate changes to an uncemented wash, although the materials in the make up are similar except for the interstitial matter which is here mainly clay and sand. The gravels and drift dip easterly from the trench entrance at a slight angle until in the tunnel itself they may be seen lying level on mica schist. The softer wash in the tunnel is about 2 feet in thickness with hard conglomerate overlying, the whole showing a thickness of approximately 10 feet at a tunnel mouth.

One chain north of the tunnel a shallow shaft has been sunk and a small drive put in for a few feet in a north easterly direction exposing similar material.

Further up the hill to the south-east basalt comes in and seems to overlie the conglomerate. It is said that half a ton of rutile was mined from the workings mentioned above and shipped to England, but that the price obtained was unsatisfactory.

Conglomerate of a similar nature appears on a block of 484½ acres, W. Titley, Purchaser, near the northern boundary of 140 acres, J. Smith, Purchaser.

Rutile is a noticeable constituent of this rock and can also be picked up from the surface in the vicinity.

No developmental work has been carried out on this latter deposit.

SAMPLING

Seven prospects of rutile were washed from the several streams in the area. These were taken indiscriminately, and in no case was the bottom wash penetrated, so that the results cannot be taken as representing the deposits as a whole. Two prospects were also washed from the gravels and drift below the conglomerate in the tunnel mentioned above and one of these bottomed on mica schist.

The rutile contents of the ground were calculated from the weights and assay results (reported as titanium dioxide) of the dish concentrates, the rutile being considered to contain 94% TiO₂ which was the result obtained by analysis and of a sample of

rutile from the district.

A good deal of chromite (FeO , Cr_2O_3) was encountered in conjunction with the rutile and as the specific gravity of these are much the same, difficulty was experienced in separation by hydraulic methods.

The following tabulated list represents values in lbs. per cubic yard of rutile as calculated from weights and assays supervised by the Acting Chief Government Chemist and Assayer:-

Prospect No.	Locality	Section	lbs. per cub. yd. of rutile
1	Small alluvial flat at junction of Orchard Creek and small creek running northerly into it in 104 ac. 1 r. B.T. McPherson, Purchaser.	2 ft. of quartz wash and silt.	2.36
2	On 48½ ac. C. Pearson, Purchaser, near small stream running east into Orchard Creek.	2 ft. of quartz gravel and wash.	0.64
3	In Orchard Creek about 20 chains north of southern boundary of 205 ac. S.S. Travers, Purchaser.	Gravel from bed of creek.	0.75
4	Small creek running northeasterly into Little Clayton Rivulet and near the junction of these in 636 acre. W.L. Jordan, Purchaser.	Quartz pebbles and wash from bed of creek.	1.16
5	Orchard Creek at road crossing on western boundary of 104 ac. 1 rd. B.T. McPherson, Purchaser.	Wash and gravel from bed of creek.	2.04
6.	Clayton Rivulet about 4 chains above its junction with Little Clayton Rivulet.	2 ft. in creek bank. Large quartz wash and soil.	.32
7.	Small Creek running westerly into Clayton Rivulet about ¼ mile below the junction of Little Clayton and Clayton Rivulets	Quartz pebbles and silt from creek bed.	.29
8	Short drive at mouth of tunnel on 15 ac. 1 rd. H.O.T. Friend, Purchaser.	2 ft. 6 ins. wash consisting of quartz, quartzite and schist boulders and pebbles with sand and clay.	1.12
9	Tunnel on 15 ac. 1 rd. H.O.T. Friend, Purchaser.	2 ft. in similar material to No. 8. Bottomed on mica schist.	1.07

The average of the nine prospects is represented by 1.08 lbs. per cubic yard of material.

RUTILE

The composition of rutile is titanium dioxide, TiO_2 , Oxygen 40.0, titanium 60.0 = 100. A little iron is usually present, sometimes up to 10 per cent.

Physical properties - Hardness, 6 to 6.5; specific gravity, 4.2 to 4.3; melting point, high; colour, red brown, red and black, deep-red when transparent; streak, white, yellow to pale-brown; lustre, adamantine to almost metallic; cleavage, distinct prismatic and pyramidal; transparency, opaque to transparent; tenacity, brittle; insoluble in acids and infusible before the blow pipe.

Uses - Although rutile has a great many uses the total consumption of it is so small as to prevent it being produced in a large way, and consequently it has always been costly to produce, compared with other minerals.

Rutile is used in the manufacture of electrodes for arc lights, as titanium dioxide in the form of rutile gives the best spectre in arc-light electrodes; in small quantities for ferrotitanium, for colouring ceramic glazes and enamels and for chemicals, such as potassium-titanium oxalate, used in tanning and for dyeing leather and cloth; in the manufacture of enamels for artificial teeth; and also, during the war, as a smoke screen in the form of titanium tetrachloride. This use depends upon the fact that titanium tetrachloride is a liquid which fumes rapidly when in contact with water, forming dense white fumes of titanium hydroxide and hydrochloric acid.

A little rutile has been used in making glass. It has also been used in many alloys, such as manganese-titanium, cupro-titanium metal, and others. Rutile has not been used in the production of titanium dioxide pigments owing to the fact that as no suitable process has been devised for converting it into a desirable state for that purpose.

Price - No market is known for rutile in Australia and prices are not quoted here.

In the United States of America during the month of May last 93 per cent. rutile concentrate was quoted at £46.13.4 per ton for 30 ton lots.

SAND DEPOSIT

At a point some 25 chains east of and about 300 feet above Button Creek on a lot of 88 acres 3 rods 4 perches purchased from the Crown by A. Wayne, and now said to be owned by a Mr. Mohr, a sand deposit is exposed.

This occurs on the western fall and near the summit of a steep hill.

Access is here gained by means of road, which leaves the main coastal road at a point about $1\frac{1}{2}$ miles east of Ulverstone. At this point, and for 40 chains southerly the road is suitable for motor traffic, but from there on it develops into a cart track.

The rocks on which the sand rests are Pre-Cambrian quartzites, while further east on the hill summit basalt is seen to exist. The sands in the vicinity consist of quartz grains and have been formed by the disintegration of quartzites in place.

A few small shallow pits have been excavated and the sand exposed at the greatest depth to 4 feet.

Overburden to a depth of 18 inches consisting of sandy loam, with a network of roots running through it, caps the deposit.

Immediately below the soil, a white uneven grained sand is seen with a maximum thickness of 3 feet where exposed by the pits. Throughout the whole small pieces of only partly disintegrated quartzite is found and in places are small bunches of quartz. Below the white sand, a hard grey coloured sand rests on and gradually merges into the country rock.

Apparently no means have been used by those concerned to test the extent of the deposit, but a few holes put down by the writer point to the fact that the area is of no great extent in the immediate vicinity of the pits.

Two samples of the white sand were taken for analysis and the following results obtained:

Constituents	Unwashed sand %	Washed sand %
SiO ₂	97.20	97.68
Fe ₂ O ₃ and Al ₂ O ₃ (mainly Fe ₂ O ₃)	3.40	2.40
Ignition loss	0.22	0.10

Classified by means of wire woven sieves, the two white sand samples gave the undermentioned results:

Seizing test	Unwashed sand %	Washed sand %
On 10 mesh	3.4	0.6
" 20 "	2.7	3.4
" 30 "	9.6	14.0
" 40 "	10.7	18.6
" 60 "	28.2	37.2
" 80 "	19.9	19.6
" 100 "	9.2	4.8
" 120 "	4.4	1.2
Through 120 "	11.7	0.6

CONCLUSION

Although the rutile as shown by the sampling undertaken does not appear sufficiently concentrated for mining in an economical manner, it would be necessary to undertake a systematic campaign of prospecting either

in the form of boring or shaft sinking to prove the extent and general value of the whole. It would also be necessary to devise some sound scheme of separating the rutile and chromite to allow a marketable product of rutile concentrates.

The first consideration, however, would be the finding of a market for rutile.

The white sand appears to be suitable for use in the building trade, but here again the extent and depth of the deposit remains to be proved.

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