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NEW ZEALAND.

REPORT ON THE PUPONGA AND PAKAWAU COALFIELDS, COLLINGWOOD COUNTY.

BY ALEXANDER McKAY, ESQ., F.G.S., GOVERNMENT GEOLOGIST.

Presented to both Houses of the General Assembly by Command of His Excellency.

Wellington, 30th June, 1900.

SIR,—

I have the honour to acknowledge the receipt of instructions to visit and report on the coal-seams at Puponga, and I accordingly report as follows :—

NARRATIVE.

In compliance with the above instructions I left Wellington on the 12th June, and Nelson for Collingwood on the 15th, and the following day Collingwood for Puponga, at which place I arrived and pitched camp on the 16th of that month. I remained at Puponga till the 21st, during which period I examined all the known outcrops of coal in that part of the district, and on that date shifted camp to the valley of Taipata Creek, midway between Puponga and Pakawau Inlet. On the 22nd I removed to Pakawau, and the same day examined the Pakawau Coal-mine and the formations exposed on the south side of the Pakawau Gorge, and the western slopes of the mountains farther to the south. On the following day, 23rd June, I returned to Collingwood, and the same day left for and arrived at Nelson about midnight. On the 25th I visited the chrome deposits being worked on the south-west side of Croixelles Harbour by Messrs. Tatton and Jackson, and returned from Nelson to Wellington on the 28th June. The chrome deposits examined on the 25th June will be reported on separately.

GEOLOGY.

The geology of the district between West Wanganui Inlet and the lower Aorere Valley and Golden Bay to Puponga Point is concisely described in a report on the geology of Collingwood County by James Park, F.G.S.,* the map illustrating which shows the boundaries of the different groups of strata, approximately correct, over that part of the district dealt with in this report.

* Geological Reports, 1888–89, pp. 186–243.

Mr. Park describes the sequence of the Cretaceo-tertiary rocks in descending order as being,—

"*a*. Grey Marl series.
1. Blue and yellow clays.
2. Marly greensands, passing into shelly limestone.

"*b*. Ototara series.
1. Compact shelly limestone.
2. Quartz sands, grits, and ferruginous cements, passing into hæmatite.

"*c*. Greensand series.
1. Ferruginous sandstones, with seams of brown coal.
2. Conglomerates, with seams of bituminous coal."

Of the lower beds (*c*, 2) Mr. Park says: "Between Puponga Inlet and Cape Farewell the conglomerates are very largely developed; but the seams of coal they contain always appear to be too small to work. The long lines of fine escarpment sections at this place afford the most valuable and reliable evidence as to the relation of the bituminous-coal measures to the brown-coal measures. The sequence usually reads,—

"1. Marly greensands, passing [upwards] into limestone.
"2. Grey sandstone and grits.
"3. Coarse ferruginous sandstones.
"4. Coarse conglomerates and pebbly sandstones.
"5. Ferruginous sandstones and shales with thin seams of bituminous coal.
"6. Coarse, heavy conglomerates."

"In the West Wanganui district the brown coals occur about the base of the coarse ferruginous sandstones [beds 3 of the above sequence]; but they are absent in this line of section, their place being apparently occupied by the conglomerates (No. 4), which rapidly thin out as they are followed to the westward." (Geological Reports, 1888–89, pp. 237–238.)

At page 204 of the same we read, "About a mile from its mouth the stream which drains into Puponga Inlet divides into two branches, one going towards Cape Farewell, and the other, which is locally known as Waimanga, trending south-west. Near the source of the latter, the length of which is less than a mile, there is an outcrop of bituminous coal. The seam is much obscured by surface detritus, but appears to be between 2 ft. and 3 ft. in thickness, with shale partings. Higher in the sequence several other smaller seams of coal, ranging from 2 in. to 6 in. in thickness, are exposed in the bed of the main stream."

These are the facts ascertained up till March, 1889, since which date, from about 1895 till the present time, prospecting has been carried on, principally in the valley of Waimanga Creek, showing that Mr. Park underestimated the possibilities of the field, and that there exists at least one seam of workable thickness and of good quality, the outcrop of which extends along the west side of the Waimanga Valley from the saddle at the source of the left branch to some 10 chains below the junction of the eastern branch of the creek.

This is higher in the sequence than any of the seams examined by Mr. Park, and at a distance of 70 ft. to 100 ft. this is overlain by a small seam, too thin to work, which also has been discovered since Mr. Park visited the district.

In all, over a distance of 20 chains, on a line N.N.W. to S.S.E., there are six or seven different seams, of which only two are capable of being worked, and of these only one with a reasonable hope of profit.

All but one of these seams (the highest) lie within, or partly lie within, the lease granted to Mr. Joseph Taylor and Mr. J. Walker in July, 1895. The thick seam (8 ft.) towards the south-west lies to the north outside Taylor's lease, and towards the east is possibly inside the lease; but the valuable part of the seam lies to the north, within the lease applied for by Mrs. A. Taylor.

Coal-seams.

Mr. Joseph Taylor showed me outcrops or exposures of coal which he considered indicated no less than fifteen different seams, but I could not agree with him in every case that the outcrops were distinct seams. Six or seven seams at most were all that could be determined by me as being present within the lease now held by him. Of these, the lowest and furthest to the east is seen in the upper right-hand branch of the Waimanga, and by a series of dislocations and slips this is exposed in a manner that has led to the assumption that several seams are present. The coal seen in the tunnel driven eastward is known as No. 1 seam, and an opencast working has been made near the entrance to the tunnel, which exposes in nearly vertical superposition, first, close to the surface about 3 ft. of coal much crushed; second, underlying fully 2 ft. of clay is 2 ft. of coal. Under the second seam is 26 in. of clay, and beneath this is No. 3 seam, 20 in. thick. No. 3 seam is underlain by 3 ft. of crushed shale, and this by coal the thickness of which could not be seen, but said by Mr. Taylor to be 4 ft.

From the face of this excavation the drive has been made for 300 ft. in an easterly direction. The first third of this twice exposes dislocated masses of coal, which in the manner of their appearance and disappearance indicate the presence of slipped ground. The inner half of this drive shows a seam of coal lying at a low angle, dipping westward, which may be *in situ*. The thickness of coal is between 2 ft. and 3 ft., but crushed and tender through movement of the seam itself, or through being in contact with overlying moving strata. Here I saw no evidence supporting the theory that more than one seam—and this less than 3 ft. thick—was present. The prospecting-works have been carried on in slipped ground, and the real value of this seam cannot be indicated.

A little higher up, and on the opposite or west side of this right-hand branch of the Waimanga Creek, is a natural exposure of coal, of which about 2 ft.—perhaps not the total thickness—is seen. This is the outcrop described by Mr. Park. Less than a chain downstream from the outcrop a tunnel has been put in, and the seam in this is 2 ft. thick, striking W. 30° S., and dipping N.N.W. at an angle of 18°. Near the natural outcrop coal also shows in the bed of the creek, but this is evidently slipped from the hill-slope on the east side of the creek valley. This seam on the west bank of the creek must be regarded as the same as that on the east side, and the conclusion is that so far only one seam of coal, from 2 ft. to 3 ft. thick, has been discovered in the valley of this the right-hand branch of Waimanga Creek.

About 5 chains below the junction of the two main branches, and abreast of the main working (No. 4), two small seams are exposed in the bed of the main creek, and 2 to 3 chains higher up the stream the same seams are again exposed. These are disturbed, since they do not conform in strike and dip with the main seam stretching along the left bank of the creek. They are too thin to work under any circumstances, and need not have been noticed here but for the fact that they are the thin seams mentioned by Mr. Park, and are considered of importance by Mr. Taylor.

Three chains above the junction of the two main branches of the Waimanga a short drive has been made on the west bank of the left branch, which exposes three small seams, the thickest of which is at least a foot, and might be a little more. This group of small seams is held within a vertical thickness of 8 ft. to 10 ft., and is thought, with the bands of fire-clay between, to be workable—at least, Mr. Taylor is sanguine on this point. They appear to me to be the small seams already described as twice appearing in the bed of the main creek, which now in their normal position, and underlying the

main seam, strike and dip conformably or nearly so therewith. The tunnel driven on these small seams is called No. 3.

Overlying these small seams, at a distance of 40 ft., comes the principal or main seam, on what is known as No. 4 working. About 7 chains below the junction of the two source-branches of the Waimanga this seam is exposed on the northern side of the valley, about 30 ft. above the bed of the stream. The coal strikes W. 25° S., and dips to the northward at an angle of 20°. Its exposure is along the eastern slope of the dividing-ridge between Golden Bay and the West Coast, between Cape Farewell and West Wanganui Inlet. Towards the E.N.E. the first exposure is seen in the locality already indicated, at an elevation of 50 ft. above the sea. Forty chains distant along the strike to the W.S.W. the coal is at an elevation of 250 ft. above the sea, near the saddle from which the drainage is westward towards the upper part of West Wanganui Inlet. The outcrop here shows coal of good quality, of a thickness of at least 7 ft. 6 in.

There is about 40 chains between the two extreme outcrops of this seam, and at both places the coal is of fully workable thickness. Towards the E.N.E., in the direction of the upper part of Puponga Inlet, it is reasonable to suppose the coal present as a workable seam for some distance beyond the east boundary of Mr. Joseph Taylor's lease, but the ground being low, the coal, overlain by alluvial or obscured in the low downs, is not seen at the surface, and will prove almost wholly below drainage-level.

From the saddle at the western end of Mr. Taylor's lease the coal strikes along the range, deeply cut into by creeks draining westward, and should be traceable on the sides of the valleys in that direction for some distance.

One mile to a mile and a half in this direction a saddle on a spur descending to the north-west lies in the strike line of the coal, and it is probable that the thicker seam now under consideration may extend as a workable coal to where the line crosses the said spur at a height of 400 ft. to 500 ft. above the sea. This is, however, a matter of speculation, and must be determined by further prospecting. Six or seven chains down the Waimanga Creek from the No. 4 working on Taylor's lease a small stream joins from the north. In the valley of this creek, in a position overlying the seam of No. 4 tunnel, a smaller seam, the highest known of the series of coal-seams, is exposed in the bed of the creek. This does not exceed 10 in. in thickness, and consequently is of no consequence as a workable seam of coal. This, like all the other seams in the vicinity, dips to the northward at an angle of 17°.

South-east of Taylor's lease, within 250 yards of the shore of Golden Bay, a small seam, dipping to the north-east, is exposed. A drive has been made on this, and the seam to some extent has been worked, but is now abandoned, the thickness of the coal being too small, evidently, to pay.

Between this small seam on the shore of Golden Bay and the several seams on the lease held by Mr. Taylor the coal-measures form an anticline, and in the intervening space is probably present the coarse conglomerates that form the lower part of the coal-bearing series. These, if exposed along the crest of the anticline, are not of such a coarse description as are the same beds in the valley of Taupata Creek, some two miles to the south-west, and it may be that the lower and coarser conglomerates are not actually exposed.

The section displayed from the shore of Golden Bay, one mile south of Puponga Inlet, north-west across Taylor's lease to the west slope of the main ridge is represented by the accompanying sketch.

It is uncertain whether the small seam to the south-east represents the highest in the series or one of the lesser seams below the 8 ft. coal on the north side of the anticline.

Of the special matters to which my attention was directed, marked (1)–(4) in my instructions, what relates to the size and position of the seams has been detailed in the foregoing part of this report. Under heading of (2) I am asked to estimate the amount of coal that can be immediately worked. The developments on the lower seam are not such as to enable any estimate being made, and the disturbed state of the outcrops precludes the possibility of this except on the assumption that it strikes and dips conformably with the overlying 8 ft. seam. The lesser intermediate seams, and the overlying 10 in. seam, the highest of the series, not taken into consideration, there remains a total of 10 ft. of coal—about 8 ft. in the big seam and 2 ft. in the lower seam.

Towards the east the crop of the 8 ft. seam is at the water-level, and where it outcrops on the saddle at the west end of Taylor's lease the difference in elevation is 180 ft., the dip of the coal being 20°. Northward, the coal to the rise of the level-free datum would be 450 ft. at least, and, making some allowance for irregularity of the line of outcrop over the length of Taylor's lease, in this seam there should be level-free coal to the amount approximately of 120,000 tons. If the lower seams be considered workable a further 30,000 tons has to be added. Coal level-free to twice the above amount may be expected to occur within an equal distance along the western continuation of the seams beyond Taylor's lease; but in this case, the outcrops lying in broken country and on the west side of the range, without roads it could not be considered available for shipment in Golden Bay, and therefore cannot be considered as coal that can be "immediately available."

Eastward of Taylor's lease all parts of the main coal-seam must be considered as below the water-level, and therefore not immediately available in the sense of being level-free.

Within and north of Taylor's lease the estimated amount of coal level-free is therefore 150,000 tons, but this amount might be more than doubled by tapping the level-free coal that lies to the westward beyond the western boundary of Taylor's lease.

The coal to be won from below sea-level or the datum of 20 ft. above that to a large extent depends on the depth of the shaft to where this cuts the coal. The dip of 20° is not likely to lessen much, so that a shaft 200 ft. deep should reach the coal 9 chains to the dip of the datum line level-free.

It were needless to show how much coal would thus be made available, because the amount is dependent on the maintenance of the thickness of the seam, both to the dip and along the line of strike.

Towards the dip nothing is known as to what the thickness of the seam may be, but along the strike it is known to maintain the same thickness for 50 chains, and I have, therefore, felt warranted in calculating the amount of coal level-free. The constancy in the thickness of the seam so far as traced along the strike leads to the hope that it will maintain its thickness for some considerable distance to the dip, and the amount of accessible coal from this seam alone, for a distance of 100 chains along its strike, and as far to the dip as would be reached by a 200 ft. shaft at or near sea-level, may be approximately set down at 1,000,000 tons, calculating on the basis of 1,000 tons per foot of coal to the acre; but this total estimate is necessarily subject to the limitations above stated.

(3.) There is a likelihood of coal being won from the lower seam, which has already been described, but the inducement to work this as the only seam in the district would not be sufficient, and the broken hilly country west of Taylor's lease may contain other seams, but under the circumstances—the season of the year and the roughness of the country—this could not be explored. This part, and the eastern slope of the range further south to the Pakawau Gorge, should be explored, more especially for the possibility of finding the 8 ft. seam in the south-eastern side of the anticline. The anticlinal ridge west of the Pakawau Gorge should be explored, and the western slopes of the main range south of the Pakawau Gorge give indications of at least one thick workable seam of coal, but whether this is identical with that worked in the Pakawau Gorge is as yet uncertain.

The part of the district immediately north and south of the Pakawau Gorge should be explored, as the discovery of workable coal in this part would probably decide the question of where a wharf should be built to facilitate the shipment of coal to a market. At Puponga the length of wharf to the same depth of water would be much greater than at a point one mile south of the entrance to Pakawau Inlet.

(4.) That a coalfield of considerable extent exists has long been known, but the smallness of the seams proved and worked in past years has had a discouraging effect on the development of the field. Now that it is proved that at least one thick seam exists at Puponga Inlet in the north, and an equally thick formation of coal, but of inferior quality, is known in the southern part, the prospects of the field are decidedly encouraging.

The coals of the southern part are bituminous and semi-bituminous. Those in the northern part are not bituminous, but yet of the highest quality of non-bituminous coals, and such as would form a very valuable and popular coal for domestic purposes, for stationary engines, and also for interprovincial and coastal steamers, but would not be equal to Westport coal for ocean-going vessels.

As from south to north these coals gradually lose their bituminous character, it is a question how far they occupy the same horizon as the brown coals of West Wanganui Inlet. Mr. Park considers that the West Wanganui coal belongs to a higher horizon, and that the coals of Puponga belong to the lower or bituminous series. In the latter case, however, he is mistaken, as the results of analyses of these coals appended will show, and the speculation is as to whether a like alteration of the condition and quality of the coal takes place as it is followed east and west from the shores of Golden Bay to West Wanganui Inlet.

If the supposition that the coal-measures are one and the same throughout prove to be correct, there is hope of an extensive field of workable coal of quality intermediate between the bituminous coal of Pakawau and the pitch coals of West Wanganui Inlet, and warrant also for the assumption that the intermediate coals will occur in seams of workable thickness, the 8 ft. seam at Puponga being cited as evidence in favour of this assumption.

ALEX. MCKAY,
Government Geologist.

The Under-Secretary for Mines.

Ten samples of coal taken from Mr. Taylor's lease, or from seams immediately outside that on its northern side, have been analysed in the Colonial Laboratory, and the following is Mr. Skey's report thereon:—

Result of Analyses of Specimens No. 8847. Reported on 5th July, 1900.

Ten Coals from Puponga, Collingwood County.—These are generally hard, coherent, and lustrous, and come under the class known as glance coal. They should bear transit well. I have only tested their caking properties at a red heat, so it is possible all might be got to frit at a high temperature.

The accompanying table shows that only Nos. 5 and 6* have such a high proportion of ash as to seriously interfere with their use. Throwing out these two, the other coals are all of excellent quality for household purposes, and several may come in very well for steam-coal on railways.

* No. 5 represents the lower of a group of three small seams that occur between the lowest seam (No. 1) and the 8 ft. seam (No. 4). No. 6 is from a small seam underlying and separated from the middle and upper parts of the 8 ft. seam by a clay parting.—A. McKAY.

The samples generally represent coal of a valuable kind.

Particulars of Locality.	Centesimal Composition.				
	Fixed Carbon.	Hydro-carbon, &c., Volatile Matter.	Water.	Ash.	Evaporative Power.
1. Outcrop of seam No. 1	52·13	36·66	6·12	5·09	6·77
2. Inner face of drive, seam No. 1	51·85	38·18	4·63	5·34	6·73
3. No. 2 working, No. 1 seam (first known outcrop) ..	49·44	34·89	5·07	10·60	6·42
4. No. 3 working, middle seam	51·57	34·84	4·52	9·07	6·74
5. No. 3 working, lower seam	41·90	28·26	5·63	24·21	5·44
6. No. 4 working, lower band	44·53	33·97	5·41	16·09	5·80
7. No. 4 working, middle band	57·08	30·15	6·61	6·16	6·41
8. No. 4 working, upper band	57·53	33·51	6·80	2·16	7·47
9. Mount Nebo outcrop, same seam as No. 4 working	58·19	34·98	5·22	1·81	7·56
10. Uppermost seam, next overlying No. 4	54·11	36·64	5·02	4·23	7·00
Average composition of the ten samples analysed	51·83	34·20	5·50	*7·47	6·63

* Excluding 5 and 6, 4·31.

(1.) From the outcrop of No. 1 seam: Gives a loose coke; ash red. (2.) From the inner face of the drive on No. 1 seam: Gives a loose coke; ash red. (3.) From the first-discovered outcrop, seam No. 1: Frits decidedly; ash reddish. (4.) From the group of small seams, No. 3 working, middle band: Frits freely; ash reddish. (5.) From No. 3 working, lower band: Coke has not coherence; ash white, mottled red. (6.) No. 4 seam, lower band: Coke frits, but can be broken up by the fingers; ash buff-coloured. (7.) No. 4 seam, middle band: Coke frits fairly well; ash red. (8.) No. 4 seam, upper band: Coke frits to a hard mass; ash reddish. (9.) Mount Nebo outcrop: Coke frits together feebly; ash pale-yellow. (10.) Wairaki Creek, the highest seam of the group: Coke frits feebly; ash brown.

W. Skey, Government Analyst.

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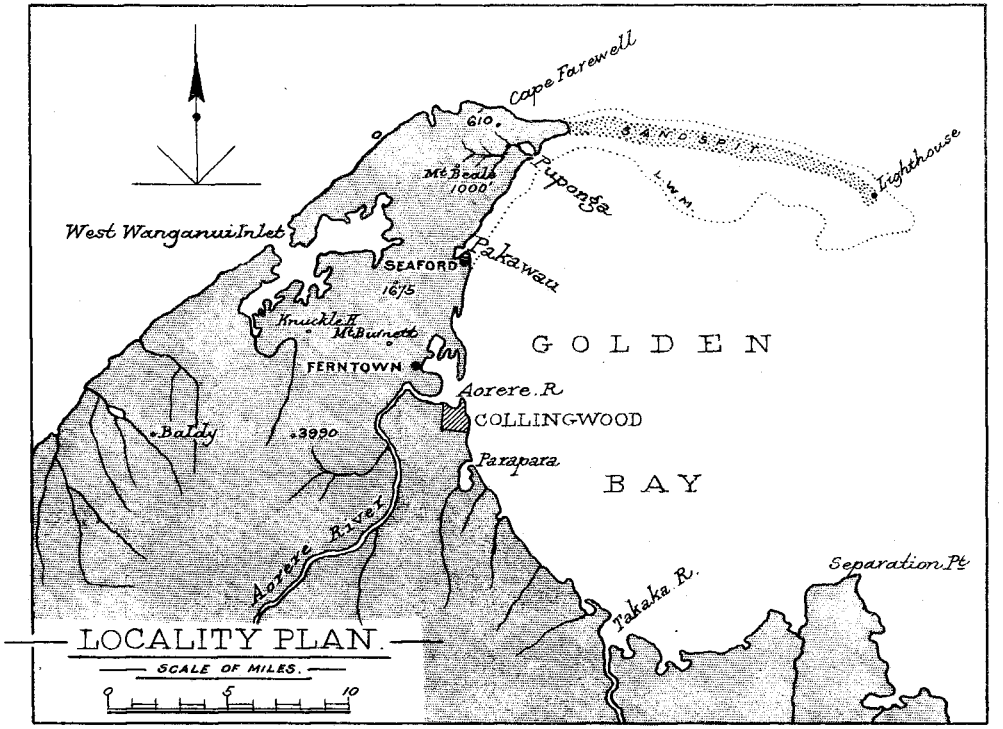


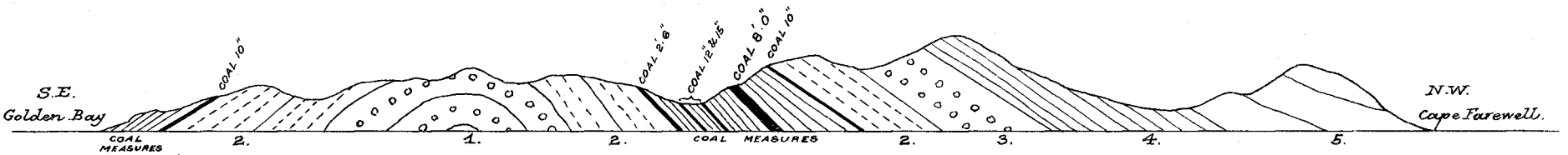
GEOLOGICAL SECTION.

by Alexander McKay. F.G.S.
Government Geologist.

To illustrate Report on the

PUPONGA AND PAKAWAU COALFIELDS.

Collingwood County.



Reference.

1. Coarse grits with bands of conglomerate.
2. Shales & limonitic sandstones, gritty sandstones &c.
3. Conglomerates. (after J. Park).
4 & 5. Fossiliferous rocks of Puponga & Cape Farewell.

C.H. PIERARD. lith.