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By His Honor's command,

J. C. RICHMOND, Provincial Secretary.

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HIS Honor the Superintendent directs the publication of the following Report for general information.

J. C. RICHMOND,
Provincial Secretary.

REPORT ON THE BULLER AND
GREY COAL FIELDS.

To his Honor the SUPERINTENDENT ;
NELSON, May 4, 1863.

SIR—I beg to forward to you the second part of my Report, viz., that referring to the Coal Fields at the Buller and the Grey.

When I arrived at the Buller River, on the 6th February, I found that Mr. Burnett had left for Nelson, and I feared that his absence might considerably retard my examination of the coal district. I am glad to say, however, that this was not the case, as by the next vessel, and before I was ready to proceed with this work, I received from him plans and descriptions of his explorations, so minute and particular, that I was able to follow them without any trouble, and to make a perfectly satisfactory examination of the coal field.

This has been so well described and illustrated by Mr. Burnett in his various reports, that I can add nothing to increase our present information on the subject:

I may, however, describe generally the features of the coal field, and the country between it and the Buller, and also the means proposed for conveying the coals to port.

The surface of the coal field consists of an undulating table land or plateau which lies at a general elevation of 2,000 feet. The point at which the coal has been found most conspicuous and abundant, is at the further or inland edge of this plateau, where it is exposed in thick seams in the banks of several streams, at a level some 200 feet lower than the middle or highest portion of the plateau, which we must cross to arrive at it.

This table-land is open, destitute of bush, except in a few gullies, and covered with rough, bare, flat rocks, for a large part of its area.

From the sea-ward edge of this table-land, the ground slopes down irregularly for a distance of nearly two miles, forming in fact the side of the Mount Rochfort range; this is all covered with bush and rough scrub and is very rugged, and much broken up into gullies and ridges, and in some places is very steep.

The foot of the range is about two miles from the sea beach, and eight miles from the mouth of the Buller river, at that point where it is considered to be most accessible by a road. This is situated between the rivers Wariatea, and Waimangaroa, which flow from this range and the table-land beyond.

For these eight miles, the land is partly open, and partly in bush.

To reach the coal at the further side of the plateau, it would therefore require eight miles of road, level, or nearly so, from the Buller to the foot of the range; about two miles of incline up the face of the range at a gradient of about one in five or one in six; one mile of incline, about one in ten; three-quarters of a mile rising about one in forty-four; and three quarters of a mile falling towards the coal at the rate of one in thirteen.

The transit of the coal to the port would be effected thus:—The loaded wagons would be drawn up this last mentioned part of the line from the mine, by a stationary engine, to the highest point; from whence they would descend by their own gravity to the head of the self-acting incline, or be lowered down by the stationary engine, the empty wagons being drawn back by the same power.

Down the two self-acting inclines the loaded wagons would descend, drawing up the return empty wagons; and from the foot of the inclines to the port, the line could be worked by horses or locomotive engines.

Now it had been assumed and with perfect reason, that the coal seams visible at the further edge of the plateau, extended under it, and would be found cropping out on the seaward face of the range. This has since been proved by actual examination, Mr. Burnett having discovered seams of coal in the gorge of the Waimangaroa, (not in a very accessible situation,) and also in other places along the range, but not in decided seams.

There can, however, be very little doubt, if any, that seams of coal may be found, not only in any part of the plateau, but all along the front of the range, by boring; and that an accessible point could be fixed upon at a moderate elevation (Mr. Burnett assumes 600 feet) where the coal could be worked, without incurring the expense of carrying the line to the top of the range and across the table-land.

This would reduce the length of line required to eight miles of level line and about one mile of incline, (self-acting) to the coal-workings.

I shall now briefly explain the kind of works necessary to be executed in forming the line.

For the first eight miles the ground may be considered as a level, presenting no unusual difficulties; the river or rather mud-flat of the Orawiti will require a very long bridge, and the Wariatea, a river of no great size, will also require bridging.

There will be a few moderate cuttings to make, and a good deal of ditching over the low flat land.

There will be some very heavy work required on the side of the hill, in the formation of the lower incline, which to act well should be as nearly straight as possible, thus necessitating deep cuttings and much filling up, to obtain a regular gradient throughout.

However, by making this incline in two lengths instead of one, the works on each would not be so heavy, either in the formation, or in the machinery necessary for working them afterwards; and in case of accidents (almost sure to occur) the damage would not be so serious in extent on short inclines as on long ones.

These advantages will be counterbalanced in a measure by the trouble attendant on the change of wagons from one incline to the other, but I think the shorter inclines will be found to be preferable.

The work on the upper inclines and across the table-land will all be of a costly nature; for the surface of the ground, though comparatively even and regular, is traversed in all directions by shallow gullies and small streams, which cannot be avoided, from the manner in which they overlap each other. A good deal of cutting and embanking will be needed here, and much rock-work will be encountered, as in many places the surface is nothing but bare gritty rock in flat tables.

This, however, will afford excellent material for walling and filling, as well as for ballast, and for constructing culverts, and drains, &c., as it occurs in slabs of all sizes.

It must be observed, that in forming this part of the line, all the materials for the railway would have to be brought up the incline; that, is rails, sleepers, &c., &c., as no timber can be procured on the table-land. Nearly the whole of the above you will observe has already been fully explained in Mr. Burnett's report, but I have thought it better to recapitulate the facts, to make my report continuous and more easily understood.

Having now given an outline of the Buller coal-field, I shall proceed to describe that at the Grey.

I must first explain that my examination of the former, thoroughly satisfied me as to its extent and great importance, and also that by the means described the coal could be worked and brought to port.

Being anxious, however, to compare the two districts, and having always felt that the claims of the Grey as a coal-field demanded serious consideration. I determined to visit it, and obtain such knowledge of the coal there, as would enable me to draw a comparison between it and the Buller.

Accordingly, I endeavored to make arrangements with some natives who knew the country, to accompany me up the Buller, to the Inangahua, and up that river in a canoe, and thence down the Mawhera-iti to the Grey, (the usual inland route), but as I could neither agree with them as to terms, nor as to the time when we should start, or when we should get there, I determined to perform the journey on foot, by way of the coast. By this plan I was able to calculate with some degree of certainty how long I should be absent from the Buller, and allowed seventeen days for the trip; this as it proved was nearly correct, as the journey occupied us just sixteen days and a half, viz., seven in going, four at the Grey, and five and a half in returning. The distance is about 60 miles on the map, lengthened to more than 70 by the numerous little bays and points, and other deviations which must be made from a straight line; the journey is also prolonged by having to wait for the tide at certain points, which must be passed at low water.

I took with me two men who had been to the Grey before with Mr. Rochfort, and started with provisions sufficient to last out the whole journey, having been informed that it was very doubtful whether we could get supplies at the Grey.

Mr. Haast in his report on this part of his expedition, warns all those who have not a sure foot, and a head unaffected with giddiness, against attempting this journey by coast between the Grey and the Buller. I may repeat this warning, as it is certainly necessary, among other qualifications, to be able to climb up precipices, and to slide or scramble down them fearlessly; these, and other gymnastic powers, being constantly called into play for nearly the whole distance. With the exception of one long, ten mile beach of hard sand, and a few shorter ones, available

only at low water, you are either climbing, creeping, or jumping over rocks of every imaginable degree of slipperiness or of jaggedness, forcing your way in places through an imperfectly cut line in bush and scrub of the very worst description, and growing on hills of every angle of steepness; wading wearily through soft sand, gravel, or loose shingle, and fording rivers, or walking in the sea round rough rocky points, the number of which it seems impossible to reckon.

On arriving at the Grey, I devoted some time to the examination of the harbor, and then set out overland up the north bank of the river to inspect the coal.

This is displayed in a seam, of which I measured a depth of $13\frac{1}{2}$ feet of pure coal, the whole of the seam not being visible.

The face of it is about one chain back from the river, and is exposed for a length of about two chains, rising at an inclination of about one in six from the water level; at the upper end it becomes hidden in the hill behind, which is covered with bush.

The hill rises behind it to a height of about 300 ft., being backed by the higher hills of the main range.

There appears to be no difficulty in the way of working this coal, as a level could be chosen above the reach of floods, on which to commence operations; and the mine could be kept dry, apparently by natural drainage.

To determine the area over which this coal extends is, of course, an important point, but it has every appearance of being a portion of a very extensive seam, and one that has not been affected injuriously by local disturbance.

It is in such a position, that a line of road could be formed nearly on a level, or with a slight descent, from it to the port.

This line would follow the extension of the coal range towards the coast to where it breaks off, then across some level land to the foot of the coast range through which the Grey has found a passage and now runs, forming a short gorge;—the foot of this range and the gorge would be traversed by side-cutting, to the level land beyond the gorge and extending from it to the sea beach, upwards of a mile. I reckon the distance altogether between seven and eight miles, of which about the half would be side-cutting, partly in rock; and the rest on level land, the whole or nearly so being in bush. The heaviest work would be in the gorge above-mentioned, the remainder would be of ordinary character.

I shall now make a few general remarks on the comparative merits of the harbors of the Buller and Grey.

In the report on this subject by Mr. Clouston, which accompanies Mr. Burnett's report on the coal-fields, preference is given to the Buller. With the reasons for that preference I fully agree, and believe that the Buller is the best harbor of the two, as regards their natural advantages.

But as that report had reference more particularly to the use of sailing vessels, I have no doubt it would have been considerably modified had the question of the employment of steam-power then been entertained; either in the way of tug-boats, or in that of screw-colliers, one of the latest improvements in the coal-carrying trade.

In the event of an extensive trade in coal, arising at either port, there is no doubt that steam-power in

one of the above forms *must* be used, and this will put the harbors more on a par, as regards facility for entrance and departure; but the Buller will still have the advantage of greater size and better internal accommodation.

In both harbors is a lagoon, where vessels may lie in safety out of the reach of floods, that at the Buller, however, is the largest and has the deepest water; whilst that at the Grey is only available for vessels of a small size, and would require some expenditure to make it useful for larger vessels.

These remarks are intended to show that, should coal be worked at the Grey, the harbor is one that could be made available for vessels of moderate tonnage by the use of steam-power, and that steam-power must be used, either there or at the Buller, to carry on successfully an extensive trade in coal.

On our return journey from the Grey, and beyond the first rocky point north of that river, (about five miles,) we crossed a stream, in the bed of which we found pieces of coal apparently of good quality, and on looking inland through a break in the range, perceived a sloping table-land similar to that at Mount Rochfort, suggesting the probable existence of a coal field at no great distance from the beach. At this point there is a sort of natural open harbor, or bay, formed by a rocky point, running out in a curve from the shore, and which might be improved and found useful for shipping at some future time. From this point to the Grey, there is a strip of level bush land between the beach and coast range, whilst behind that range, inland, for the same distance is an extensive stretch of land, level and apparently of excellent quality, and which will some day make an excellent site for a settlement.

A very good township could be laid out on the flat adjoining the River Grey and the beach, the survey of which has, indeed, been commenced.

I have the highest opinion of the Grey, generally, as a place for settlement, it is not so striking at first sight as the Buller, as you do not at once see the extent of available land, but that it will at no distant day, be the site of a thriving and prosperous settlement, there can be no doubt whatever.

Leaving these general observations, we have now to consider the comparative costs of the necessary works, at the Buller and the Grey, and also the cost at which coal could be put on board at either port.

Whilst on this part of the subject, it will be well to take also into consideration the other localities, from which it is expected that coal may be procured, and place them side by side, in order that their relative advantages may be more distinctly appreciated.

To begin with the Wangapeka, I calculate that this coal cannot be reached by a shorter distance than 65 miles (possibly 70 or 75), nor the Batten by a shorter distance than 50 miles; these distances may not be quite correct, but they will be found to be not far from the truth, and sufficiently accurate for our present purpose. Following the same mode of calculation as that adopted by Mr. Burnett, in his report on the Buller coal, that is, assuming an annual yield of 100,000 tons, we have the results as below, that is the net cost of producing one ton of coal.

The costs in the following table, I need hardly say, are only approximate, and most probably all too low, as only the principal items of expenditure are entered, and no addition is made for profit.

Nelson from the different places, at the following prices per ton :—

		Freight	
Wangapeka			17/9
Batten			14/9
Buller, long line	7/11½ at Buller	6/6	14/5½
„ short line	7/0½ „	6/6	13/6½
Grey	6/8 at Grey	8/0	14/8

The amount of freight I have assumed on the ground that the carrying trade will be very large, and subject to competition.

As residents and consumers of coal in Nelson, we have of course to look only at the last column, and to choose the cheapest coal, supposing the quality of all to be alike. But this affects only a very small part of the question; as a community, the point that we wish to arrive at, is this, to be able to supply coal at some port in the Province at the lowest possible price, in order entirely to command the trade, or, at least a fair share of it.

We must consider, therefore, whether buyers who have coal to deliver, say at Auckland, or Wellington, could do so cheaper by buying it at Nelson, for 14/9, or 16/9, or by going to the Buller or the Grey, and buying it at 7/- or 6/8.

This question, for example, would affect all large quantities of coal, to be delivered, say, in Cook's Straits, for the supply of sea-going steamers.

And, supposing that we succeed in forming a railway to the Batten or the Wangapeka, the success of that railway must depend almost entirely on the cheap rate at which we could deliver coal in Nelson; for by no other means could we hope to retain the trade, even should we be the first to establish it; and as the first outlay on the railway will be the same, whether we produce 100 tons or 100,000 per year, it is clear that the more we can sell, the less will be the expenses on *each* ton produced.

The interest on the cost of construction and the working and maintenance of the way, must be greater on a long line than on a short one, and will put a limit to the cheapness, the advantage always being on the side of the shorter line.

This, therefore, brings us to the conclusion, that if, at any other port of the province, coal could be produced at such a low rate as to be able to bear, beyond that rate, the expenses of sea-carriage, a *chance* arises that we might have sea-borne coal delivered at Nelson, in our own market, at a lower rate than we could deliver it by railway; the whole question hinging on the lowness of freight.

We must not evade this view of the question, as, whether the West Coast coal-fields, at the Grey, Buller, or Mokihinui, are opened out now, or not, they cannot, from their size, importance, and position, long remain unworked.

We have, however, to view railways in another light than simply as coal-producing, as wherever they may be laid down, they will be the means of peopling the country, and of cultivating the land through which they pass.

But to coal we must look as the *principal* item of traffic, and as the *immediate* object of laying down railways in whatever direction; we must not of course expect such great results from them as in the old country, where population existed before railways, but must trust to the railways to make the population, with the hope that they will not fail to produce the desired result.

I have, &c.,
JOHN BLACKETT,
Provincial Engineer.

	BULLER RAILWAY. 12½ miles long.	BULLER RAILWAY. 9 miles long.	GREY RAILWAY. 7½ miles long.	WANGAPEKA. 6½ miles long.	BATTEN. 50 miles long.
12½ m., @ £4,000 = 50,000 Stationary engines and other machinery, &c., 9,000 Locomot. engines, wagons, shipping, pipes, &c., 14,000	£70,000	9 m., @ £3,500 = 31,500 Locomot. engines, &c. (as before), 14,000	£45,500	7½ m., @ £3,000 = 22,500 Locomot. engines, &c. (as before), 13,500	£36,000
Interest on Capital at 10 per cent.	7,000	4,550	3,000	23,100	17,650
Cost of working 100,000 tons, at 2s. 6d.	25,000	25,000	25,000	25,000	25,000
Other expenses, royalty, agency, management, and contingencies, say at 2s. 6d.	7,812	5,625	4,687	40,625	31,250
Cost of haulage, at 1½d. per ton per mile	39,812	35,175	33,287	88,725	73,900
Total on 100,000 tons ...	£	£	£	£	£
	Cost per ton 7s. 11½d.	Cost per ton, 7s. 0½d.	Cost per ton, 6s. 8d.	Cost per ton, 17s. 9d.	Cost per ton, 14s. 9d.

The item for haulage, the amount for which varies exceedingly on different railways, and has a material influence on the total cost of the coal, especially on the longer lines, I have charged to all of them at the same rate, to make a fair comparison.

Thus it appears that coal could be delivered in