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By His Honor's command,
ALFRED DOMETT, Provincial Secretary.

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

ALFRED DOMETT,
Provincial Secretary.

REPORTS OF THE GREY COAL-FIELD NORTH OF THE BULLER RIVER.

NELSON, September 3rd, 1862.

To His Honor the SUPERINTENDENT,
Nelson.

SIR,—In accordance with your letter of instructions, dated, "Schooner *Mary*, Buller River, West Coast, April 5th, 1862." I have the honor to report that I have cut a line, from the flag put up by Mr. Brunner near the mouth of the Buller, to the base of Mount Rochfort; and about half a mile up that mountain. From the base of the mountain, I have cut a series of lines over the level land, to the Wariatea River, a little above the place where it enters the plain. From this point a path is cut up the ridge, on the right bank of the river; but this is not surveyed, as the mountain side is too steep and rugged to do so satisfactorily; however I have fixed the position of several points by bearings to stations on the plain.

After reaching the table land or plateau at station 17, I went to the lowest point on the edge of it, (Station 18), the position of this is fixed by bearings to four different objects on the plain below; and by taking the vertical angle I found the height to be 1,450 feet above the plain and probably 15 feet more above the sea.

From 18 the traverse is continued over the plateau up the left bank of a small stream, to a saddle at 29, and from there down another stream to a branch of the Waimangaroha River flowing from the south. Thence up this stream for about a mile to its source; and down it half a mile to station 63 where the traverse ends, having been stopped at this point by bad weather.

In the course of this survey I have examined the mountain side from the Buller to the Wariatea, with a hope of finding workable seams of coal; and during the course of this examination, I have explored most of the streams to the height of 1,000 or 1,500 feet. On the plateau, I have examined most of the gullies on both sides of the line of traverse; noting the strike and dip of the strata, which is marked on the plans by arrows showing the direction of the dip, and figures the angle of it.

I have also visited Mokihinui (see my report of May 12, 1862), but have not had time to connect it by actual survey with that part of the Coal-field near the Buller; neither was I able during my very short visit to make anything but a very superficial examination.

The Plans which accompany this report are—

No. 1.—A Plan of part of the Grey Coal-field, north of the River Buller. The Buller River and the coast line is from Mr. Rochfort's survey. The coast line from Ngakuwaho to

Mokihinui, and the course of these rivers, is sketched from a few bearings. The rivers, &c., shown by dotted lines, are also sketched, partly from my own and partly from Mr. Rochfort's observations. The long section, and the cross sections on the margin, are on the same scale as the plan, both horizontal and vertical.

Scale, 80 chains, or one mile to one inch.

No. 2.—(Sheets I., II., and III.) Is a Plan of my traverse, &c., with a section of the part passed through by the proposed railway.

Horizontal scale of plan and section, 20 chains to one inch. Vertical scale of section, 300 feet to one inch.

No. 3.—Is an enlarged Plan of the part colored pink on Nos. 1 and 2, to show more details.

Scale, six chains to one inch.

The part colored green on all these plans shows the bush; and what is left uncolored, the open land.

The red lines, figures, and letters show the traverse lines and stations. The blue figures indicate the height above the sea, or rather the plain, in feet. These heights are only taken by noting the vertical angle at every station, in the course of the traverse; but many of them are the result of two or more observations from different points, and may be relied on as moderately correct, and quite sufficient for the purposes of this report.

I now beg to lay before your Honor the result of the work I have just described. And in doing so I shall divide the report into three parts, viz:—

1. Some account of that part of the Grey Coal-field north of the River Buller.
2. Observations on the actual working of part of this Coal-field.
3. Remarks on the roads, &c., necessary to make the Coal-field available; on the understanding that the Buller is to be the shipping port.

Should the Mokihinui prove to be a harbor at all likely to rival the Buller, the whole question of roads would be very much changed; and my views as to the best place for working coal, probably entirely altered.

PART I.

SOME ACCOUNT OF THAT PART OF THE GREY COAL-FIELD NORTH OF THE RIVER BULLER.

On looking at No. 1 Plan it will be seen that the country north of the Buller, consists of a considerable breadth of flat land, partly wooded and partly open, extending from the coast to the base of the mountains, and varying in breadth from 4 miles, at the Buller, to nothing at Ngakuwaho, where the base of the mountain forms the coast line. At the base of the mountains there are extensive terraces rising from 150 to 300 feet high, formed of soft sandstone and marl, evidently of very recent formation. These terraces are extensive in places, particularly at the south-west base of Mount Rochfort where they cover several square miles. They are remarkably regular, and almost perfectly flat on the top; resembling the artificial mounds on which the ancient Assyrian cities were built, as described by Layard, Loftus, and others. This recent formation is colored yellow on the cross sections on the margin of No. 1 Plan.

The mountain chains marked Mount Rochfort, Mount William, and Mount Frederic, are composed almost entirely of coal-bearing strata, as is also the elevated plateau lying between them marked "gentle sloping table land, consisting of grit, sandstone and shale." It is of the slopes of these mountains, and this elevated plateau, of which I wish to speak more particularly; though it is only a small part of the whole field, which extends much further towards the east, certainly to the Orikaka River; and towards the north beyond the Mokihinui. But of the actual extent of the field, I am not prepared to speak, having only explored a small part of it; so I shall confine my remarks to that part which is immediately available; and which I know is sufficient to supply the Southern Hemisphere for the next century.

The sections on the margin of No. 1 Plan, and the Diagrams, Nos. 1, 2, 3, 4, and 5 are intended to illustrate the general conclusions to which I have come, with respect to the geological formation, of that part of the field; and also to give an idea of its physical features. I think that the whole coal formation has been thrown up by granite, and that granite will be found immediately below it at various and irregular depths. Some of my reasons for supposing this, are as follows:—

1. At F. on the River Buller and for some miles above it, the base of the mountains is composed of granite. In the gorges of the Orawiti and Waimangaroha, and also at the base of the mountains at Ngakuwaho, granite is found in *situ*, though in all these cases the upper part of the mountain is coal formation.
2. In many of the streams flowing from the mountains, granite boulders are found mixed with rocks of the coal measures.
3. The extensive fractures, as seen on the south and south-east side of Mount Rochfort, and the south-west side of Mount William must have been caused by a great upheaval, after the strata was in a solid state. This will also account for the irregular and broken nature of the strata in places.

The long section is from (A.) Mokihinui, through the lowest part of the plateau, over the top of Mount Rochfort and along the ridge of its southern continuation to the Buller at F.

The cross sections are drawn opposite their true positions on the Plan and long section.

I have mentioned the data on which these sections and diagrams are made, so that the geological part may be taken for what it is worth, as my knowledge of that science is very limited. But the surface may be relied on as giving an idea of the physical features of the plateau. For some account of the geology of the district I may refer you to Mr. Haast's Report, pages 111 to 116.

I will now describe the general features of the mountain side from the Buller to the Wariatea, as far as my observations go. No. 5 Diagram will show the difficulty of exploring this part of the field. It will be seen from this that the whole formation for a considerable distance up the mountain side is covered with debris, consisting of vast accumulations of the rocks forming the higher part of the mountain, in masses varying in size from fine sand to huge blocks so large that it is often difficult to know whether they are detached or in *situ*. It is only on the tops of some of the spurs, and in the gullies where this accumulation has been cut through by streams, that the solid rock can be seen, and even in these places very occasionally. I have often followed these streams for more than 1,000 feet, without finding a single rock which I could be certain was in its natural position.

Up the gorge of Orawiti for a considerable distance the banks are composed entirely of the recent sandstones and marles, which form the low table land before spoken of; these often rise in perpendicular precipices 60 or 100 feet, and yet are so soft that

they can be cut with a knife. High up the gorge, granite is found in *situ*. The boulders or angular masses consist of grit, conglomerate, sandstone, coal, shale, granite, and granatic-brachia, consisting of angular masses of granite in a granite matrix (similar to the detached rocks near Ngakuwaho, which I pointed out to your Honor on our visit to that river.) I also found one piece of mica slate, but how it came their I do not pretend to know.

The ridge to the south of Mount Rochfort slopes down towards the west gradually, but is broken off suddenly to the east by an almost perpendicular precipice, into a very rugged valley, the strata thus exposed shows the following section at E.

Various beds of grit	...	200 feet
Sandstones and shales	...	50 feet
Coal, very much covered with loose soil and dense vegetation		0 6 inches

The dip of the strata immediately above the coal is to the S. W. 25°. So it would appear that coal will be found at a much lower level on the western slopes of the mountain, and on searching on the spurs and in the gullies, I found a seam from six inches to a foot thick about half way down; but here the whole strata is very much changed and though the dip is still towards the S. W., the angle is increased to 65°, with every indication of violent convulsion. No. 5, Cross Section, will give an idea of the position of the Coal-field here, though it is very probable, both here and at No. 4, that the granite may crop out on the western slopes, as shown in Nos. 1 and 2, Cross Sections. Diagram No. 5 is intended to illustrate the way in which both coal and granite may crop out on the mountain side and not be found, being covered up by debris; and also to show what really is the case, that the strata on the western slopes, north of the Orawiti, generally dips into the mountain.

With regard to the part south of the Orawiti, there is no reason to doubt that coal exists in large quantities; but owing to the heavy dip, from 20° to 65°, it would be inconvenient to work, and at present can be done more easily elsewhere.

From the Orawiti to the Wariatea, the character of the mountain side is much the same, except that it is more rugged and broken. The boulders in the streams are grits, conglomerates, sandstones and shales in enormous quantities, and generally a little coal in small pieces. The general dip is to the S.E. and S.S.E., at from 17° to 30°. The direction of the dip here would lead me to suppose that granite cropped out on the western slopes, and thus bent up the ends of the different beds above it, as shown on Diagram No. 5; but as I have not seen it I cannot say that it is so.

Perhaps I cannot better describe the difficulties of exploring this mountain side than by copying part of my note-book referring to one of the small streams. It runs as follows:—"May 14th, 1862.—Went up a small stream, crossing traverse line No. 6. About a mile up, found a small bed of shale in *situ* on the left bank, dipping S.S.E., 17°. Half a mile further, the stream becomes very precipitous, and though many rocks show themselves they are so much broken that it is difficult to ascertain their true position; but the prevailing dip is S.S.E., and the angle varying and uncertain.

"Though there is an enormous quantity of grit, conglomerate, sandstone, and shale, I have not found a single particle of coal, except in small threads mixed with shale. A hundred yards further up, found six inches of coal on a landslip about 200 feet above the stream; it is lying pretty regular, with a dip of 25° to N.N.W., but it is loose in loose ground, and more like a layer of small coal than a true seam; particularly as the solid rock in the stream immediately below is dipping to the S.S.E. But I was glad to get away from it, as the whole mass was on the move, and I sent down some tons of it on my scramble up and down.

"Returned to camp very much disgusted as usual with the result of my day's work on this most provoking mountain side, where there is every indication of coal, but none to be found in the solid."

On ascending to station 18 on the plateau, the whole scene is changed, and instead of the rugged mountain side covered with bush and scrub, the country is spread out before you open, bare, and barren, a desolate wilderness of flat rocks.

This plateau, as will be seen from No. 1 Plan, extends from Mount Rochfort in a north-east direction between the two chains of Mount William and Mount Frederic, to the saddle at the sources of the Waimangaroha, Ngakuwaho, and Orikaka. It is moderately level, rising gradually on each side to the mountains; and perhaps would be more accurately described as an elevated valley, than a plateau or table land. (See sections on the margin of No. 1 Plan.)

The surface is composed of grit, sandstone, shale, and other rocks of the coal formation; it is almost destitute of vegetation, except in the gullies which are full of dense scrub. And here and there small patches of stunted bush. It is very much intersected with gullies running in all directions, so that the surface is a good deal broken.

There is no doubt that the whole of it (15 or 20 square miles) is available Coal-field.

The Diagrams, Nos. 1, 2, 3, 4, and 5 are intended to illustrate the general features of this part of the Coal-field, and it must be clearly understood that they do not profess to be plans or sections, but mere sketches of what I think may be, reasoning from what I know. For instance in No. 1, the top of Mount Rochfort from *a*. to *b*. is drawn to scale (roughly of course), and No. 2 is a section of the strata of that part taken by Mr. Haast and myself, partly in the deep gulley on the east side and partly on the face of the terraces on the north and west side. (See Mr. Haast's Report, pages 55 and 113.) The sudden breaking off of the thick beds of grit and conglomerate, in perpendicular precipieces giving the whole top of the mountain the appearance of an enormous artificial mound or the ruins of some old fortress—

"Piled by the hands of giants
For god-like kings of old."

Station 17 is correct as to position and elevation, and the surface gives a pretty fair idea of the side of the mountain. I know that granite exists in the gorge of Orawiti immediately under the mountain, but I dont know at what elevation; I know from provoking experience that debris is largely deposited on the western slopes of the mountain. Therefore having drawn the top of the mountain from *a*. to *b*. from my own measurements and the dip of the strata, and knowing that to 17 this dip continues pretty much the same, I have a right to presume that what is below is similar. But as I have never found seams of coal in the next few hundred feet, or say within 1,000 feet of the top, I have not drawn any, though it is probably there. This brings us down to the level of the plateau where I knew that coal exists in large quantities. Several black lines are therefore drawn to represent seams, and here the whole series must exist, lying regularly through the mountain with an average dip of 5° or 6° to the N.N.W. the whole mountain is an available Coal-field, and great part of it capable of being worked by free level. Of course I do not expect the strata to be so regular as I have represented it, for it is certain to be more or less disturbed. I have not shown coal in the lower part of the field though there is no reason to doubt that it is there; but I am anxious to show as little as possible that I cannot prove. And I may

observe here that it is probable anthracite may be found in the lower part of the field near the granite; as a confirmation of this, I found a piece of coal in the Orawiti, very much resembling anthracite, but it was too small to be of much use as a specimen.

These Diagrams will show the general features of this part of the district, forming as it does, a sort of basin between the mountains up to the sources of the before-mentioned rivers; and then probably dipping gradually down to Mokihinui. But of this part I cannot speak from personal observation.

I am not prepared to speak confidently as to the quantity of coal contained in this plateau, but I know of five workable seams none less than five feet thick, giving a total thickness of 38 feet 6 inches. All of really good quality, and equal if not in some respects superior to the Grey Coal. I supplied small samples of four of these at the same time as my first report, and on my return from the Buller last time I brought about 60 lbs. of the other. this I believe to be the best sample that has yet been brought from the West Coast. I may remark generally that these seams are remarkably free from shale and foreign matter, and when a seam is spoken of as being so many feet thick, it means that there is that thickness of *pure coal*.

I do not say that the whole of these seams will be found all over the plateau, neither can I be certain that some that are mentioned as different may not be the same cropping out in different places, for without actual mining it is impossible to trace seams of coal for miles over a rough country. There are many smaller seams known to me in different places, but under the circumstances I consider any thing under three feet as unworkable and have not included such in the 38 feet 6 inches mentioned above.

It is reasonable to suppose that in such a rich field almost entirely unexplored, many seams have yet to be discovered. But without calculating more than is actually known, the following figures will give some idea of the capabilities of this part of the Coal-field—*15 square miles or say 10,000 acres, a moderate estimate of the extent which is available at once.*

Calculating only 18 feet of coal (instead of 38 feet 6 inches,) over the whole extent.

Now as a cubic yard of solid coal will produce a ton, every acre of a 3 feet seam will yield 4,840 tons.

Then 4,840 tons by 6=29,040 tons per acre, 18 feet thick. And 29,040 tons by 10,000=290,400,000 in 10,000 acres. But supposing only half of this can be calculated on, there still remains 145,200,000 tons.

And supposing half of this to be lost in the working, we still have 72,600,000 tons (seventy-two million six hundred thousand tons) of available coal; and this is only one eighth ($\frac{1}{8}$) supposing all the seams known, to exist over the whole 10,000 acres. I think in this calculation there is a margin for all contingencies, particularly as the discovery of more coal is not calculated on. I can therefore state positively that on this particular part of the Coal-field, there are 72,600,000 tons of coal which may be brought to the Buller Harbor, by means of a railway in no place exceeding 18 miles in length; but for many years 12 or 13 miles would be sufficient, and possibly only 9.

This 72,600,000 tons would supply 2,000 tons a day or 600,000 tons a year for 121 years.

Having stated a few of the leading features of this part of the district (and let me observe that it is a very small part of the whole Coal-field), I go to the second part of the report.

Perhaps one of the most curious and interesting circumstances connected with this district, is the fact of gold being extensively worked in the Waimangaroha, a river rising in, and flowing through the Coal-field.

PART II.

OBSERVATIONS ON THE ACTUAL WORKING OF THIS PART OF THE COAL-FIELD.

By referring to No. 3 Plan, it will be observed that coal is seen to crop out in various places on the southern branch of the Waimangaroha river, named Coal Brook Dale. And as it is the nearest point to the Buller where workable coal has been found, and where I can say positively that a large extent may be worked at once at a very small expense, by free level, I will describe it as minutely as my observations will allow.

I may here state that this is the place where coal was first found by Mr. Haast. And that the discovery of the part of the Coal-field north of the Buller is due to him, as the southern district of it on the Grey is to Mr. Brunner. For although *drift coal* had been found in the Waimangaroha and several other streams, it was not till our visit in 1860, that any seam had been seen. See Mr. Haast's Report, page 54 to 59 and 112 to 115.

At the place where the proposed line of railway ends (station 34), a seam of coal 8 feet 3 inches thick is found, cropping out on both sides of the gulley 1860 feet above the sea. It forms the bed of a small stream for about 100 yards, from 35 to 36 stations, where four feet of the top of it forms a waterfall. The seam here strikes regularly S.S.E. and N.N.W., with a dip of 5° to the E.N.E. (See section from A. to B. on Plan 3 and Diagram No. 7.) On following up the ridge above the coal I found the strike and dip of the overlying beds of grit and sandstone, to continue pretty much the same up to station 33, when there is a great change; the rocks at this point and along a ridge continuing nearly due S. are folded over and dip on the E. side, to E.N.E. as before and on the W. side to W. or W.S.W. Immediately below 39 station the same seam is found forming a waterfall in a deep gulley, and it can be traced to the other side of the valley where it is again exposed by a waterfall. (section C. to D.) From this to the next small stream from the W. the bed of the river is almost entirely coal. A little further up a seam nine feet thick is found again at a waterfall, it is so flat that I could scarcely detect any dip; but the strata at the head of the gulley immediately above, dips E.N.E. 2°. (See section from E. to F.)

You will observe that from 33 towards the south the dip is rapidly decreasing, as shown by the arrows.

It was not for some time that I could satisfy myself whether these seams were all the same or different ones; for the dip at the one on A.B. section being exactly contrary to what I had seen further up on C.D., I was very much puzzled till the overlying beds were examined and the change of dip or folding of the strata distinctly seen. Then the greater thickness of the seam at E.F. (9 feet instead of 8 feet 3 inches) made me suspect that it was different, but finding the small seam 12 feet below here as at C.D., as also its position, leaves no doubt of the matter; neither is there with regard to the seam at A.B., though here I have not found the small seam. I was sorry to be forced to this conclusion, for at first I hoped there were two seams instead of one.

The section on No. 3 Plan, and Diagram No. 6, marked "Section of Strata in Coal Brook Dale," shows the different beds above and below the seam, not at any particular place, as there is no point where the whole can be measured at one face, it has therefore been taken at different places where there was a chance, so I cannot answer for its *minute* accuracy, the coal seam itself is the average thickness.

The small sections A.B., C.D., and E.F., will give an idea of the position of the above seam; the scale both vertical and horizontal is the same as the plan,

to show things in their natural position. The out-crop of the seam as shown on the side of the valley is correct as to position and height, and is continued down on the supposition that the dip continues at the uniform rate of 5°. The lines on the plan, A.B., C.D., and E.F., show the position of the sections.

The dotted line from station 35 shows the strike of the seam from that point, or, in other words, the level line, so that supposing the strata to continue perfectly regular, with a uniform dip of 5°, this line would show the position of a level driven in the seam, by means of which all the coal to the rise or west side of it might be drained and worked; and for the sake of illustration I have presumed this to be the case, though in actual working irregularities would be met with. But as the level of the river is 36 feet lower than the out-crop of the seam, by putting in a drive from that level, a breadth of nearly seven chains more may be won. This level line is shown as before by a straight dotted line.

This drive could be taken from the end of the railway by a back-over branch as shown at *m.* and *n.* or by continuing the railway from the end of the 12 miles directly into the mine by a gentle curve. This last plan would probably be the best, not only for its simplicity, but by it a few more feet of level would be gained.

Therefore all that is required to win the coal down to that level is a drive, about 130 yards long and say 8 feet square capable of admitting the waggons used on the railway. The rocks to drive through would be grit, sandstone, coal, and shale, all easily worked yet strong enough to stand without timbering most of the distance. Besides this, a small shaft for ventilation, 50 or 60 feet deep, would probably be needed. I think £500 would be sufficient for both these purposes, so that after this sum had been spent the seam would be won to this level and ready for immediate work.

The extent thus won I calculate at about 100 acres, but say 60 acres of coal 8 feet thick.

Now 1 acre of coal 8 feet thick will produce 12,904 tons. Then 12,904 tons by 60 acres =774,240 tons the produce of 60 acres. If properly worked almost the whole of this could be got out as the roof is good, and the depth from the surface very trifling but allowing one quarter (¼) to be lost in working, we still have 580,680 tons which will supply 300 tons a day or 90,000 tons a year at 300 days in the year for more than 6 years. This I think would give any company a fair start and allow time to prepare for more extensive operations.

I have presumed this to be the whole which can be won by free level on the right bank of the stream at this place, but I have reason to think from the gradual flattening of the strata towards the S. and E. that the level as it extends to the S. will bear more to the eastward, and thus leave a greater breadth to the rise. I think it is also probable that the drive proposed will win more coal at once, as the dip is not so heavy towards the point B., and it is quite possible that it may rise again towards the "Low Woody Hills," but of this I will not speak confidently. However the 60 acres mentioned is a moderate calculation.

It is very possible that from further down the river more might be won here; but as I have not examined it so minutely, and the woody nature of the hills is not favorable for such examination, I shall not speculate on the subject; particularly as the rocks in the river bed are by no means regular, for at station 57 the dip is to the N. 30°, and again at 63 it is nearly in the old direction E.N.E., but with the heavy dip of 30°. Here there is a seam of coal, but when I found it there was no time for examination, and I have not since had a chance of visiting it again. Indeed I may state that I am unacquainted with the position of the strata under these low woody hills, and I must defer any remarks on them, till there is time for a closer examination.

It is probable that a considerable amount of coal may be worked on the left bank of the stream in Coal Brook Dale, for the strata rises again soon after crossing the river, and it is very likely that a little stone drifting would win as much here as at the other side. But of this I cannot speak confidently, as I have not examined it so closely, and the strata is not so regular. The uncolored part of section C.D. from C. to *c.* shows this rise, but it is merely sketched, as I don't know exactly where the change takes place.

I only mention one seam here, but there is every reason to believe that many more will be found; and here let me observe that it is often almost by chance that seams are found at all, for it is quite possible to pass close to the out-crop without knowing, even though you may be searching all the time. For the gullies where it is most likely that coal will be exposed are generally full of dense scrub, and the ground, nay often the watercourse itself, is closely covered with thick moss; and the face of the out-cropping seam concealed by a curtain of this moss, leaving a hollow space of 1 foot 6 inches or 2 feet between itself and the coal.

With regard to the part between Coal Brook Dale and the edge of the plateau at stations 17 and 18, all of which I believe to be immediately available and probably containing many workable seams, I may state, from Coal Brook Dale to station F. (see Plan No. 3 and Diagram No. 3) the strata is very much broken, and though it may probably be easily worked still it is impossible to say how or where, therefore with my present limited information, I will say no more about it, though the broken nature of the strata may even facilitate the working in some positions.

Diagram No. 3 is intended to illustrate this part of the field. At Coal Brook Dale the seam is shown as on section C.D. on No. 3 Plan, and Diagram No. 7 and between that place and station F. it is represented as very much broken; but it must be clearly understood that these dislocations are not supposed to be correct, but are merely drawn to show that there is confusion. Neither do I wish it to be supposed that the seam in Coal Brook Dale is continued as represented on the Diagram, it is merely shown in this way to illustrate the presumed dislocations, though there is no reason to suppose that it may not be here; but it would be absurd to pretend to trace a seam of coal over such a country without extensive boring and leveling operations. That workable coal exists here in large quantities there is not the least doubt.

From station F. to station 18 the strata is very regular dipping to the N.N.W. at an angle of about 5°, and it is quite certain that the rocks in this part, must crop out on the side of the mountain below station 18 and that the coal will be exposed there, but in what position I cannot say. Only in the stream for some considerable distance below the plateau, the beds of grit, sandstone, and shale continue pretty regular. Presuming that a seam of coal is found below station 18, we may safely calculate that it will extend over great part of the plateau from station 18 to F. on the N.E., and from station 17 to E. and F., an area of, say 300 acres, which would be won by the opening of the seam at the out-crop.

Now suppose that a seam 8 feet thick should be found there extending over 300 acres, we have the following figures.—

An acre of coal 8 feet thick will produce 12,904 tons. Then 12,904 tons by 300 acres =3,871,200 tons. And supposing half of this to be lost in working, there still remains 1,935,600, tons which will supply 1,000 tons a day, or 300,000 tons a year for more than six years.

Besides this it is probable that great part of the coal in Mount Rochfort itself might be won from here (see Diagram No. 1).

Of course in speaking generally of coal being won from this or that place, I do not mention the various minor difficulties likely to occur, such as local dislocations, changes of position, &c., &c., all of which are certain to be met with, and must be overcome by various mining operations not necessary to mention. What I wish to be understood is, that, if coal is met with on the side of the mountain near station 18, the probability is that some hundreds of acres on the plateau, and also on Mount Rochfort could be worked by free level, without taking the railway on to the plateau at all. Now it is very likely that the railway works, to be spoken of in the third part of this report, will expose seams of coal here, if so it may not be necessary to extend the line further for years, and thus avoid the most difficult and expensive part of the railway.

Before closing this part of my subject I will refer again to the part of the Coal-field on the northern branch of the Waimangaroha River on the eastern slopes of Mount Frederic; which I visited with Mr. Rochfort (see my report dated April 5th, 1862.)

I am sorry that I have not had a chance of going there again, and connecting it by actual survey with the other side, so that I can give very little more information about it. However I can give some idea of the position of the out-crop of these seams. The figures on that part of No. 1 Plan show the position of the seams so numbered in the report of April 5th, I shall copy them below.

No. 1.—Found on the northern branch of the Waimangaroha.

Thickness.—12 feet exposed; but how much more there is below the bed of the river, I had no means of ascertaining.

Dip.—To S.S.E., 25°.

Above this seam there is a bed of shale a few feet thick; then 8 feet of flaky sandstone; then the coarse grit, which forms the general surface of the table land.

No. 2.—Found on the western branch of the Waimangaroha.

Thickness.—5 feet at least, but could not get a satisfactory measurement, as the top was much destroyed by exposure.

Dip.—To S.W., 15°

No. 3.—Found on the same stream as No. 2, and at a considerable distance above it, both in position and order of stratification.

Thickness.—About 8 feet.

Dip.—To S., 5°.

There is a large area of this seam very near the surface, and I may safely state that 100,000 tons of it could be worked by merely removing the surface.

No. 4.—Found on the right bank of the Waimangaroha, just at the edge of the table land.

Thickness.—5 feet at least.

Dip.—To S., 7°.

This seam is in a fissure, very much covered with moss and broken rocks, so it is difficult to get correct measurement.

I regret exceedingly that I was obliged to leave before making a minute survey of this, perhaps the most interesting part of the Coal-field; and where by fixing the positions and elevations of the different seams, there is more chance of getting some information as to their relative position in order of stratification.

I need scarcely state that here, as elsewhere, enormous quantities of coal can be worked by free level; Diagram No. 4, and Cross Section No. 2 on Plan 1 will show that very clearly. I will only state further that this part of the field is accessible by a continuation of the railway.

I have not sufficient information, to speak of the working of other parts of the field; but at Coal Brook Dale as before described, coal might be put into the railway waggons and brought to the mouth of the mine at 2s. 6d. a ton.

PART III.

REMARKS ON THE ROADS, ETC., NECESSARY TO MAKE THIS PART OF THE COAL-FIELD AVAILABLE; ON THE UNDERSTANDING THAT THE BULLER IS TO BE THE SHIPPING PORT.

The banks of the River Buller at the point where the proposed railway is commenced, (see No. 1 Plan, and No. 2 Plan, Sheet I.) is composed of loose shingle, very much exposed to the action of the stream, and is being rapidly washed away.

The surface of the ground here is only a few feet above high water mark, and may possibly be flooded in a heavy fresh, though I have never heard that it has taken place. It will therefore be necessary in the first place, to protect the banks of the river so as to secure the shipping place.

A wharf and other convenience for shipping, sheds for storing coal, &c., &c., will also be needed.

From the edge of the river the first mile and a half of railway will pass along the skirts of the bush, over loose shingle and sand; almost level (see section).

At one and a half miles a small bridge will be needed over a stream flowing out of the swampy land in the bush.

15 chains further brings you to the Orawiti River and Mudflat, which must be passed by a viaduct 28 chains long, but the actual channel here is not more than 30 yards wide and 5 feet deep at low water; the remainder is hard firm sandy mud, dry at low water. As there is such a wide extent of flat, and not much water in the river, floods need not be dreaded; and I should think if the railway line was 6 feet above high water mark, it would be perfectly safe.

From the end of this viaduct the bank rises about 30 feet, and continues for nearly a mile over flat bush land, but perfectly dry except here and there a soft place, caused by the stoppage of the small water-courses by fallen timber &c.

For the next two miles the line passes over flat open land covered with stunted fern, manuka scrub and toi-toi, quite free from swamp, and with a hard sound bottom about 18 inches from the surface.

The next 53 chains is through bush much the same as that on the north side of the Orawiti. In this bush there are two small streams to cross. After passing this belt of bush there is open again for 30 chains, dry and hard. Then 37 chains of dry bush with four small streams. From the last stream there is a sudden rise of about 40 feet to station 6, but this can be avoided by skirting the west side of the hill.

From station 6, the line may pass along the side of the terrace to the point 7¼ miles; and from there sweep round the base of the hills to the Wariatea River, 8 miles from the Buller.

Though I have not actually surveyed along the line marked for the railway (the red lines show my traverse) I know that there are no obstacles, and I am convinced that if it was necessary to carry the line exactly as I have marked it, for the first 8 miles it could be done very easily. For up to this point there are no difficulties in making either a horse, stationary engine, or locomotive line almost level and at a very moderate expense.

From the Wariatea River the difficulties commence, and as they are really formidable, and will require a good deal of engineering skill to surmount them; I will merely mention a few particulars and leave the whole question to some one more competent than myself. Though I may state that I have no doubt that a railway sufficient for all the purposes of this Coal-field can and will be taken up the mountain side, it is a mere matter of pounds shillings and pence.

From the Wariatea River, at the point 8 miles on the railway line, to the lowest part of the plateau, station 18, is a distance of 106 chains in a horizontal straight line, and in this distance there is a rise of 1,450 feet. The mountain side for the most part is covered with dense bush, but from station 14 *a*. (see No. 2 Plan, sheet II,) it is open in places, and I have burnt as much as possible at various times. Up to 14 *a*. it is very steep, but from there to immediately below the plateau, the rise is more gradual, that part of the mountain side forming a sort of basin, bounded to the S. by the steep spur on the bank of the Wariatea up which the present path is taken; on the E. by the steep edge of the plateau, which drops down suddenly for several hundred feet; and on the N. by a ridge running down to the W.

This basin is intersected by several deep gullies and ridges, partly bush and partly open, but the general rise is comparatively moderate, till you arrive immediately below the edge of the plateau which is here reared up almost like a wall; and it is only by scrambling up some of the rugged gullies that you can reach the plateau at station 18. From 18 the ground rises gradually for 10 chains at an angle of about 6°, and then drops suddenly down 100 feet into a deep wide gully. The straight black line on the section shows the gradient, supposing a line to be taken straight between the two points; but I have not attempted to show the profile of the mountain side as I have no data.

If a line like the Dun Mountain railway, would answer here, it would be a comparatively simple question, for it might wind round at almost any gradient till it reached the plain, as the mountain side extends to the Buller. But it is evident from the bulky nature of coal, and the enormous quantities which would require to be brought down; that some easy means must be provided of bringing up the empty waggons. For this purpose nothing is so well adapted as the self-acting incline, where the full waggons going down draw the empty ones up. In this position probably more than one would be required.

In such incline planes, particularly with a heavy gradient, it is necessary that the line should be as straight as possible, and the gradient itself regulated as far as circumstances will admit, by certain fixed principles. It will thus appear very evident that to construct such a line of railway in such a place as I have described, is a work of considerable difficulty, and must necessarily be expensive; involving as it is sure to do both heavy earth and rock work, besides tunneling.

It ought to be remembered that there is likely to be a large traffic on this line, and no expense should be spared in making it capable of performing the greatest possible amount of work in the shortest time. For though the powers of double locomotive lines are almost unlimited; the capabilities of an incline plane are confined within certain definite limits, to extend which, almost regardless of expense, is of great importance in the present case. For the supply of coal is only limited by the powers of taking it away; indeed the capabilities of these incline planes will form the basis on which to calculate the productive powers of the Coal-field.

Under these circumstances, there is no doubt, that the formation of a railway here will involve much heavy work; but this very work will probably expose workable seams of coal on the mountain side, which will do away with the necessity of extending the railway further for years to come.

The dotted line from station 6 (No. 2 Plan, Sheet II.) and the blue line on the section shows that a higher level may be attained by the railway on the plain before the ascent is commenced. And I may also state that there is no difficulty in extending the line north of the Wariatea, so as to afford an easier gradient up the mountain side. It might even be extended to the Waimangaroha but the rugged nature of the gorge of that river would render the formation of a railway by it to the plateau, more difficult and expensive than the route I have painted out. But all these are questions for the consideration of the Provincial Engineer.

From the point 9½ miles, the line may be taken up either side of the gully; to station D. as shown by the black line on the plan and section with a rise of 1 in 7½ or to station 26 as shown by the dotted line on the plan and the blue line on the section, a distance of 1¼ miles with a rise of 1 in 10. Of course this part, as well as that below, must be passed by self-acting incline; and though the gully up which the line must come is rough, it is moderately wide, and presents no real difficulties; and though 1 in 10 is a managable gradient sharp curves as shown in the black line must be avoided.

From station 26 to 29, there is a rise of 89 feet or 1 in 37; but at 29 the ground drops suddenly about 40 feet to the east, and if this was cut through, the gradient would be 1 in 66, the distance being 50 chains. In this distance four small streams are to be crossed, and slight unevennesses of the surface to be removed and towards the saddle a cutting 40 feet deep. Here the highest point 2,129 feet is reached.

From station 29 to the proposed mouth of the mine, a distance of about 64 chains, there is a fall of 305 feet, but supposing the 40 feet at the saddle to be removed, it would leave 265 feet, giving a gradient of 1 in 16 or thereabouts.

From the point marked 12 miles, the line could be extended both north and south so as to command the whole field up to the sources of the Waimangaroha, Ngakuwaho, and Orikaka, (in short the whole of the 15 or 20 square miles, treated of in this report) by locomotive line. And beyond there towards Mokihinui on the north, and Orikaka on the east; by railways worked by stationary engines. In short this railway would be the key of the whole Coal-field; and not only this, but if it was connected with a road down the Orikaka to the Buller, it would connect the whole of that district, the extensive valleys of the Inangahua, Mawhera-iti, and the Upper Grey, with the Buller Harbor.

It may be interesting to mention that the old Maori path from the Upper Buller, passed up the Orikaka over the saddle to the north of Mount William and over the plateau nearly on the route of this proposed railway.

A stationary engine would be required at station 29, to draw the waggons up from the mine; it could also be used to work the line from the saddle to the top of the first self-acting incline at station 26.

The bush on the plain and mountain side, and the hard grit and other rocks on the plateau, would supply plenty of firstrate material for railway and mining purposes.

It must be clearly understood that the line sketched out is merely to show that a railway can be made, and to supply some slight data from which an engineer may judge of the practicability of doing so.

To show some of the difficulties overcome in coal-mining at home and compare them with the case in hand, I will give a few particulars of the working of

Monkwearmouth, the deepest colliery in the north of England.

The lowest seam worked is 4 feet 6 inches thick, and is 1,740 feet below the surface. The first 660 feet from the bottom, the coal is brought up an inclined plane, 1,400 yards long, rising 1 in 6 (by means of a stationary engine at the top of the shaft, 120 horse-power). It is then raised the remaining 1,080 feet up a perpendicular shaft in the usual way. The engine draws 30 waggons, each containing 8 cwt., or 12 tons of coal in each train, up this inclined plane; the average being 1,000 waggons, or 400 tons, in 12 hours. The workmen also pass up and down during this time, from 60 to 80 in a train.

Thus 400 tons a day can be drawn *up* from a seam 4 feet 6 inches thick, 1,740 feet below the surface. At the Buller it is required to bring coal from a seam 8 feet thick *down* from an elevation of 1,824 feet.

As to the capital required, I can only state that the railway is the only expense which need be calculated on. For deep sinking, pumping, and drawing, engines and other expensive mining items, necessary in working under water-level, would not be needed here for many years. As I have before stated, £500 would be sufficient to put the seam at Coal Brook Dale in working order, if the railway was completed.

Of the cost of the railway I cannot form an idea, but probably £70,000 or £80,000 would be needed, say £100,000. And supposing that 100,000 tons a year could be disposed of, the following statement will show a satisfactory result.

Rough estimate of the expense of putting a ton of coal on board ship at the Buller. Capital expended being £100,000 and the demand 100,000 tons a year.

	£	s.	d.
Interest of £100,000 at 10 per cent.	10,000	0	0
Cost of working 100,000 tons, at 2s. 6d.	12,500	0	0
Cost of working the line and keeping it in proper repair, including all expenses connected with it after the first construction, say £500 per mile per annum, on 12 miles	6,000	0	0
Sundry other expenses, including royalty, agency, management, and a margin for unexpected contingencies, say 2s. 6d. per ton	12,500	0	0
Total on 100,000 tons ...	£41,000	0	0

Or 8s. 2½d. per ton.

Probably 100,000 tons a year would not be required for the first year or two, therefore the expense per ton would be increased. But in a few years there is no doubt that the demand would be enormously increased. I have been told that in Melbourne alone upwards of £200,000 is annually paid for coal.

I have heard that a prejudice exists in the minds of some people, against the introduction of foreign capital, and that it would be better to try to do everything ourselves, and have all the profits, even if we were longer about it. In this case that is impossible, and to attempt it, is to grasp at the shadow and loose the substance.

But I think the more capital we can introduce into the Colony the better, if we can pay the interest and also provide a sinking fund for the liquidation of the debt. In the present case even supposing the whole £100,000 to be borrowed, and the whole of the interest at 10 per cent. to be sent out of the Colony, which is extremely improbable; still we have £31,000 a year put in circulation in the Province without calculating anything for the over-sea carrying trade, which might to a considerable extent be in the hands of Nelson ship owners. But this is a commercial question, and out of place in a mining report.

I have neglected to state, that I think it would be very desirable, by boring or other means, to endeavor to find a workable seam of coal on the edge of the plateau near station 10.

Before closing this report, I would like to impress on your Honor the necessity of having correct and minute plans of all mining operations. These plans should show as minutely as possible the natural features of the surface, by conteur lines, or otherwise, representing the relative heights.

The workings of each seam should be shown in the same way; and records kept of all sinkings, boring, and drivings, showing sections of the strata in various positions, and supplying other valuable information. These records ought also to embrace everything of interest connected with the mine, such as blowers of gas or feeders of water being met with in such and such places.

These plans and records are very easily kept up if they are commenced with the actual working, but it is impossible to supply them afterwards when shafts are closed, old workings filled with water, or fallen in.

The want of such plans and records of old workings has caused the loss of hundreds of thousands of pounds worth of property, and hundreds, nay perhaps thousands of lives; and is a source of constant expense and anxiety in districts where old workings are known to exist.

On this point allow me to quote a paragraph from "Dunn, on the Coal Trade," giving a slight sketch of its history in the North of England.

"1815.—In this year, an inundation took place in Heaton Colliery, whereby nearly 90 lives were lost. The waters of Old Heaton and Jesmond Collieries, which had been abandoned for upwards of seventy years, were thus let in, owing to the want of plans showing the extent of the old workings. The exploring drifts of this colliery had been subjected to the process of boring for many years; but in this instance some inadvertence had taken place which caused the disaster, affording a melancholy argument for the necessity of recording plans."

In conclusion I regret that my observations have been so limited, owing to the circumstance, that I was obliged to leave on account of bad weather, before I had finished what I intended to do, thus leaving much of the work incomplete.

With regard to Mokihinui, I can give no more information than what is contained in my report of May 12th, except a small section of the strata at the coal seam, it is roughly taken, and may not be quite correct.

I would have given the section in that report, but as it was written unexpectedly, I had left my note-book at the camp.

Section of Strata at Mokihinui—

	Ft.	in.
Grit (uncertain)		
Coal	1	6
Hard sandstone, part of it very micaceous	6	0
Coal	7	0
Very black micaceous sandstone, with bands of shale	6	0
Grit (uncertain)		

This lower grit forms the bed of the river, so it is impossible to know its thickness.

Dip to N.W. or N.N.W., about 10°.

I cannot close this report without congratulating the Province on the possession of one of the most valuable Coal-fields I ever saw, and commanding a harbor like the Buller, which will make it immediately available. It is not too much to expect that

in a few years Nelson will be the great coaling station of the Southern Hemisphere.

I have the honor to be,
Sir,
Your obedient servant,
JAMES BURNETT,
Colliery Engineer.

P.S. I have not entered on the subject of the quality of the coal except to say that it is quite equal, if not superior to the Grey, as the samples will show; but owing to the nature of the country it would be difficult to get a large quantity for trial, except at Mokihinui.

To his Honor the SUPERINTENDENT, Nelson.

SIR—According to instructions conveyed to me in your letter of March 12, I have the honor to report that I started the same day, accompanied by Mr. John Rochfort and the Maori Paul, to visit the Coal-field on Waimangaroha River.

We proceeded up the Waimangaroha River as far as the gold-diggings, and then ascended a spur which brought us out on the table-land, about a mile to the north-west of the seam discovered by Mr. Haast and his party two years ago (see Mr. Haast's Report, pages 56 and 114).

Without entering into minute particulars, which it is impossible for me to do at present, I will endeavor to convey to you a general idea of that part of the Grey Coal-field situated North of the Buller, so far as my limited knowledge of it will permit, reserving details for my future report, when a more lengthened visit will enable me to become more thoroughly acquainted with the district.

This part of the field is situated on the elevated table-land to the north of Mount Rochfort. I say part of it, because at present I am not prepared to state how far it extends in any direction; but this I can say, that the whole of the table-land (many thousand acres in extent) is a very rich Coal-field, containing a great number of workable seams, similar in quality to the Grey coal, and which can be worked, I think, at less expense.

The peculiar formation of this part of the country, broken as it is by deep gullies, which expose the seams in all directions, presents facilities for working in several places, and, to a great extent, by free level (*i.e.*, without artificial drainage). The open nature of the table-land, and the large extent of rock exposed, are very favorable for exploring. The dip of the strata is generally very moderate, from 5 to 25°.

Besides a great number of small seams, Mr. Rochfort and myself examined the following large ones, all of which, except the last (No. 5), are in every way favorable for working; but I cannot, at present, determine the relative position.

The numbers refer to samples of each seam furnished to your Honor on my return from the Coal-field:—

No. 1.—Found on the northern branch of the Waimangaroha stream.

Thickness.—Twelve feet, exposed; but how much more there is below the bed of the river, I had no means of ascertaining.

Dip.—To S.S.E., 25°.

Above this seam there is a bed of shale a few feet thick; then eight feet of flaky sandstone; then strong coarse grit, which forms the general surface of the table-land.

No. 2.—Found on the western branch of the Waimangaroha.

Thickness.—5 feet at least, but could not get a satisfactory measurement, as the top was much destroyed by exposure.

Dip.—To S.W., 15°

No. 3.—Found on the same stream as No. 2, and at a considerable distance above it, both in position and order of stratification.

Thickness.—About 8 feet.

Dip.—To S., 5°.

There is a large area of this seam very near the surface, and I may safely state that 100,000 tons of it could be worked by merely removing the surface.

No. 4.—Found on the right bank of the Waimangaroha, just at the edge of the table land.

Thickness.—5 feet at least.

Dip.—To S., 7°.

This seam is in a fissure, very much covered with moss and broken rocks, so it is difficult to get correct measurement.

No. 5.—Found on the right bank of the Waimangaroha, at the gold-diggings, and not more than a few hundred feet above the level of the sea.

Thickness.—About seven feet.

Dip.—To N.E., 70°.

The whole strata round this seam is very soft and broken, and, although there is a large surface exposed, it is difficult to say whether it is in its natural position or part of a slip. Of course the angle of dip renders working it out of the question where there is so much coal with a more moderate inclination.

I have said nothing about the quality of the coal in the above seams, as I have furnished your Honor with samples of each; but I may observe, generally, that I think it equal to the Grey coal. It all burns well and cakes freely, though all the samples are from the surface.

Should this coal be worked, a tramway will be necessary from the mines to the port, and the only difficulty in its construction is the ascent to the table land. This, I think, in the lowest place, does not exceed 1,500 feet above the level of the sea. The side of the mountain extends nearly to the mouth of the Buller, so a tramway might be taken up it by a gentle gradient: the length would be about twelve miles, and the difficulties are by no means so great as those overcome by the Dun Mountain Railway.

I think it is extremely likely that coal may be found cropping out on the side of the mountain, considerably below the table land; but I think it probable that in this position, the angle of dip will be found too great for convenient working. This, in fact, is the case in No. 5, and the whole strata in the lower part of the Waimangaraho river is very much on edge.

In your Honor's company I visited a seam which has been opened near the mouth of the Ngakuwaho River, about fifteen miles north of the Buller, but it is not of good quality, and does not at all resemble the other coal in this district. This is singular, as the Ngakuwaho flows through the real Coal-field, and pieces of drift coal found in it shew that good coal exists there also.

It is reported that a large seam of good coal is being opened at the Mokihinui River, about twenty miles north of the Buller, but, as I have not yet had time to visit the place, I can say nothing about it.

If coal can be easily worked at the Mokihinui, and the harbor used by vessels of a hundred and fifty or two hundred tons (which is very doubtful) it may be the most convenient place for working coal, as an expensive tramway would not be needed, or it might be cheaper to make a tramway even to the mouth of the Buller, than from there to the table land.

As to the Buller Harbor you will have Captain Clouston's Report, and from what he says, it appears

that it can be used by ordinary vessels of two hundred tons, and by three hundred ton vessels built for the purpose.

Since my arrival here (the Grey) I have visited the Coal-field, but I cannot say that I have added much to my previous knowledge of it, for, without actual and extensive working it is almost impossible to form an idea of its extent and value.

The difficulty of exploring this part of the Grey Coal-field is owing to the nature of the country, which is so covered with dense bush and detritus from the mountains, that the strata can only be seen a short distance above and below where the Coal is found in the river. However there is very little doubt that it is a large and rich field, though how much of it is available for present use cannot be determined, for the above mentioned reason.

The only workable seam, at present known, crops out on both sides of the River Grey, about seven miles from its mouth. It is fifteen feet thick, and dips at an angle of about ten degrees, and a large quantity might be obtained by free level.

The reef is a strong sandstone, and would not require much timber; indeed the coal could be worked at a very moderate expense.

The thirty tons brought to Nelson in December last were from this seam, so it is unnecessary to say anything about the quality, though the whole of it was mere surface coal.

Both above and below this seam there are smaller ones. For an account of the strata taken by Mr. Haast and myself, I beg to refer you to his Report, pages 43 and 104.

Here, as at the Buller, a tramway would be required from the mine to the port, which must skirt the base of the mountain to avoid a large tract of low land. It will probably require a length of ten or twelve miles, and part of this would be heavy rock cutting, but the gradient would be very gentle, the height of out-crop of the seam being only eighty feet above the level of the sea.

I must again refer you to Captain Clouston for all information with regard to the Harbor of the Grey.

In conclusion, without entering into particulars, I think that coal can be worked and brought to the shipping-places at the Grey and Buller, at about the same cost, though it is probable that the Buller tramway will be more expensive.

This being the case, the rival claims of the Grey and Buller can only be decided by the merits of their harbors, and on this point there can be no doubt that the Buller has great advantages.

The Buller has another advantage, by its position as before pointed out: it is not so difficult to ascertain its extent and value. as it is at the Grey. I do not say that the Buller is a more valuable part, but that we know more about it at present, and the comparative merits of the harbors at once decided that, for some time at least, the Buller is the more favorable place for working, if it is proved that the coal is of as good quality as that from the Grey.

As the construction of the tramways, either at the Grey or Buller, will require some considerable engineering skill, I would strongly advise your Honor to have the opinion of a competent engineer on the subject, as, after the harbor, this is the most important point.

I have, &c.,

JAMES BURNETT,
Colliery Engineer.

Mouth of the Grey.
April 5, 1862,

To his Honor the SUPERINTENDENT, Nelson.

SIR—I have the honor to report to you that I have cut a line, according to your directions, from the flag erected by Mr. Brunner to the base of Mount Rochfort, and a considerable distance up that mountain, its length being upwards of five miles. This line, till it crosses the Orawiti River, passes through a great deal of swamp, but, on the north side of the river, to the base of the mountain, it is perfectly dry (except a little surface water here and there), with a hard, sound bottom.

From the base of the mountain I have continued northward by a series of lines over the flat to the Wariatea River, where it enters the level land from the mountains, and, up to this point, I have met with no swamp, both the bush and open land being quite dry and sound. I have no hesitation in stating that, from the Wariatea River at the base of the mountains, to the Orawiti river at the beach (or at the most convenient place for crossing that river), there is nothing to prevent a railway being made at a very trifling expense. This line, I think, might be perfectly or nearly straight, with a very gentle fall towards the Buller, and that without any earthwork worth mentioning, as the whole distance is almost level.

From the Orawiti River to the Buller, the railway might easily be carried along the belt of dry bush between the sea beach and the swamp passed through by my line. The crossing of the Orawiti River is a question entirely for the consideration of the Provincial Engineer, but, except that, there is no difficulty whatever from the base of the mountains to the mouth of the Buller.

I am now engaged cutting a path from the right bank of the Wariatea to the table land of Mount Rochfort, where this Coal-field is most exposed, and can be most easily worked. And as this is the most important part, and will require much of the attention of the Provincial Engineer, I am anxious to afford him all the assistance that a bush track can afford before proceeding to other work.

Hitherto, I have not been successful in finding workable coal along the base of the mountains, nearer than it was already known; the very rugged nature of the mountain streams, the immense quantity of detritus, and a very large deposit of soft sandstone of recent formation, rendering search in this direction difficult and unsatisfactory, as you may often clamber up 1,000 feet without finding a piece of solid rock, except this recent soft sandstone.

However, I have not finished my examination of this part, and possibly I may yet find workable coal at a lower elevation than the table land.

I have further to report to your Honor that a fortnight ago I visited Mokihinui, and although my examination of that part of the Coal-field was merely preliminary (being undertaken at that time because one of my men was sick, and I could not go on with other work), I have great pleasure in stating that there is a seam of workable coal of good quality, situated about two and a-half miles from the mouth of the river, and cropping out on its right bank. The thickness of this seam is from six to seven feet with a dip of about 5°; it has a good firm roof, and, a few feet above it, there is another seam, but too small to be of any value. I am sorry that I cannot give your Honor minute particulars; but, as I did not anticipate writing just now till I arrived here last evening, I unfortunately left my note-book at the camp; however, a general account will probably be sufficient at present.

Though this seam is in a most favorable position, I may state that it cannot be worked by free level, but would require some artificial drainage, as the most of it is below the surface of the river, but very

shallow sinking would be required to win a large extent of coal.

If this coal is worked a tramway would be required to the shipping place.

As the Mokihinui seems to be considered a separate Coal-field, I may as well state at once that it is only a part of the same field as the Buller, and probably in uninterrupted continuation from Mount Rochfort, though it will most likely require years of actual working to arrange and classify the various seams. With regard to the harbor, I can only state that the channel, though narrow, is straight, and the bar appears remarkably smooth, though there is a considerable break on each side of the channel, and there is deep water much nearer the shore than at the Buller. As to the depth of water I cannot say, but I have been informed by a person on board the *City of Nelson* that that vessel entered the river at LOW WATER.

For a mile and a-half up the river there is water enough for any coasting craft, and at that distance there is a very great rise of tide, upwards of ten feet at full and change. It has always been a matter of regret to me that there was not time for the *Mary* to go into Mokihinui and survey the harbor, as, if large vessels could enter, it might be the most important place on the West Coast.

I have, &c.,
(signed) JAMES BURNETT.

Buller River, May 12, 1862.

MARINE SURVEY OF RIVERS
ON THE WEST COAST.

To his Honor the SUPERINTENDENT, Nelson.

SIR,—Having accompanied you to the West Coast, and visited the Rivers Buller and Grey, I now, in accordance with your request, give you my report thereon.

There can be little doubt of the superiority of the Buller over the Grey, which arises not so much from a greater depth of water on the bar, as from its width and steadiness. The prevailing wind on the coast being from the south-west, vessels can easily enter and leave the Buller in ordinary weather; and in the event of calms there is no danger in vessels being towed either in or out. This could not be accomplished at the Grey River without running some considerable risk. The depth of water on the bar at the Buller, at low water, spring tides, is six feet six inches; neap tides, seven feet six inches. The ordinary rise of spring tides is from eleven to thirteen feet and of neaps from eight to ten feet, making a depth of nineteen feet six inches of water on the bar at high water.

The harbor is altogether well calculated for vessels whose draught of water does not exceed twelve or thirteen feet; but it would be necessary before vessels of such tonnage visit the harbor, to have two large buoys, with suitable chains, laid down, one placed abreast of the present landing place, and the other a considerable way down the river towards the opposite shore, as the river rises so rapidly and comes down with such force as to render it unsafe for vessels to lie in the stream, and in such case no dependance can be placed on their anchors. The buoys would therefore enable them to shear over to the opposite side, by warps, where the current is comparatively slow, and where they could lie at the mouth of the lagoon in perfect safety with plenty of water.

The lagoon is admirably adapted for small vessels of about six feet draught of water.

I am sorry to say I cannot report so favorably upon the Grey.

The channel is altogether different and constantly shifting.

On our entering the deep water of the channel (which was very narrow and lay close along the northern bank, which makes it more difficult of access with the prevailing south-west wind), we fortunately entered with a fair wind from the northward, and found, even then, there was but little room to yaw about.

The first fresh that came down after our arrival gave another entrance direct to the sea, but very narrow, and a few days after we had a third, trending to the west-south-west, each with their accompanying sandbank, so that it would be imprudent for vessels of large tonnage to attempt at any time to enter the river.

There is, however, one thing favorable to vessels leaving the river, and that is the strong land breeze, which is experienced every morning; vessels may with perfect safety get out, should the tides answer, any time between five and ten o'clock, being sure of a good commanding breeze, otherwise they would have to wait until the tide again agreed with the morning breeze, which would be in about ten days, or take the chance of a south-wester and smooth bar; there are about seventeen feet of water on the present inner bar, what on the other channels I am unable to say, not having had an opportunity of judging; I should think, however, that no vessels drawing more than eight feet of water would become traders to this river, unless they could secure the assistance of an able and skilful pilot, as the probability would be that of their having to wait too long for an opportunity to start, as it would be unsafe for vessels to be towed out to sea, from the narrowness of the channels.

In accordance with your instructions, I made careful observations of the latitudes of both the Buller and the Grey Rivers, the result of which I give you below, as compared with Mr. Haast's Report and the New Zealand Pilot's:—

	HAAST.			N. Z. PILOT.			CLOUSTON.		
Buller entrance,	deg.	min.	sec.	deg.	min.	sec.	deg.	min.	sec.
North side .	41	42	20	41	46	15	41	46	13
Grey	42	23	45	42	28	30	42	28	4

By this it will be seen that there is little difference between my observation and the New Zealand Pilot's, and that Mr. Haast is a little out in his latitude, there being a difference of 3 mins. 53 secs., or near four miles, in the latitude of the Buller, and 4 mins. 19 secs., or upwards of four miles and a quarter, in the latitude of the Grey.

In concluding my report, I am happy in congratulating your Honor upon the advantages likely to accrue to this Province from the possession of such a harbor on the West Coast as the Buller, as without this our mineral resources in that district, more especially the coal, would, in all probability, never be developed.

I have, &c.,
HENRY CLOUSTON.

Nelson, April 15, 1862.

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