REPORT

ON THE

OTAGO GREAT CENTRAL TRUNK RAILWAY,

BY

MR. J. MILLAR, F.S.A., C.E.

FIRST SECTION.—WAIPAHI TO ETTRICK.
SECOND SECTION.—ETTRICK TO CROMWELL.
THIRD SECTION.—BRANCHLETS: 1ST. NORTH-EASTERLY, BY MANUHERIKIA VALLEY, ST. BATHANS, &c.; 2ND. NORTHERLY, CROMWELL TO LAKES WANAKA AND HAWEA, &c.; 3RD. WESTERLY, TO LAKE WAKATIPU, QUEENSTOWN, &c.

PRESENTED TO BOTH HOUSES OF THE GENERAL ASSEMBLY, BY COMMAND OF HIS EXCELLENCY.

WELLINGTON.

1872.

REPORT OF MR. J. MILLAR, F.S.A., C.E., ON THE TOKOMAIRIRO AND TUAPEKA LINE OF RAILWAY.

Mr. J. MILLAR., F.S.A., C.E., to the Hon. W. REEVES.

SIR,— Dunedin, 1st August, 1872.

In accordance with instructions from the General Government, conveyed to me through His Honor the Superintendent of Otago, I have the honor to report upon and furnish a reconnaissance survey for a projected line of railway, partially sketched out in the suggestive petition (hereunto annexed, *vide* Appendix A.) addressed to His Excellency the Governor by the residents of the midland districts of this Province.

In pursuance of His Honor's instructions I proceeded to examine that portion of the westerly extension of the Southern Trunk Railway—already surveyed and reported on by Mr. Brunton—where it passes through the town of Clinton, and tending towards the Mataura.

Having traversed this line through the Popotunoa and Waipahi districts, I adopted it as a base line, and established a junction with it nine miles west of Clinton and about eighty-four miles from Dunedin, as delineated on the map herewith. From this point the proposed "Great Central Trunk Railway" starts, taking a generally northern direction, parallel to that portion of the Waipahi River, lying between the point indicated and its confluence with the Pomahaka River, passing over the latter, at a slightly oblique reach in the river where the banks afford favourable abutments for a railway bridge, and landing upon the north-east side; following its windings by side-cuttings in solid ground, through the gorge between the outcrop of the Tapanui Ranges and the base of the Conical Hills, until an almost level plateau is reached, stretching away to the west side of the town of Tapanui (twelve miles distant from the junction) and its adjoining extensive forest of valuable timber. Five steam-power sawmills, of a minimum aggregate of 100 horse-power, are at present fully employed there, and apparently may be for many years to come.

From Tapanui the line is continued through a magnificent tract of about 250,000 acres of chiefly alluvial country, unsurpassed in the Province for its excellence of soil and fertility. This plain comprises the Pomahaka Valley, Robert's Flat, &c., lying at the base of the Tapanui Ranges, where they gradually blend with the central plateau right up to the Spylaw Creek, and lie ready for immediate agricultural settlement upon a permanent and extensive scale, presenting no special engineering difficulties for railway construction.

The Spylaw Range, being of considerable altitude, may be ascended by simple contouring, with one or two moderately heavy cuttings. Here a new township might, with advantage to the public convenience, be established, where the line crosses under the highway between Dunkeld and Switzers.

These ranges also are fit for settlement. The ascent from Moa Flat will be through a leading valley, by easy contour gradients, cutting through an intervening narrow saddle of little more than one chain width at its apex; from whence a descent through the Benger district may be had upon the opposite side by traversing the natural sinuosities of a corresponding valley, right down to the level plains lying between the Benger Burn and the Clutha (*i.e.*, Molyneux) River; upon the auriferous banks of which the township of Ettrick is situated, at a distance of 36 miles from the Waipahi Junction.*

Pursuing the comparatively level gradients along the banks of the Clutha for seven miles, the township of Roxburgh (*i.e.*, Teviot) is reached, from whence the line would be continued to the gold mining township of Alexandra, a further distance of 22 miles. Alexandra is passed on the west side. At the same time, I lay down for choice an alternative line *through* that township, at, however, an increased cost of a railway bridge over the Clutha River, thus forming a communication with the town of Clyde, distant four miles, where I utilize a railway reserve laid off there several years ago.

Being of opinion, however, that the Province would be best served by the line being continued for thirteen miles further (*i.e.*, having its terminus at Cromwell), I have therefore traced the line in that direction, upon the west bank of the Clutha River, it being preferable in an economical point of view, as it presents features fitting for railway construction, besides obviating any necessity for interfering with the narrow and expensive roadway excavated out of the mountain side upon the opposite bank. On the west side the line would generally pass over the outcropping spurs of the hills, where they die away into river banks. The altitude obtained would be sufficiently above the river level to preserve the line from being flooded during any sudden rise occasioned by the snow melting upon the upper ranges.

* Taking the Southern Trunk Railway and its western extension as a base line, I find that the distance from Tokomairiro to Ettrick *via* Lawrence would be 55 miles; whereas, from the same base line at the Waipahi Junction to Ettrick is but 36 miles, showing a saving of 19 miles of construction, seeing that in any case the western extension is required to communicate with Invercargill.

The line, by this plan, would enter Cromwell by a bridge thrown over the Kawarau River, thus rendering unnecessary a more expensive railway structure over the wider Clutha.

The total mileage of the line would thus be 82 miles from the Waipahi Junction, or 166 from Dunedin. In addition to this, I recommend for future consideration the construction of three 24-inch gauge tramways, upon the new established principle known in the engineering world as the "Welsh Festiniog."*

1. North-easterly from Alexandra, up the Valley of the Manuherikia, affording access to the five gold-mining townships of Ophir, Drybread, Blacks, Blackstone Hill, and St. Bathan's [from whence it may be subsequently extended as a loop line through the Mount Ida District *viâ* Naseby, ultimately connecting with the Great Northern Railway at Palmerston].†

2. Northerly from Cromwell, embracing the seven townships of Bendigo, Upper Ferry, Alberton, Cardrona, Pembroke, Newcastle, and Gladstone, the three latter situate on the shores of Lakes Wanaka and Hawea.

3. Westerly from Cromwell, to the eight townships of Kawarau Gorge, Nevis, Morven, Shotover, Skippers, Arrow, Frankston, and Queenstown, the two latter on the shores of Lake Wakatipu.

These twenty towns and postal districts, together with the seven towns upon the line, and three from Spylaw Station (namely, Horse Shoe Bend, Dunkeld, and Switzers), altogether numbering thirty towns and postal districts which the railway would put into almost direct daily communication with the City of Dunedin.

It may not be considered altogether foreign to a reconnaissance survey and report upon a projected line of railway, that I should add a few of the many advantages which would assuredly accrue to the Province were this line constructed.

1. The area of land tributary to railway returns, say within the watershed of the Tapanui Ranges upon the east, the Umbrella Mountains on the west, and from the 46th degree of latitude to nearly the northern boundary of the Province, where the available country within the watershed spreads out to something like sixty miles at its widest part, comprising upwards of three million acres—that is, about one-fourth of the entire Province—a considerable proportion of which is well adapted for colonizing purposes, such as for agricultural settlement, seeing that it is the most fertile portion of Otago, and with a very temperate and equable climate.

2. The exclusively pastoral portions of the district named are of the finest character, as is amply proved by the sheep census returns of last year, numbering 1,072,032 sheep, although most of the runs are understocked. I have consequently taken advantage of that fact, and supplemented the item of wool carriage by estimating what it should produce in 1875.

3. The mining resources of the several localities of the thirty townships and postal districts enumerated are established by the detailed *Gazette* returns; that for 1870 being 102,175½ oz.; for the past year (1871) being 100,889$\frac{2}{10}$ oz. of gold, the value of which was about £389,825 3s. 3d., being two-thirds of the gold production of the entire Province. The escort returns for 1872, so far as the year has gone, bear about the same proportion, and to all appearance are likely to largely increase, as more improved mechanical appliances and scientific knowledge are brought to bear upon the newly discovered auriferous reefs, and other mineral wealth of the Province.

4. The population of the district, so far as can be gleaned from the Census returns, numbers about 10,792, that is, one-fourth of the population of the Province, after excluding the fixed population centred in the city of Dunedin and suburbs, the towns of Lawrence and Invercargill.

To return to the item of estimated traffic—*Vide* Appendix B. It may be a difficult problem in a new country to solve the monetary value of the traffic, which, in the usual course of events, may be expected to increase when the tributaries to a new railway become settled down into working order. An increase is the inevitable result of the substitution of a railway for an ordinary road, or, as in the majority of the cases here, a mere bush track. It will, however, be admitted that the expected receipts on the proposed line, calculated as they are from known statistics, without being over-estimated, and submitted to the rigid scrutiny of experts, cannot be otherwise than correct. My tabulated estimate of traffic, hereto appended, *vide* Appendix, simply represents the value of only such traffic as is absolutely certain, having been framed upon reliable data, showing that the net proceeds, over and above working expenses, would leave a large margin to cover interest upon constructive capital, sinking fund, &c., &c.

At the present time, owing to the nature of the intervening country, the carriage of goods both up and down is scattered over many tracks, and conveyed to its destination at a vast loss to the settlers, the Colony, and all parties concerned; for instance, the present cartage rate from Dunedin to Ettrick *via* Lawrence is £5 10s. per ton, whereas it would well pay a railway to carry at one-fourth of the amount, and in as many hours as the former requires days.

By the construction of this line of rail all that would be remedied, seeing that the traffic of the "Great Central Basin" of the Province would thereby be conveyed to one point,—that point being at the Waipahi, through the Conical Hills Gorge, the only legitimate railway outlet to the western extension of the Southern Trunk Railway. Moreover, the vast additional and concentrated traffic thereby contributed to the latter line would of itself be sufficient to insure its being a remunerative enterprise, thereby rendering the Great Central Trunk Railway, in conjunction with the Southern, the most important line of the Middle Island.

I have, &c.,

JOHN MILLAR, F.S.A.,

The Hon. the Minister for Public Works. Consulting Railway Engineer.

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* During the past Session of the British Imperial Parliament, Bills were passed empowering the North-Western Railway Co., and others, to construct several hundred miles of 24-inch gauge feeding railway or tramway lines in the County of Merioneth, North Wales, and elsewhere, so as to unite the Festiniog 24-inch gauge railway with North-Western wide (4 ft. 8½ in.) gauge, working in concert with each other.

† The words within brackets are added at the request of Mr. Millar, after the Report had been presented to the House of Representatives.—F. E. CAMPBELL.

Appendix A.

To His Excellency Sir George Bowen, Knight Grand Cross of the Most Distinguished Order of Saint Michael and Saint George, Governor and Commander-in-Chief in and over Her Majesty's Colony of New Zealand and its Dependencies, and Vice-Admiral of the same, and the Members of the Executive of the said Colony,

The Petition of Residents in the Up-Country Districts of the Province of Otago, in the Colony of New Zealand.

Showeth,—

That the undersigned are residents in the up-country districts of the Province of Otago.

That while fully recognizing the wise policy of your Excellency's Government in opening up the waste lands of the Colony to settlement by means of railway communication, they regret that several lines should have been placed upon the First Schedule which can never attain a higher rank than feeders of the main system.

That the proposed Tuapeka Railway is a notable instance of this, as it only opens up a limited extent of land suitable for settlement, and, owing to the physical features of the locality, is incapable of extension in any direction unless at an enormous outlay of capital and labour.

That a line opening up the fertile plains of the Mataura, the vast forests of the Blue Mountains, and the rich mining districts of Switzers, the Nokomai, Mount Benger, Manuherikia, Dunstan, &c., &c., could be constructed for little if any greater expenditure than that required for the construction of the Tuapeka Line.

That such a line, connecting with the Mataura Line at Popotunoa or the Waipahi, thence proceeding along the valley of the Pomahaka in a northerly direction, crossing that river at a point near Robert's Flat, striking the west bank of the Molyneux at a point adjacent to Moa Flat, thence along the bank of the river through the rising townships of Roxburgh and Alexandra, to its terminus near Clyde; that such a line would through its whole course pass through a level country, presenting no engineering difficulties, and requiring but a trifling expenditure in bridges.

That, briefly stated, the advantages of such a line would be:

1. Access given to a vast area of agricultural and pastoral country.
2. An impetus given to mining on an extended scale throughout the most auriferous portions of the Province.
3. The profitable working of the deposits of iron, copper, plumbago, cinnabar, antimony, and other ores known to exist, rendered possible.
4. Economy of construction, owing to the greater portion of the land through which the proposed line would take its course being still the property of the Crown, to the absence of heavy cuttings, tunnels, or bridges, and to the facilities for procuring an unlimited supply of suitable timber.
5. Easy extension to all the outlying centres of population, such as Cromwell, with its valuable reefs, the Hogburn, St. Bathans, Blacks, Hamiltons, Drybread, Naseby, &c.
6. Easy connection with the Northern Trunk Line, thereby perfecting the railway system of the Province.

That in addition to these important prospective advantages, such a line would immediately benefit a large and settled population, including persons engaged in various kinds of productive labour.

Therefore your petitioners pray that your Excellency will be pleased to direct an immediate inquiry to be made, and on a favourable report being received of the line recommended by your petitioners, will send it for consideration of the ensuing Session of the Legislature, and in the meantime direct that no steps be taken towards carrying out the line from Tokomairiro to Tuapeka.

And your petitioners will ever pray.

Appendix B.

Annual Approximate Traffic Estimate, Great Central Trunk Railway, Otago.

First Section, Waipahi to Ettrick, 36 Miles—42-inch Guage.

	Cr. £	s.	d.
Wool.—Sheep stock in 1875, 1,608,048; bales, 19,296; tonnage, 2,894 tons 8 cwt.; 36 miles at 6d. per ton per mile, *i.e.* about 2s. 8½d. per bale	2,604	19	2
Live Stock.—Sheep to market, 75,000, at per sheep per mile, ¼d.	2,812	10	0
„ Cattle, from 30,000 stock	950	0	0
„ Horses, carriages, and dogs	300	0	0
Meat Preserving Establishment at Clyde, say 2,000 tons at 18s.	1,800	0	0
Timber.—300,000 superficial feet per week from Tapanui Steam Sawmills; present cartage rates 7s., reduced to 5s., at 5s.	3,900	0	0
Minerals.—Lime (from Teviot), and Lignite, 3,000 tons at 18s.	2,700	0	0
Merchandise.—11,000 tons, being, at one ton per head of population, at 18s.	9,900	0	0
Agricultural Produce.—100 tons per week, 5,200 tons at 6d. per ton per mile, at 18s. ...	4,680	0	0
Gold.—100,000 ounces per annum, at 1d. per ounce	411	13	4
Mails.—At same rate as P.O. Contract; Palmerston to Clyde, *i.e.* per mile at £12 10s.	450	0	0
Police, &c., say	450	0	0
Passengers.—50 per day to and fro; 36 miles at 2d. per mile, 313 days at 6s. ...	9,390	0	0
Miscellaneous.—Parcels, &c., at 5 per cent. on total	2,017	9	6
Gross receipts	£42,366	11	6

	£	s.	d.
Brought forward—Gross receipts	42,366	11	6
Dr.			
To working expenses, £500 per mile per annum on 36 miles, £18,000; contingencies, 10 per cent., £1,800	19,800	0	0
Net Revenue	£22,566	11	6
To interest on constructive capital, 36 miles £180,000, at 5 per cent.	9,000	0	0
Net surplus balances against sinking fund &c., representing 7½ per cent. profit, being altogether 12½ per cent. per annum upon capital expenditure ...	£13,566	11	6

J. MILLAR, F.S.A.,
Consulting Railway Engineer.

Dunedin, 1st August, 1872.