1873.

NEW ZEALAND.

REPORT OF ASSISTANT ENGINEER-IN-CHIEF.

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

Mr. BLACKETT to the Hon. the MINISTER for PUBLIC WORKS.

SIR,— Public Works Office, Wellington, 30th June, 1873.

I have the honor to forward my annual report on road work executed under the Immigration and Public Works Acts in New Zealand, up to 31st May. The works in the different districts have steadily progressed during the year, with, however, varying degrees of speed, according to the natural or other difficulties encountered.

To the north of Auckland the work is necessarily divided into many small sections, and is scattered over a large area, and the unfinished nature of the works prevent any very great or real benefit being generally felt, until the several links in the lines of communication are completed.

In the Waikato, the same remarks will apply to a great extent, as the works were only commenced in January, and none of the projected improvements are yet completed.

In the Bay of Plenty, real progress has been made, as is evidenced by the establishment of coach traffic through to Taupo, and beyond to Napier, between which and the Thames a considerable traffic in cattle and sheep is also carried on along the newly made road. The other short roads in this district are also of real value, and are gradually opening up the interior of the country, and rendering travelling safe and expeditious.

The same may be said of the Hawke's Bay and Poverty Bay districts, over which a network of roads is gradually extending. Considerable progress, it will be seen, has been made in the western district of Wellington Province, in the road made through the Seventy-Mile Bush, both north and south of the Gorge; and on the West Coast the works have steadily advanced, although the progress has not been rapid, on account of the various difficulties and delays incident to carrying on works in a purely Native district, subject at all times to the open or indirect opposition of the Natives.

In Westland, the scheme of roads originally laid out has nearly been accomplished, and the country is reaping the benefit of increased facilities for communication from end to end, as well as in the Lower Grey Valley; and in the Province of Nelson the works projected have been successfully carried out, many of them under very exceptional difficulties, arising from long continuance of wet weather—a complete line of communication now being completed up the Grey Valley, and down the Inangahua to the Buller.

The progress for the year will, I trust, be considered satisfactory, and the details of the various works, as supplied by the District Engineers in charge, are described below.

ROADS NORTH OF AUCKLAND.

(T. HEALE in charge.)

The general scheme of these was described in last year's report, the intention of the Legislature being to provide an uninterrupted line of communication from south to north, partly by road and partly by water, with cross roads at intervals joining the East and West Coasts, and to spend on this a sum of £60,000, to be spread over four years. Surveys were then in hand, and some portions of the works were also in progress; but to expedite the work as much as possible, and to enlarge the scheme, it was arranged with His Honor the Superintendent of Auckland, who made the proposal, that £10,000 should be spent under the supervision of the Provincial Engineer, in work extending from the North Shore to the Wairoa River, including the following, namely:—

1. Improvement of the main road, Auckland to Kaukapakapa *via* Riverhead, including four bridges.

2. Improvement of road, North Shore to Mahurangi, *via* Wade, including two bridges.
3. Main road, Mahurangi to Kaukapakapa.
4. Improving road, Kaukapakapa to Port Albert, including bridge at Warehine.
5. Improving road, Mahurangi to Mangawai and Port Albert.
6. Road, Mangawai to Waipu and Mangawai to Te Paparoa, including bridges.
7. Bridge over Waipu.
8. New road, Waipu to Mangapai, and improving present road.
9. Road, Paparoa to Matakohe, Toka Toka and Arapohue, to join Mangakahia Road.
10. Improving road, Mangaturoto to Waipu, and opening road to Mangapai through Waikiekie.
11. Road, Otamatea to Inland Settlements, and Mangapai to Wairoa.
12. Improving road, Mangapai to Wangarei, including bridge.
13. Road, Whangarei to Wairoa, including cost of obtaining land.
14. Road, Whangarei to Whangarei Heads, including bridge.

Of the progress made with the above works, no detailed report has been received, but a sum of about £7,000 has already been expended on them.

As in the district north of Auckland there is a large Native population and many Native interests and peculiarities to be met with and provided for, other roads were placed immediately in charge of the Hon. the Native Minister, and are as follows:—

1. Waitangi to Taheke. 2. Taheke to Hokianga Heads. 3. Kaikohe to Wairoa. 4. Whangarei to Kawa Kawa. Nos. 1, 3, and 4 are being supervised by Mr. Marsden Clarke and Mr. Wilson; and No. 2, being through Native lands, is in charge of Hon. Wi Katene. No. 5. Waimate to Kaeo. 6. Mongonui to Ahipara and Kaitaia. 7. Ahipara to Hokianga. 8. Whiruiaki to Takauae, on southern side of Hokianga River. 9. Kaitaia to Awanui Portage. 10. Mahurangi to Port Albert. 11. Waimate to Waihou.

The work executed on certain sections and subsections of the above is described below:

Mangakahia and Kaikohe (part of line Wairoa to Kaikohe).—This new line of road will be completed in a few months, and will then be a serviceable bridle-road, which could easily be made available for drays. Formerly it was a heavy day's journey from Kaikohe to Mangakahia; but when this work is finished, the same journey may be performed easily in four or five hours. The total amount of work done on this section is as follows:—9½ miles of bush clearing; 130 chains of side-cutting, 6 feet wide. No metalling has been done.

Okaihu and Waimate.—This has long been used as a dray road, but has been improved by altering the gradients, which were formerly 1 in 5 or 6, to 1 in 13 or 14, and it is now one of the best in the district. Three miles have been cleared of stones and vegetation, and 40 chains formed, with four culvert-bridges and three culverts. No metalling has yet been laid.

Waimate and Waitangi.—This is, strictly speaking, the Waitangi end of the Great Trunk Road, and the only outlet for the finest districts in this part of the Island. Although the traffic on this line is second to none north of Auckland, the road is probably one of the worst in condition, from the junction of the Waimate and Kaikohe roads to Haruru. It crosses twenty-three streams and swamps, over which are only one bridge and seven culverts erected; the remainder have to be forded, and many have very steep banks or very muddy approaches. The carting is performed by strong teams of bullocks, as the roads are quite unsuited for horse vehicles of any kind; 95 chains have been formed on this road.

Pekekaka to Kaikohe is a branch of the Great Trunk Road, terminating at Taheke.

Kaikohe and Taheke.—This is almost entirely a new line. The road formerly used was surveyed by the Provincial Government, and made passable for drays, but is now thoroughly impracticable, and will never make a good road, on account of its heavy gradients. The new line has only lately been surveyed, but the cost of opening it will be less than that of making the old road passable; already 3 miles 66 chains have been cleared through bush and scrub, &c.

Waitangi to Te Ti.—This road is expected to be completed very shortly, as also the contract for clearing about two miles of bush on the road from Keri Keri to Whangaroa, beyond which, towards Mongonui, a survey of five and three-quarter miles of road has been made, and plans and specifications prepared for the work, which extends across a difficult hill and a long tidal mud-flat. Most of the works in this district are progressing rapidly, and many difficulties at first apprehended or met with amongst the Natives have been overcome, and the Natives, as a rule, are working cheerfully.

Awanui and Kaitaia Road.—Two contracts, including about three miles of work and two long bridges, are in progress on this road, and the survey in extension of it to Ororu, near Mongonui, is completed.

The bridge over the Ororu, with approaches, is also completed; it is 130 feet long. From Awanui Portage northwards to Rangaunu the line has been surveyed and reported on—no work done.

Mahurangi District.—On the new line of road to Albertland nearly two miles have been completely formed, over very broken forest country, with bridges and culverts. The continuation of this line northwards to Hoteo, about six miles, has been well explored, and the survey completed. From Hoteo onwards to Albertland, the country is open and covered with fern,

presenting no difficulties. A survey has been made, but some alterations are required to meet the action of the Road Board and Provincial Government.

The contract for building a bridge over the Mahurangi River has been let. The bridge will be 161 feet long, and a design has been prepared for a bridge over the Hoteo River, 140 feet long, with a centre span of 60 feet; but the work is not yet let.

WAIKATO DISTRICT.

(W. H. Clarke in charge since 16th January, 1873.)

Great South Road.—Mercer to Ngaruawahia. Three contracts have been let on this road, namely,—

No. 1. For metalling from Mercer to Whangamarino Bridge, length 5,400 feet. This work has been suspended on account of the wet weather. The road is refascined for about two-thirds of its length, and is quite passable. Fascines are on the ground in sufficient number to complete the work shortly as regards fascining, and the metalling will be proceeded with when the weather becomes drier: one small cutting through a hill is also nearly finished.

No. 2. Raising and embanking road from Whangamarino Bridge to Mere Mere Hill, 8,000 feet in length. This is now formed to the full width and height specified, forming a good solid road where no side road exists. A good summer road has been left at the side for more than half a mile, with turn-offs from the bank, which along this portion is still slightly soft, but will carry a horse.

No. 3. For providing road metal, and carting it to Taupiri Gorge. The furthest distance to cart is from Mangawara Bridge, about 7,100 feet. The contractor has opened the quarry and put in a tramway, and will shortly begin quarrying.

A small contract for fascining, raising, and gravelling the Great South Road through Hopu Hopu School Reserve has been let, and is now nearly finished.

The Whangamarino Bridge, in contract No. 1, and Mangawara Bridge, have been repaired, also two culverts; and one new culvert has been put in, and the road has been fascined and drained in several places where such work was needed.

The punt used for crossing the Waikato at Ngaruawahia requires some alterations and repairs to render it safe and serviceable. These are now being proceeded with—as are also some necessary repairs to the bridge at Cambridge, where the soft rock on which one of the piers rested had cracked and rendered the approach unsafe; this work is nearly finished. The bridge at Alexandra is also under repairs, for which the timber is ordered.

Moanatuatua Swamp Road.—Constabulary labour and hired drays have been employed on the Rangiaohia Swamp Road. Fascines have been laid along the entire distance and covered with earth or sand to a depth of 12 inches and a width of 16 feet, for 94 chains, leaving 43 chains yet to be sanded.

The Pukekura Swamp Road has had no work bestowed upon it for some time, and consequently the fascines are being destroyed, leaving the road in a bad state.

Besides the above, a considerable amount of work has been done from time to time by parties of the Armed Constabulary, on works which had been laid out before the appointment of an engineer to this district, a schedule of which, for twelve months ending 31st May, is as follows:—

Hamilton West.—Earthwork, 2,527 cubic yards; forming, 53 chains; fascines, 1,320.

Hamilton East.—Earthwork, 561 cubic yards; forming, 60½ chains.

Hamilton and Cambridge Road.—Earthwork, 906 cubic yards; forming, 313 chains; 2 culverts made and others laid.

Moanatuatua Swamp Road.—59·80 chains of 7-feet ditch deepened from 2 feet to 5 feet; 4¾ chains of ditch 7′ × 4½′; 18¼ chains of ditch, 3′ × 2′; 7¼ chains of ditch 2′ × 2′; 1,700 fascines cut and carried 100 yards; 22 chains fascining; 12½ chains fascines laid; 90 chains turf spread; 94 chains of sand spread: 15 chains outfall ditch, 2½′ × 3′; one culvert, 15′ × 7½′.

Alexandra and Whata Whata Road.—Earthwork, 3,153 cubic yards; forming, 71 chains; fascines, 400.

Ngaruawahia and Whata Whata Road.—Earthwork, 1,543 cubic yards; forming, 36 chains; Ohote Creek Bridge repaired.

Ngaruawahia Ferry.—Earthwork, 1369 cubic yards; fascines, 250.

Ngaruawahia and Hamilton Road.—Earthwork, 320 cubic yards; forming, 39 chains.

Taupiri Gorge, Great South Road.—Earthwork, 563 cubic yards.

Tamahere and Cambridge Road.—Levelling, 324 chains.

Hamilton and Ohaupo Road.—Earthwork, 2,548 cubic yards; forming, 8 chains.

Cambridge Bridge.—Sundry repairs.

The number of Armed Constabulary of all ranks employed on roads in Waikato during twelve months varied from 22 to 83, or an average throughout of 59.

In connection with this district it is necessary to make a few general remarks on the roads and the manner in which they have been laid out. As a rule, those in use are on the highest ground within reach, running along the backs of the spurs, rising and falling continually, and in many places steeply, and any improvements attempted on such roads may be described as a waste of money. The country being generally flat between the rivers, roads almost level

can be obtained with a little care and the crossing of a little swamp at intervals, and time bestowed in laying out these roads in a proper manner will be well spent.

The worst roads occur between Hamilton and Te Awamutu, Otaupo to Alexandra, Alexandra to Ngaruawahia, Whata Whata to Hamilton; and on the best roads now existing there are many places capable of improvements—the Tamahere Gully on the main road Hamilton to Cambridge, may be quoted as an instance; and in reference to the work which has been done and is being done by the Armed Constabulary and by the Road Boards, it may be stated that the improvements gained will bear no proportion to the amount of expenditure and work, much of which has really been thrown away by adhering to the old lines of road on the spurs, which were no doubt originally the driest and most available ground, but over which it will require an enormous expenditure to make really good roads, the work undertaken by the Road Boards consisting very frequently of cuttings to reduce the grades of hills from 1 in 6 to 1 in 9 or 1 in 10; when, by judicious alteration of routes, really good level roads might be obtained at less expense. There is no doubt that a few months spent in surveys of better lines would be productive of real good and much future economy; and these could be carried on during the winter months, in readiness to begin the necessary works in the spring.

Nearly all the old bridges on the main lines of road are in a bad state of repair, some of them quite unsafe, and many renewals will ere long be necessary.

BAY OF PLENTY.

(A. C. Turner in charge.)

Tauranga to Taupo.—Dray road formation, 18 feet wide. The work on this section, extending to Atiamuri, Waikato, which has been completed during the last year, consists of seventeen and three-quarter miles of formation of which one mile is through forest and the remainder through open land. This completes the formation over this length of road, viz. sixty-six and a half miles, and includes 495 feet of bridging, 81 culverts, and 19,948 cubic yards of rock excavation distributed as follows—viz., 1,209 in the Mangorewa Valley, 655 in the Hemo Gorge, 202 at the Kotukorua Bridge approach, and about 800 at the Atiamuri Bridge approach. Besides the above, a deviation of thirty-eight chains has been completed through forest, mostly in heavy side-cuttings, and including five culverts and one bridge of 9 ft. span. This was rendered necessary by the heavy floods in April, 1872, which destroyed the line as first laid out.

This road is now sufficiently completed to admit of traffic for wheeled vehicles, but some works are yet unfinished—viz., road excavation at the Atiamuri Bridge approach, about eighty culverts in side-cuttings for which the timber is being cut, and a few slight alterations and improvements now in hand; the bush portion, about eighteen and a half miles, will doubtless require metalling to maintain it in good order, and should form part of next year's work.

Tauranga and Kati Kati Horse Road.—This forms part of the main line of road to the Thames, and its formation—6 feet wide and 19½ miles long—was completed before the end of June, 1872. Since then the whole of the rivers, excepting the Wairoa, have been bridged, and twenty-three large culverts built, sufficiently wide for dray traffic. The bridges and culverts are as follows:—

Bridges, 254 feet, viz:—

Te Puna, plain, 52½ feet	Wainui, plain, 82½ feet
Waipapa, truss, 56 „	Whatakao „ 63 „

Culverts, all 12 feet wide, viz:—

3 culverts, 6 feet opening	9 culverts, 2 feet opening
4 „ 4 „ „	7 „ 12 in. × 12 in. opening.

Some of the traffic in cattle and sheep between Napier and the Thames has passed over this road; and the amount is increasing, so much so as to necessitate the formation being widened to at least 10 feet; and the Armed Constabulary are engaged on this work between Judea and the Wairoa River, about three miles, and have already completed about 10 chains of swamp.

Between the Wairoa and Ongatete (the end of the road) the work is being done by contract and is progressing favourably. On its completion it is proposed to let the maintenance of it for twelve months by contract. The survey of the extension of this road to the confiscated boundary, towards the Thames, will be proceeded with shortly.

Maketu and Rotorua Dray Road.—Thirty-eight miles. Several improvements have been made on this road during the past year, viz. the erection of a truss bridge, 51 feet in length, over the Taheke, with side-cutting for approaches 62 chains long; also side-cuttings along the shore of Roto-iti, between the Taheke and Morea, 37 chains, including 558 cubic yards of rock; 16 chains of side-cutting leading into Maketu; repairs and reconstruction of Mourea Bridge, 86 feet in length, plain; one 10-feet bridge over a stream on west side of Kaituna River, and two small bridges beyond the Ngae. Timber is being prepared for the erection of a 40-feet truss bridge over the Puheringa River, and will shortly be delivered. Other improvements are in progress, such as alterations in grades at Omatuku, 1 in 6 to 1 in 12, under contract with Natives, who, however do not evince a disposition to complete the work as speedily as could be desired.

Rotorua and Tapapa Horse Road.—In length about twenty-seven miles. The survey of this road was commenced with a view to the work being executed; but it was afterwards considered advisable not to proceed with it at present, and the survey was therefore not completed.

Galatea to Ahikereru.—About eighteen miles, in the direction of Waikaremoana. It was expected that arrangements could have been made for the execution of this work during the year by Native labour, but the negotiations have not been successful.

Maketu and Whakatane Horse Road by the Coast.—Thirty-four miles. The work on this road since last report has consisted of the erection of a plain horse-bridge over the Otamarakau, and two similar bridges from the mainland to the island opposite Whakatane, respectively 69 feet and 340 feet long. The approaches to the two latter were formed by the Armed Constabulary stationed at Whakatane. Other work is required, but the Natives demand too high a price for it.

Matata and Te Teko Horse Road.—Up to June, 1872, about 10½ miles, comprising the first section to Otakiri, were nearly completed. Since then the road has been formed over 7 chains of heavy swamp near Otakiri, and a plain bridge 27 feet long erected over the Umuhika River. The whole of this section is now formed 8 feet wide, with gradients sufficiently easy to admit of its expansion into a dray-road at some future time.

Of the second section, Otakiri to Te Teko, four and a half miles, the work left unfinished last year has been completed, viz., about three and a quarter miles, and a landing formed on both sides of the Terawera River for the ferry-boat. 48½ chains of this year's work lie across a very bad swamp and through dense manuka scrub, and since this was formed it has been found necessary to raise it by fresh fascines, the subsidence being so great. This has been done by the Native Contingent under Captain Preece, and the road is now in good order.

Opotiki and Otara Dray Road.—Five miles. The widening and other improvements on this road were about half completed in June, 1872; since then the work has been finished, with two additional culverts near the Town Belt, and the whole is now in excellent condition.

Opotiki and Ohiwa Horse Road along the Coast.—Eleven miles; of this about one and a quarter miles from the Waioeka River, opposite the town of Opotiki, to Hunter's Creek, have been formed during the last year by the Armed Constabulary, 8 feet wide, including one 6 feet culvert. Since its formation it has been used by the settlers as a dray road in conveying goods from Ohiwa Harbour, and has been much cut up. This points to the necessity of widening and otherwise improving it.

Ohiwa and Waimana Horse Road.—Eight and a half miles. This road leads from the head of the Ohiwa Harbour to the Waimana Valley as far as the confiscated boundary. The work has been contracted for by the Urewera Natives, and is all but completed.

Tauranga and Tapapa Horse Road.—Thirty miles, including nine miles of forest. Eight miles have been formed in such places as were necessary since June, 1872, including one 12-feet culvert and one 6-feet bridge; and the Omanawa dray-bridge, 110 feet long, near the end of the completed work, is in course of construction, and when completed the road to it will be fit for dray traffic, and will form part of the projected line of road to Cambridge.

Opotiki and Poverty Bay Horse Road.—About seventy-five miles long. The formation of this work has been let by contract to Mr. L. Simpson, who has completed about eight miles at the Opotiki end, and about twenty-five miles at the other, making thirty-three in all. The contractor is under agreement to use Native labour on this work, but has great difficulty in keeping the Natives to their work, especially at the northern end, and his progress has not therefore been so great as could be desired. The country is very much broken and mountainous, and two-thirds of the road is through dense forest.

Tauranga and Judea Road.—Three-quarters of a mile. Was reported last year as being completed, and has been found to be of the greatest service to the settlers on the Otumoetai Block. It forms part of the roads already described, to Cambridge and to the Thames, which branch from it at Judea. It is now kept in repair by the local Road Board.

Matapihi and Maketu Dray Road, by the coast; reported last year as being in good order, in which it still remains.

Opotiki and Waioeka Dray Road.—Five miles. Ninety-five chains of this were reported as being formed last year; the remainder is now in progress by the Armed Constabulary, and one mile and sixty-six chains are completed, as also a truss bridge 38 feet long over a branch of the Waioeka. This promises to be a good road, and will be of great service to the Waioeka settlers.

Whakatane and Ohape Horse Road.—Three and three-quarter miles have been kept in repair by the Armed Constabulary stationed at Whakatane.

Ohineroa Horse Road.—Fifteen miles. No work has been done on this, as the Natives have not come to any agreement.

Te Teko and Galatea Dray Road.—Thirty-one and a half miles, reported last year as being opened for dray traffic. Since then easier grades have been laid off in the worst places, and are now being reduced by the Native Contingent under Captain Preece. Nearly nine miles up to Fort Clarke have been thus altered.

Whakatane and Te Teko Horse Road.—Thirteen miles. Endeavours were made to arrange with the Natives for the construction of this road, but without success, their demands being in excess of the value of the work, and it was therefore commenced by the Native Contingent. To this, however the Natives objected, and the work has since been stopped.

Horo Horo and Te Whetu Horse Road.—This is about seventeen miles in length, and branches from the Tauranga and Taupo road, about half-way between Lake Rotorua and the Atiamuri Bridge, running westerly into the Patetere country. The whole of the work has been

finished during the last twelve months with the exception of some rock in the side-cuttings, and the road is now used by travellers from Cambridge to Rotorua.

Rotorua and Tarawera Dray Road.—About seven and three-quarter miles long. The survey of this was finished in March, and two miles of the formation let to Natives by contract; another mile of heavy side-cutting will be made by the Militia under Captain Mair, and the remainder will be let by contract to other natives. Two bridges will be required of 18 ft. and 20 ft. respectively, and will be completed along with the rest of the work, which when completed, will allow traffic for wheeled vehicles to Tarawera Lake, and be convenient to travellers visiting the Rotomahana Springs.

Opotiki Table Land Road, about two and three-quarter miles in length, was surveyed in April last; it leads from the town of Opotiki eastward across the Otara River, ascending the table-land on the east side of the river. One section of one and a quarter mile is under contract, and the second will shortly be let by tender, including formation in such parts only as really require it. Although a short road it will open a fine block of land, hitherto inaccessible for drays.

Cambridge and Taupo Road.—Atiamuri to Cambridge, approximate length fifty-five miles. This line was explored in September, 1872, and reported on in October. A better route than that ordinarily travelled was observed, of which about eight miles immediately north of Atiamuri were the most difficult, the rest of the distance being more favourable for road making. An approximate estimate of the cost of opening this route for drays is as follows, namely:—

Eight miles, @ £120 a mile	£960	0	0
Forty-seven miles, @ £80 a mile	3,760	0	0
Three bridges, about 90 feet	360	0	0
Culverts, &c.	200	0	0
	£5,280	0	0

The work has not been proceeded with as the Natives to whom it would have been given objected to the necessary survey being made until a price was agreed upon for construction, and the matter remains thus for the present.

NAPIER TO TAUPO—TAUPO TO ATIAMURI (WAIKATO), ALSO WAIROA AND POVERTY BAY AND EAST COAST DISTRICTS.

(E. H. Bold in charge.)

Road, Napier to Taupo.—Section 1, *Taradale to Pohui.*—Twenty-three miles *via* Glengarry. By this route it is intended to connect the Hawke's Bay Provincial Road with the Taupo Main Trunk Road, which it will join at Rangimaipapa Hill, about two miles south of Pohui, avoiding the Harbour Crossing and the numerous fords of the Petane River. The survey of this road is so far in progress that tenders may shortly be called for its construction.

Subdivision, Napier to Kaiwhaka.—Twelve miles. This is maintained by the Provincial Government, but will be cut out of the main line when the route *via* Taradale and Glengarry is opened.

Kaiwhaka to Mohaka.—Sixteen miles. This has been maintained and improved during last year, employing from three to six men according to state of weather. It is intended to metal two and a half miles near Titiokura and Pohui, where the ground is very soft; and good limestone metal has been found for the purpose at the Titiokura Saddle, a moderate distance from the road. On this section improvements are required at the Mohaka River, consisting of the widening of the road and the erection of 6 chains of parapet fence.

Mohaka to Tarawera, Lower Waipunga Bridge.—Sixteen miles. On this section, during the last year several contracts have been completed, as well as work by the Armed Constabulary, such as culverts and bridges, and rockwork, which before were a bar to through traffic. The road has also been generally improved and widened at the sharp turns, but more work in this direction is required, viz. a mile and a half of metalling, and about half a mile of road-widening, from 12 feet to 20 feet, mostly on the sharp curves.

Tarawera to Runanga.—Nine miles, between the Lower and Upper Waipunga Bridges. The work has been very heavy on this section, consisting chiefly of deep cuttings in rugged and broken country covered with bush, and though yet incomplete the road has been opened for traffic. The work in hand consists of widening 50 chains of road from 10 to 18 feet; and that required to place it in a fair state for present traffic comprises about 20 chains of metalling and 800 yards of rock excavation.

Runanga to Tapuaeharuru, Taupo Lake.—Thirty-eight miles. About fifteen miles of this have been permanently formed by parties of Armed Constabulary from Runanga, Opepe, and Taupo posts—the two latter having executed about thirteen miles of this distance. The works in progress are the formation of 120 chains of road, to avoid the Tohuawaka Hill, with all necessary culverts and small bridges; also the supply of timber for culverts and box drains for eighteen miles of road at the Taupo end. Further works are needed over about seven miles, between Rongo Te Ahu (near Runanga) and Opepe, consisting of light formation, with the necessary works for drainage, proposed to be executed by Native labour or parties of Armed Constabulary.

Maintenance.—It is suggested that the maintenance of the Napier and Taupo road be let out in sections; the part most requiring it is that between Kaiwhaka and Runanga. About forty-one miles beyond Runanga, the road across the plains with ordinary traffic retains a very fair surface and will require little attention. It is recommended however that all the softer portions of the road should be metalled as speedily as possible.

The following is a schedule of works executed on the above line of road, Napier to Taupo, during the eleven months ending 31st May:—Road formation, 18 feet wide, 519 chains; earth excavations, 155,221 cubic yards; rock do., 5,827 cubic yards; catch-water drains, 3 feet × 3 feet average section, 50 chains; bush felling and clearing, 100 square chains; mitre drains fascined with brush manuka, 35 chains; timber culverts, five, 12 in. square, 128 feet run; forty-two, 16 in. square, 1,099 feet run; seven log do., 36 in. square, 260 feet run; total, 1,487 feet; thirteen stone culverts, 24 inches square, 425 feet run; one bridge, 24 feet; sawn timber, 8,340 superficial feet; twelve stone retaining walls, 143 cubic yards; sod do., 304 cubic yards; road fascined, 12 feet wide 3¾ chains, corduroyed 4 chains, and metalled 16 chains; line surveyed, 50 miles.

The total amount of work done on this road under "Public Works Act, 1870," up to same date, is as follows, over ninety miles:—Earthwork, 470,687 cubic yards; rock, 18,433 cubic yards; bush cutting, 973 square chains; formation, with double ditch, 574½ chains; culverts and box drains, wood and stone, varying in size from 12 in. square to 4 feet × 3 feet, 339 in number, and of a total length of 7,748 feet run; side drains fascined, 135½ chains; stone retaining walls, 143 cubic yards; sod do., 437 cubic yards; sawn and squared timbers, 55,340 superficial feet; six truss bridges, 335 feet; nine plain bridges, 195 feet; besides maintenance, haulage of timber, and sundry small works.

Road, Taupo to Atiamuri.—Towards Tauranga, twenty-four miles. During the past twelve months the works executed are as follows, viz.:—Erection of a truss bridge over the Waikato at Atiamuri, with one span of 52 feet, and one land span of 17 feet, the work on which has been executed in a satisfactory manner. The timber, mostly totara, and ironwork being found by the Government, and the labour by the contractors.

The formation of about 146 chains of road beyond the bridge, and the fixing of numerous box-drains and culverts, containing altogether 9,000 feet of timber, as well as sundry improvements of the road at different places. The bridge over the Waikato, at Tapuaeharuru, is also under construction, and nearly completed.

Several improvements on this section of road will be required, such as replacing the first rough bridges built by Native labour with substantial structures, and generally improving the grades and cuttings as first carried out.

The schedule of work on this for past year is as follows:—Erection of Atiamuri Bridge, 70 feet span, including 4,000 extra feet of timber; road formation, 146 chains; bridge approaches, 8 chains; culverts, 16 in. square, 200 feet run; Taupo Bridge, in progress, 84 feet span; rock, 150 cubic yards; haulage 8 miles 12,000 feet timber; haulage 2 miles 18,000 feet; haulage ironwork from Napier; line surveyed, 2 miles.

The total work executed stands as follows:—Earthwork, 30,509 cubic yards; rock, 450 cubic yards; formation, 18 feet, 1,311 chains; drains, 3 feet, 20 chains; timber squared, 2,660 feet, or sawn, 33,189 feet; scrub clearing, 100 square chains; bush clearing, 30 square chains; one plain bridge, 24 feet; one truss bridge, 70 feet; box-drains and culverts, 13,300 feet; line surveyed, 22 miles.

Wairoa District, Hawke's Bay. — A difficulty has been experienced in obtaining the requisite supply of labour, and the works consequently have not made such progress as could be desired.

Wairoa to Opoiti.—Cart road, twelve miles. This has been before described. All the proposed contracts have been completed, with the exception of a small one for drainage and the erection of Scamperdown Bridge, which is not progressing speedily, on account of the difficulty of procuring suitable totara timber, which had to be brought from a distance by sea from the forest south of Napier. This road will only be suited for light traffic during summer and dry weather, the soil being very light; and metal is only obtainable at great distances and in small quantity, rendering the operation of metalling too costly to be undertaken for the present small amount of traffic.

The following is a schedule of the work executed during the year:—Earthwork, 35,050 cubic yards; rock, 2,335 cubic yards; drains, 2 feet, 14 chains; twenty-three culverts, 460 feet run; nine bridges, 170 feet; total length of contracts, 270 chains; line surveyed, 10 miles.

The totals are as follows:—Earthwork, cuttings, and banks, 35,050 cubic yards; rock, 2,335 cubic yards; road formation with double ditch, 342 chains, 12,222 cubic yards; drains, 2 feet average, 14 chains; thirty box-drains and culverts, 600 feet run; twelve bridges, 219 feet run; timber used, totara and matai, 46,462½ feet; contracts, 612⅔ chains; line surveyed, 14 miles.

Te Kapu to Waikaremoana.—Bridle-road, twenty-nine miles. The formation of this road has been very fairly executed by Native labour, under ten contracts, mostly undertaken by the Urewera and Wairoa Tribes, who have also charged themselves with the maintenance of the road under contract for a year. The grades are generally good, and the road could be improved and widened for cart traffic if ever found desirable. The establishment of a self-acting punt on the Wairoa at Te Kapu, and of a canoe ferry at the Waikare-Taheke, is recommended.

The amounts of work executed during the year are as follows:—Earthwork, 27,628 cubic yards; rock, 4,369 cubic yards; cuttings and embankments, 653½ chains; fascining and embankment, 4 chains; bush and scrub clearing, half-chain wide, 34 chains; scrub and fern, 75½ chains; thirty-one culverts, 240 feet run; nine bridges, 7 feet wide, 192 lineal feet; timber, 17,675 square feet; contracts, total, 2,392½ chains; line surveyed, 29 miles.

Opoiti to Poverty Bay.—Inland, estimate forty miles. The work on this track has been only of a preliminary character, with a view of choosing the best line, which, as selected, will pass through the Ahimanu country, reaching Poverty Bay flats near Patutahi. Twelve miles have been surveyed, and divided into four contracts to be undertaken by Natives, and the rest will be surveyed shortly; but it is apprehended that the scarcity of labour will prevent the early execution of the work.

Bridle Track: Wairoa—Poverty Bay—by Coast to Maraetaha.—Fifty-eight miles. The only new works undertaken are the contracts for maintenance on that portion between Mahunga and Maraetaha, some twenty miles through the bush, including small repairs and removal of fallen trees. The bush portions of this track will be improved by the felling of the timber for the telegraph line, which will be carried this way.

The total amount of work done on this road amounts to—Bush clearing, 12 feet wide, ten miles; side-cutting, 7 feet wide, seventeen miles; culverts, 100 lineal feet. None of this was done during last year.

Gisborne to Ormond.—Twelve miles. The contracts for fascining and draining between Makaraka and Ormond, eight and a half miles, have been completed, and a few improvements to the cart road have been made beyond Ormond by the Armed Constabulary stationed there. Some parts of this road are in a bad state and require metalling, material for which can be procured from the Waipara River beach, about a mile and a half distant from the road.

The following is a list of works for the year:—Formation and embankment, 20 feet, with double ditch, 332 chains; metalling approaches to eight culverts, and repairs; embankment, 24 feet by 18 inches, 14 chains; formation 30 feet, 19 chains; side and outfall drains, with one 10-feet culvert, 101 chains.

The total amount of work is as follows, viz.:—Line surveyed, 13 miles; side and outfall drains, 12-feet section, 1,496 chains; culverts, 152 lineal feet; fascined formation, 16 feet, 15 chains; formation and embankment, 20 feet, 405 chains; road metalled, 12 feet by 12 inches, 23 chains; also approaches to eight culverts.

The works on the branch road Makaraka to Arai, for the year, are—Formation, 20 feet, 107 chains; side and outlet drains, 61 chains; bush clearing, 25 feet, 17 chains; bush clearing 66 feet, 30 chains; grubbing and clearing 25 feet, 20 chains. And the total works are—Line surveyed, 4 miles; side and outlet drains, 274 chains; formation 20 feet, 107 chains; bush-clearing 66 feet, 30 chains; grubbing and clearing 25 feet, 20 chains; culverts, 16 feet.

Gisborne to Maraetaha by Coast.—Twelve miles. The bridge over the Karawa Creek, reported as being in hand last year, has been completed, in three spans of a total length of 67 feet, in a satisfactory manner; also three 10-feet culverts and one 4-feet culvert. No other work of importance has been done on this road, except keeping track clear of fallen timber, &c.

Bridle Road, Gisborne to Hick's Bay, by Coast.—One hundred and twelve miles. The survey of this has been completed during the year, and the work divided into thirty-two sections to be let to the Native tribes. Up to December very little progress was made, owing to Native opposition; but since then twenty-two contracts have been let and thirty-two miles are reported as completed, the Natives working steadily on the parts yet in progress, which are near completion.

Ferries have been established on this line, at Pakarai, Uawa (Tologa Bay), Waiapu, and Ohutua, for subsidies averaging about £10 each. The work is as follows for the past year:—Surveyed, one hundred and seven miles; side-cutting, 7 feet, thirty-two miles, 24,230 cubic yards; forty-four culverts, 111 feet. And the total work is—Survey, one hundred and seven miles; road formation, 7 feet, thirty-two miles; culverts, 111 feet; bush clearing, 33 feet, two and a half miles.

Te Awanui to Te Horo.—Dray road, three miles. This will connect the landing-place at Awanui with the Waiapu Valley, where are Native plantations. The survey, about three miles, has been completed, but the work has not yet been contracted for.

SEVENTY-MILE BUSH DRAY ROAD.

NORTHERN DIVISION, ABOUT THIRTY-SEVEN AND A HALF MILES.

(D. Ross in charge.)

At the date of last year's report the bush had been felled and cleared, and the only works in progress were the building the Mangamanaia Bridge of 49 feet span, and the formation of two chains of heavy cutting at the Manawatu Gorge. After their completion, no further works were undertaken till the end of October, when road formation was commenced by the Scandinavian immigrants who arrived by the "Hovding" and "Ballarat." One party of these were located near the edge of the Ruataniwha Plains, between Te Whiti and the Mangatewainui (Norsewood). They have completed six and a half miles of formation between Takapau, at the

Any works undertaken here should not only be designed for the protection of the town, but for giving at the same time good wharf accommodation to the shipping likely to frequent the Buller, should it be determined to connect it with the coal fields by railway. Taking for granted that such will be the case, endeavours should be made to carry out works of such a design as to deepen the water at the entrance of the river, and if possible give the navigation a more fixed character, preventing the frequent changes constantly occurring at the mouth, and which renders it both difficult and dangerous to enter.

A serious drawback to the construction of harbour works here is the absence of good stone in the neighbourhood, Westport being situated on a delta of the river, or on land formed by alluvial deposit. Granite is to be obtained at the Buller Gorge, some six miles distant, the only means to transport which is by boat on the river, an expensive and very slow process. About five miles north of the town I examined the terraces, the surface of which is covered, for a depth of about 20 feet, with loose blocks of quartzose sandstone, very hard and durable in quality, and well suited for these works. These blocks are many of them very large and angular, and being loosely packed together, could be quarried without blasting. The projected line of railway to the Ngakawau would pass within a mile of these terraces; the country between being open flat land, a branch line could reach them with little expense. There are other points on this line of railway where I believe good stone will be found suitable for such works, but with a longer lead necessary.

The use of timber for protective works I consider out of the question; firstly, because of the impossibility to obtain good durable timber on the West Coast; and, secondly, because in practice it has been found that in this river no dependence can be placed on piles even 60 feet in length, driven 30 feet below the bed. During floods it has been found that the scour round them is so great as to entirely release them from their positions. The shingle on the bottom is small and easily acted upon by the current.

I have therefore come to the conclusion that stone must be employed for any works undertaken, the design and position of which only remain to be determined. It will be seen from the plan attached that a shingle spit extends from a point on the north bank to Wakefield Street, forming a natural protection to the banks for some distance below it. It also shelters vessels from the force of the stream, and guards them to a great extent from floating timber. This spit for some years has shown no change beyond a slight increase in length. I recommend that it should not be interfered with, beyond planting the up-stream end with willows where necessary.

A stone protection bank should commence at or near McLeod's Wharf under the shelter of this spit; this would be at the head of the position, available for mooring vessels. It should extend the whole length from that wharf to the point following the present river bank with a gentle and uniform curve. From the point I should continue it for 1000 feet in a more solid form and following the same curve, the effect of which will, I anticipate, be that the deep water channel will follow this wall, and consequently be thrown in a more direct course over the bar, undoubtedly deepening the water and straightening the channel.

In carrying out this work, a commencement should be made at the up-stream end, near McLeod's Wharf, by at first tipping in a rough stone bank, from a little above the level of high water, the outer slope being composed of the largest stone. This bank would of itself form a protection to the town, by keeping off the scouring action of the floods. By degrees this stone would find its proper bearing in the shingle bed; a face wall could then be built up on it from the level of low water, and when completed be backed up by the surplus stone in the bank. The extension of this wall for 1,000 feet seawards would of necessity take a different form. It could however be constructed of the same material, if blocks of sufficient size are procurable. These might be thrown in at random, and gradually extended outwards till the desired effect was produced. Being inside the bar it would not be required to stand against very heavy seas, so that a structure composed of loose stone blocks may be considered amply strong enough for the purpose.

I have provided in my estimate for a further protection to the coast line for a few hundred feet from the point, but consider that should the training wall be constructed there will be no necessity for this, as the shingle from the river will most likely be washed up behind it, where it will be safe from the scouring action of the river, forming a sure protection against further encroachments of the sea. My estimate for the construction of these works has been as carefully formed as it was possible under the circumstances; for at present no accurate information exists as to the probable cost of such work in the locality.

Stone bank from McLeod's Wharf to the Point, 2,700 feet long ...			£22,500
Building quay wall on above			5,180
Backing ditto with stone			900
Earth filling behind wall			4,000
Stone protection facing sea			900
			£33,480
Contingencies			6,696
			£40,176
Sea framing wall extending for 1,000 feet	£12,600		
Contingencies	2,520		
			15,120
			£55,296

The stone would require to be hauled about five miles by railway, and the means for doing this would consequently depend upon the construction of the latter.

It would take but a few months to construct the line up to the quarries, there being no engineering difficulty to contend against, beyond one or two bridges. Should the utmost despatch

be used in pushing on this length of line in order to obtain stone, several months must elapse before these works could afford material protection. Temporary means should therefore be at once devised to prevent further encroachment both from the river and sea.

On the shore, brushwood fascines, well tied down, would in a measure prevent the gradual melting away of the bank that now goes on at high watermark. On the bank of the river, the reserves previously proposed should be at once fenced off, and all places denuded of timber re-planted with willows. The bank across the overflow channel at Snag Falls should also be constructed at once, otherwise, before the possible completion of the proposed works, the port of entrance might be at the mouth of the Orawaite.

I have, &c.,
H. P. Higginson,
Superintending Engineer.

3rd July, 1873.

Enclosure C.

Mr. David Simpson to the Engineer-in-Chief.

Sir,— Grahamstown, June, 1873.

I have the honor to forward report and sketch plan of the navigation of the Thames and Piako Rivers, and also report and plan of flying survey of proposed railway between Shortland and the Waikato rivers.

REPORT ON NAVIGATION OF THE THAMES RIVER.

The Thames River receives the drainage of the western slope of the peninsula south of Shortland, and also the waters from a large portion of the great plain on its western bank, from Te Aroha upwards. The bar, on which there are 4 feet 6 inches at low water, lies one mile west of Grahamstown, the intermediate space being a mud-flat. The channel is thrown so far to the westward by a shell bank running off from the shore above Shortland, and only just covered at high water. Inside this bank, near Kopu, there is a good harbour, with 10 feet of water at low water, within a short distance from the shore. From Kopu the channel is good until you reach the first shore above Puriri, on which there are 2 feet 6 inches at low water (rise of tide, 7 feet). Between that point and Ohinemuri, there are three shallows with 2 feet 6 inches at low water (rise of tide 6, 5, and 4 feet), and the sandbanks are liable to shift during heavy floods. There are also between these points thirteen dangerous snags. The steamer at present plying between here and Ohinemuri draws 3 feet 6 inches, and makes the passage in about three hours, taking the tide with her. We have also a steam launch plying between here and Hikutaia, and drawing 2½ feet.

The steamer to Ohinemuri leaves the main river and goes up the Ohinemuri River to the settlement, a distance of three miles, of a tortuous course and with many dangerous snags. The Thames, for a distance of twelve miles above the junction of the Ohinemuri, is impeded by seven eel-pas and some dangerous snags. These eel-pas are composed of strong piles driven into the bed of the river and extending nearly across the stream, rendering the navigation dangerous, but not absolutely closing it, as steamers have passed them by daylight; the rise of spring tides are just perceptible up to this point. From thence upwards to the first rapids, near Te Aroha, there are many dangerous snags and several shallows or fords, but none with less water than 2 feet 6 inches during the summer.

With some difficulty we forced the boat over the first rapids, and found a tolerable channel for three miles up to the second rapids, passing several large snags, which would require removal. We were unable to force the boat up these rapids, and explored the river on foot for a further distance of sixteen miles, passing a third rapid, and found the river bed so full of snags as to be dangerous even for boats. This third rapid may be considered the end of any navigation. At this point a quantity of material has been landed for the use of Firth's run, having been brought up from Grahamstown in canoes. It must be borne in mind that at the time of our exploration the rivers were at summer level, and would be easy of navigation during winter if the snags were removed.

The Thames from Grahamstown to the first rapids, near Te Aroha, is admirably adapted for steamers of 2½ feet draft, the current not being rapid (two knots), and the bends sufficiently easy.

The proposed railway would cross the river about five miles below the first rapids, at the point where the great plain of this Province touches its western bank, and a steamer of ordinary speed would reach this point from Auckland in nine hours, or five hours from Shortland—the town of Hamilton, on the Waikato, being within thirty miles, and the road nearly level. A barge, with steam crane, would be the best means of clearing the snags, eel-pas, &c., and I estimate the cost (exclusive of the barge) at £900. This would be for the whole distance up to Mata Mata (Firth's run), and the cost to the proposed railway crossing £500.

REPORT ON NAVIGATION OF THE PIAKO RIVER.

The Piako River empties into the Firth of Thames about four miles to the westward of Shortland. The entrance is rendered difficult by immense mud-flats, the bar being of considerable extent, having only 1 foot at low water with a mean rise of 9 feet. After entering the river the stream becomes confined and tortuous, carrying 6 feet on the shallows, and a breadth varying from 2 chains to 40 feet for a distance of forty miles, where it receives its main tributary, the Waitoe. Up to this point the river winds through a low swampy country, and during heavy freshes the whole district between the Waitoe and the sea (with the exception of one or two slight elevations) is inundated. On this portion of the river there are some dangerous snags and several eel-pas. One of these is a very formidable structure; having been designed to stop the passage of any vessel during the last war, it occupies the whole breadth of the stream, with the exception of a centre passage just wide enough for our boat. Above the junction of the Waitoe the country becomes higher, and the river rapidly decreases in depth, becomes exceedingly tortuous, and so full of snags that we could not navigate it with a canoe; we

explored the river on foot to Te Awa, Waikato, a distance of sixteen miles, where all navigation is stopped by a fall of 10 feet. This point is near where the proposed railway would cross the Piako, and is about thirteen miles from Hamilton.

A few miles below this we passed an outcrop of coal on the river bank, but the Natives would not allow the smallest portion to be removed, and a party who came up shortly after, for the purpose of putting down a trial shaft, were driven off with threats. We explored the Waitoe in a canoe up to the point where the proposed line would cross it, but found it so shallow, tortuous, and full of snags as to render it useless for navigation. Heavy rain falling at this time, on our return passage, after leaving the Waitoe, we sailed for twenty miles across the country, steering by compass, without any regard to the river. This river is much inferior to the Thames for all purposes of navigation, the stream resembling a very tortuous canal on which no vessel of speed could be employed, and the upper portion, where the banks are inhabited, being so shallow as to be impracticable a considerable portion of the year. Should the coal on its banks be developed, it would require a tramway to near the junction of the Waitoe; and a moderate expenditure in removing snags and cutting off bends on the lower portion would render it available for crafts at low speed, with this objection, that the consumption could not be in towns on its banks, and barges suitable for the river traffic would not be safe to cross the Firth in all weathers, as a heavy sea sets on the shore with north-westers, and they would be liable to great detention.

REPORT ON FLYING SURVEY OF PROPOSED RAILWAY—SHORTLAND TO WAIKATO.

This survey has, from the beginning, been prosecuted under unusual difficulties, arising from the sullen and defiant conduct of the Natives, requiring great caution on our part to enable us to proceed with the work. The greatest opposition was from the Ohinemuri Natives, who at last drove us off by force of arms. Many of the Natives between the Thames and Waikato seemed to favour the undertaking; but the murder of Sullivan occurring whilst I was in the vicinity of Cambridge, the Natives became excited, and advised me to desist. I spent a week returning slowly over the ground, when an accident to the instrument prevented the survey of this portion being as complete as I could have wished. The survey commences at the terminus of the Grahamstown and Tararu line, traversing the beach to the south end of Shortland, when it crosses property of little present value, to the Kauwaeranga Stream, passing close to Shortland Wharf. The works required are a retaining wall along the beach, with filling, as shown on section marked A, which is similar to that of the G and T line in front of Grahamstown, and is an average section. Provision will be required for the passage of the Karaka Creek, and four street drains. The Grey Street crossing will be level, and a filling of two and a half feet required to the Hape Creek, with retaining wall. The filling and retaining wall will be continued to the Kauwaeranga Creek. As the population is increasing above this point, and the stream navigable for small craft, it would require a swing.

From this point the line runs over a succession of fern plains and swamps, passing through three small bushes, to the Thames Crossing, between Ria Te Papa and Te Aroha Mountains, a distance of twenty-nine and a half miles. The whole of this distance is practically level, and the swamps are easily drained where the line crosses them. The longest bridge on this length is the Ohinemuri, and the aggregate length of all the bridges on this portion is 986 feet. The Thames will require a bridge of 184 feet; and as it is some miles below where navigation by steamers can be carried, and the banks too low to allow crafts to pass under, it will require a swing.

The country between the Thames Crossing and Hamilton is very favourable, crossing the fern flats and swamps forming the lower portion of the great plain of this Province to the gorge at Te Awa, Waikato. This gorge is formed by the passage of the Waitukaruru, which, rising on the Waikato side of the range, runs several miles parallel to that river, and then turning east falls into the Piako. From Te Awa, Waikato, the line runs along the higher or south side of the great swamp of 62,000 acres, and leaving it enters on the fern flat which extends into Hamilton, passing down Clyde Street into the reserve at the ferry landing. With the exception of about 6,000 yards of cuttings near Te Awa, Waikato, the whole of the line is level, the swamps requiring a ditch on each side the material thrown into the formation. There are no heavy bridges on this portion, the aggregate length required being 652 feet. This portion has not been chained, and I estimate the length at under thirty miles.

The Kauwaeranga Creek and sea beach would furnish an unlimited amount of excellent ballast, and most of the creeks between Shortland and the Thames Crossing would furnish an adequate supply. The pumice formation from the Thames to Waikato would furnish its own ballast.

A large quantity of excellent timber for sleepers would be furnished by the ranges to the east of the line between Shortland and the Thames Crossing. On the portion between the Thames and Waikato, near the Waitoe, the line passes large totara bushes, a large portion of which is on Government land. An unlimited supply of first-class kauri timber of all dimensions can be supplied by the powerful saw-mills in operation on the Thames, and also from the various mills on the coast near us. All material used on the line could be conveyed by water either from this place or direct from Auckland to any point up to the Thames Crossing. Rails, &c., for the Waikato portion would have to be delivered at this crossing, the cost of carriage being much less than by the route through Mercer and the Waikato. Material could be delivered at the crossing at 17s. per ton from Auckland and at 10s. from Grahamstown.

Vessels of any draught could discharge here into steamers suitable to convey it direct to the crossing. The advantages of cheap and direct communication between the large consumers of this district and the producers of the Waikato cannot be too highly estimated. At present all the agricultural produce consumed on the gold field is procured at uncertain intervals, chiefly from the adjacent Provinces or Colonies.

With direct communication, the bulk of these supplies could be procured from the Waikato,—they receiving in return, besides gold, many articles suited for their use: amongst others, an unlimited supply of first-class timber, of which their district is nearly destitute.

The supplies required by this mining population (already the second in the province and third in the Colony) will in all probability be largely increased, as sufficient evidence was offered of the

auriferous character of a large portion of the district through which I explored, as well as of the existence of extensive coal deposits, so essential to the welfare of a mining community.

The establishment of this route would materially increase the security of the Waikato Settlements, by giving command of the country in their rear. This country, extending as far as the eye can reach, and capable of supporting a nation, could be traversed by cavalry, and supplies could reach the foot of the plain from this place in five hours by steamer, or by rail in one. The steam service from Shortland reaches to within two hours' run of this point daily. The population of this district (nearly equal in numbers to that of two neighbouring Provinces) will not receive any benefit from the lines in progress in this Province, whilst, from the superior advantages offered by this route, its adoption would confer an inestimable benefit on this large community, and be without doubt the cheapest route between Auckland and the Waikato Settlements. This would be the case with the Waikato Settlements in their present extent; and any extension of settlement on the fertile lands between the Waikato and Thames Rivers would increase the advantage in its favour.

Almost immediately after leaving the Thames Crossing, the line reaches a fertile district extending to Te Awa, Waikato, nearly the whole of which is in the hands of the Government or Europeans, and awaiting settlement. This district, before the late war, was noted for its production of wheat, and would, if cultivated, produce sufficient for the whole province.

The cost of passage by steamers between Auckland and Ohinemuri is 13s. first-class and 10s. second-class, and for this price they could be conveyed to the Thames Crossing,—and allowing 4d. per mile on the rail to Hamilton, would make the total 23s. first-class and 20s. second-class. This service could be wrought to the greatest advantage, as it would embrace the whole of the passenger traffic between this place and Auckland and likewise between this place and Waikato, as well as a large portion of the passenger traffic to Tauranga and the East Coast, which route is growing into favour even in its present imperfect state.

It will be seen from the foregoing statement of facts that the adoption of this route to the Waikato would directly benefit nearly all the population of the province south of Auckland, and this result would be obtained by a small expenditure, both in construction and maintenance, compared with any other route: the thirty miles of railway required not passing through high priced land, being nearly straight and without inclines.

Looking at the proposed route in all its bearings, I should advise the extension of the Grahamstown and Tararu to Kopu three miles, from thence making use of the river (decidedly the best in the Province) to the Thames Crossing, and a railway of thirty miles to the Waikato.

The advantage of extending the Grahamstown line to Kopu would be that fast steamers suitable for river traffic could be employed. They would not be subject to the delay so often experienced by the present steamers of having a circuitous route to travel at low water, and to wait for tide to cross the mud flats into Shortland.

As a large amount of the traffic between the Gold Fields and Waikato would consist of live stock, they could be landed at Kopu where there is suitable accommodation for their keep, and when slaughtered, the carcases brought in by rail. At present the cattle consumed here are ship-borne; each cargo is confined in sheds close to the town, and hand-fed until killed, which must be attended with loss.

For the reason mentioned in my preliminary report I adopted Hamilton as a terminus, but an additional distance of about three miles, over a favourable country, would reach Cambridge.

I have, &c.,

DAVID SIMPSON.

John Carruthers, Esq, C.E.

By Authority: GEORGE DIDSBURY, Government Printer, Wellington.—1873.

[*Price 9d.*]