

P A P E R S .

RELATING TO

THE SUPPLY OF WATER ON THE GOLD FIELDS.

I.—REPORTS AND CORRESPONDENCE.

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

WELLINGTON.

—
1871.

SCHEDULE OF CORRESPONDENCE.

D.—No. 8.

AUCKLAND.

No.	Date.	From.	To.	Subject.
1	1870. Nov. 19	Hon. Colonial Secretary	The Superintendent of Auckland	Mr. Blackett will visit Auckland in a few days, and is instructed, after consultation with His Honor, to have survey of waterworks for Gold Field undertaken.
2	Nov. 14	The Superintendent of Auckland	Hon. Colonial Secretary	Requesting early attention to water supply on Thames Gold Field.
3	Nov. 21	Hon. Colonial Secretary	The Superintendent of Auckland	Acknowledging receipt, and referring to No. 1.
4	1871. Jan. 16	Mr. Blackett ...	Hon. Colonial Secretary	Report: His visit to Thames Gold Field. (Plan.)
5	Feb. 21	Hon. Colonial Secretary	The Superintendent of Auckland	Forwarding copy of Mr. Blackett's report.
6	Feb. 2	Mr. Puckey ...	Provincial Engineer ...	No objection on part of the Natives to the high level line. It would be advisable to defer survey of that portion of the other line which runs across the Native Reserve, until the consent of the Natives has been obtained.
7	Feb. 21	Hon. Colonial Secretary	The Superintendent of Auckland	No difficulty existing, Hon. Dr. Pollen has instructed Mr. O'Neill to proceed with survey.
8	March 6	Provincial Secretary ...	Hon. Colonial Secretary	Acknowledging receipt.

PLAN.

Rough Sketch of the Thames Gold Field, showing the several schemes proposed to supply the field with water, to accompany Acting Engineer's report No. 4.

NELSON.

9	1871. July 29	The Superintendent of Nelson	Hon. Colonial Secretary	Forwards resolution of Provincial Council relative to scheme of water supply recommended by Provincial Engineer.
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WESTLAND.

10	1870. Oct. 21	Hon. Colonial Secretary	The Chairman, County Council	Dr. Knight proceeds to Hokitika to report on construction of waterworks for the Westland Gold Fields.
11	1871. Jan. 17	Dr. Knight ...	Hon. Colonial Secretary	Report on water-races.
12	Feb. 23	Hon. Colonial Secretary	The Chairman, County Council	Forwards report, and requests expression of views thereon.
13	March 3	The Chairman, County Council	Hon. Colonial Secretary	Acknowledges receipt, and encloses resolutions of County Council.
14	May 19	The Chairman, County Council	Hon. Colonial Secretary	Requesting the Government to undertake or guarantee the cost of water-races in the Paroa and Arahura Districts.
15	June 7	Dr. Hector and Mr. Blackett	Hon. Colonial Secretary	Recommending purchase of plans of the Mikonui and Kanieri Races, and that the survey of Arahura Race and of sundry roads be authorized.
16	June 7	Hon. Colonial Secretary	The Chairman, County Council	Embodying above report.
17	June 10	Mr. O'Connor ...	...	Memorandum on Ross, Mikonui, and Kanieri Water-races, with enclosures relating to the above and to Waimea and Maori Gully Districts.

PLANS.

Sketch Map showing proposed water supply, Kanieri District, illustrating report of Mr. O'Connor. Enclosure in No. 17.
 Sketch Map showing proposed water supply, Waimea District, illustrating report of Mr. O'Connor. Enclosure in No. 17.
 Sketch Map showing proposed water supply, Mikonui District, illustrating report of Mr. O'Connor. Enclosure in No. 17.

OTAGO.

18	1870. Nov. 12	Hon. Colonial Secretary	The Superintendent of Otago	Forwarding letter from Mr. Haughton and Mr. Broad on the water supply for the Twelve-Mile District, Wakatipu Gold Fields.
19	1871. July 22	The Superintendent of Otago	Hon. Colonial Secretary	Forwarding resolution of Provincial Council of Otago on the subject of gold fields water supply in the districts of Dunstan, Mount Ida, and Tuapeka; also resolution with respect to the application of a portion of the Public Works Loan to the drainage and improvement of land.
20	...	The Superintendent of Otago	Hon. Colonial Secretary	Forwarding message to and resolution of the Provincial Council, that the £300,000 voted for waterworks on gold fields may also be made applicable to sludge channels, and that out of that amount a sum of £150,000 should be placed at the disposal of the Otago Province.

PAPERS RELATING TO THE SUPPLY OF WATER ON THE
GOLD FIELDS.

D.—No. 8.

AUCKLAND.

No. 1.

Hon. Mr. GISBORNE to His Honor T. B. GILLIES, Auckland.

SIR,—

Colonial Secretary's Office, Wellington, 19th November, 1870.

I have to inform your Honor that in a few days Mr. J. Blackett, C.E., engineer in the Public Works Department, will proceed to Auckland, with a view to the completion of the survey of a railway line from Auckland to Tuakau, with branch to Onehunga, commencing from and terminating at a point to be determined by the Governor in Council, as authorised to be constructed by the "Railways Act, 1870."

Mr. Blackett will wait on your Honor, and I shall feel obliged by your directing him to be furnished with such information and assistance as it may be in the power of the Provincial Government to afford in the performance of this service.

Your Honor will perceive from the 26th section of the "Immigration and Public Works Act, 1870," that the Governor may, on the request of the Superintendent and Provincial Council of a Province, cause works to be constructed for the supply of water to a gold field. I understand, though unofficially, that such a request has been made, or is about to be made, by your Honor and the Auckland Provincial Council, in respect of the gold fields at the Thames; and in that case, Mr. Blackett is instructed, after consultation with your Honor, to cause the necessary steps to be taken forthwith for the requisite survey, and other measures, for the purpose of ascertaining what water works ought to be constructed, and the mode of their construction.

I have, &c.,

His Honor the Superintendent, Auckland.

W. GISBORNE.

No. 2.

His Honor T. B. GILLIES to Hon. MINISTER OF PUBLIC WORKS.

SIR,—

Superintendent's Office, Auckland, 14th November, 1870.

I have the honor to enclose a request by myself and the Provincial Council, to His Excellency, to cause works for a water supply for the Thames Gold Fields, to be constructed in terms of section 26 of the "Immigration and Public Works Act," and trust that the Government will be able at as early a period as possible to give effect to our request.

I have, &c.,

The Hon. Minister for Public Works,
Wellington.

THOMAS B. GILLIES,
Superintendent.

Enclosure 1 in No. 2.

His Honor T. B. GILLIES to His Excellency the GOVERNOR.

SIR,

Superintendent's Office, Auckland, 14th November, 1870.

I have the honor, in pursuance of section 26 of the "Immigration and Public Works Act" of last session of the Assembly, to request that your Excellency will cause to be constructed such works for supplying water to the Thames Gold Fields as you may think fit, and I enclose resolutions of the Provincial Council to the same effect.

I have, &c.,

His Excellency the Governor,
Government House, Auckland.

THOMAS B. GILLIES,
Superintendent.

Sub-Enclosure in Enclosure 1 in No. 2.

ADDRESS No. 11, SESSION XXVI.

[Extract from the Journals of the Auckland Provincial Council, Friday, 4th November, 1870.]

Resolved—That this Council concurs with His Honor the Superintendent in the opinion that it is desirable immediately to undertake the necessary works for procuring a sufficient supply of water for the Thames Gold Field, and respectfully requests him to intimate this resolution to His Excellency the Governor.

Resolved—That a respectful address be presented to His Honor the Superintendent, forwarding the foregoing resolution.

(True extract.)

His Honor the Superintendent.

G. MAURICE O'RORKE,
Speaker.

PAPERS RELATING TO THE

No. 3.

Hon. Mr. GISBORNE to His Honor T. B. GILLIES.

SIR,—

Colonial Secretary's Office, Wellington, 21st November, 1870.

I have the honor to acknowledge the receipt of your letter No. 613 of the 14th inst., addressed to the Hon. the Minister for Public Works, enclosing a request by Your Honor and the Provincial Council of Auckland to His Excellency the Governor, under the 26th section of "The Immigration and Public Works Act, 1870," relative to water supply on the Thames Gold Fields, and to refer Your Honor to my letter No. 275 of the 19th instant.

I have, &c.,

His Honor the Superintendent, Auckland.

W. GISBORNE.

No. 4.

Mr. BLACKETT to Hon. Mr. GISBORNE.

SIR,—

Public Works Office, Auckland, 16th January, 1871.

I have the honor to report that, in accordance with your instructions, I have visited the Thames Gold Field, for the purpose of obtaining such information as would enable me to give the necessary instructions in reference to the survey which will be required for the purpose of ascertaining what water works ought to be constructed, and the mode of their construction, as provided for under the 26th section of the "Immigration and Public Works Act, 1870."

The portions of the gold field inspected by me comprise the Hape Creek, Karaka Creek, Waiotahi Creek, Moanataiari Creek, Tararu Creek (all these with tramways), and the Kuranui Creek, as well as a portion of the valley of the Kauaeranga, from which it is proposed to obtain the supply of water, and which is the only one likely to afford sufficient. I also took an opportunity of inspecting the working of the Long Drive Claim, for the purpose of making myself acquainted with the general character of the ground, &c.

The general opinion expressed by those whose position and connection with the gold field would give that opinion value is, that much good would result from the introduction of a good water supply, not only in leading to an increased yield of gold, and increase in the number of machines, and, consequently, of population, but in lessening the cost of obtaining the gold by those machines already at work. I found, however, the greatest difference of opinion as to the amount of increase to be expected, which, in fact, must be purely speculative, the amount varying from 25 to 50 or 60 per cent.; but none whatever as to the increased economy of working, the latter saving leading at once to the working of ground now not considered payable. The saving on this latter head may be reckoned at about 50 per cent. on all machines driven by steam, costing now about 20s per week per head of stamps, which might be reduced at once to 10s per head; and a further saving and greater yield would be effected by the use of clean water for crushing, in place of that now used, in many cases very dirty, from having passed through other machines, and time sufficient not being allowed it to settle.

The greatest difference of opinion exists as to the level on which the supply should be brought in, varying from 60 or 80 feet up to 500 feet above the sea level.

In the latter case, the water could be used over and over again for different machines, in each of the Creeks, in steps say from 60 to 100 feet, either in turbines or water wheels, the water flowing from one to the other.

This plan was proposed to the Auckland Provincial Government by a company, who offered to construct the work at a guaranteed rate of interest on the outlay, and to bring in 40 sluice heads from the head water of the Kauaeranga along a channel 36 to 40 miles long, at a cost of £60,000, and a large part of the survey, I am told, has been completed. An exaggerated estimate of the returns of such a work may, however, be formed by taking for data merely the supply of water and its elevation; thus, say each machine required two sluice heads, 40 heads would supply 20 machines at 500 feet, and assuming that the supply fell in three stages below this, the water would work 80 machines, which, at £10 per week, for 20 stamps, would give £41,000 per year as returns for water rent.

The number of machines now on the field is only 35, and it is improbable that this number would be increased to 80 by any water supply.

A low level water supply, say at 100 feet, would not only tend to the erection of new machinery in the lower part of the creeks, but would supply all those steam machines now at work on the flat, embracing about 230 heads of stamps.

This scheme, it is obvious, would require the construction of a very much shorter race than the high level scheme.

Very much difference of opinion exists as to the capability of the Kauaeranga to supply the amount of water required, but as far as my examination extended, I have no doubt that it will afford an ample supply either on a high level or on one comparatively low.

I shall now lay before you a few general facts relative to the gold fields, and from these endeavor to shew what probable results would be obtained from an efficient water supply. Taking the published return of last month, the yield of gold was 13,086 ounces from 8,991 tons of quartz, or about 1.45 ounces of gold per ton. The number of stamp heads on the field is about 600, giving about 22 ounces of gold per stamp head per month, or 5.5 ounces per stamp head per week, and the actual quantity of quartz crushed per stamp head per month 14.8 tons, or 3.9 tons per week. The real amount crushed per stamp head in 24 hours reaches 1 to 1½ tons, which would give 6 to 7½ tons per week each, but the full number of days per week is not worked, which will explain the difference.



Assuming therefore that the work on the field will be increased 25 per cent, as represented by the number of stamp heads (and leaving out the Tararu Creek, which could not well be included in this calculation from its distance, and from the fact that it is already tolerably well supplied with water) the

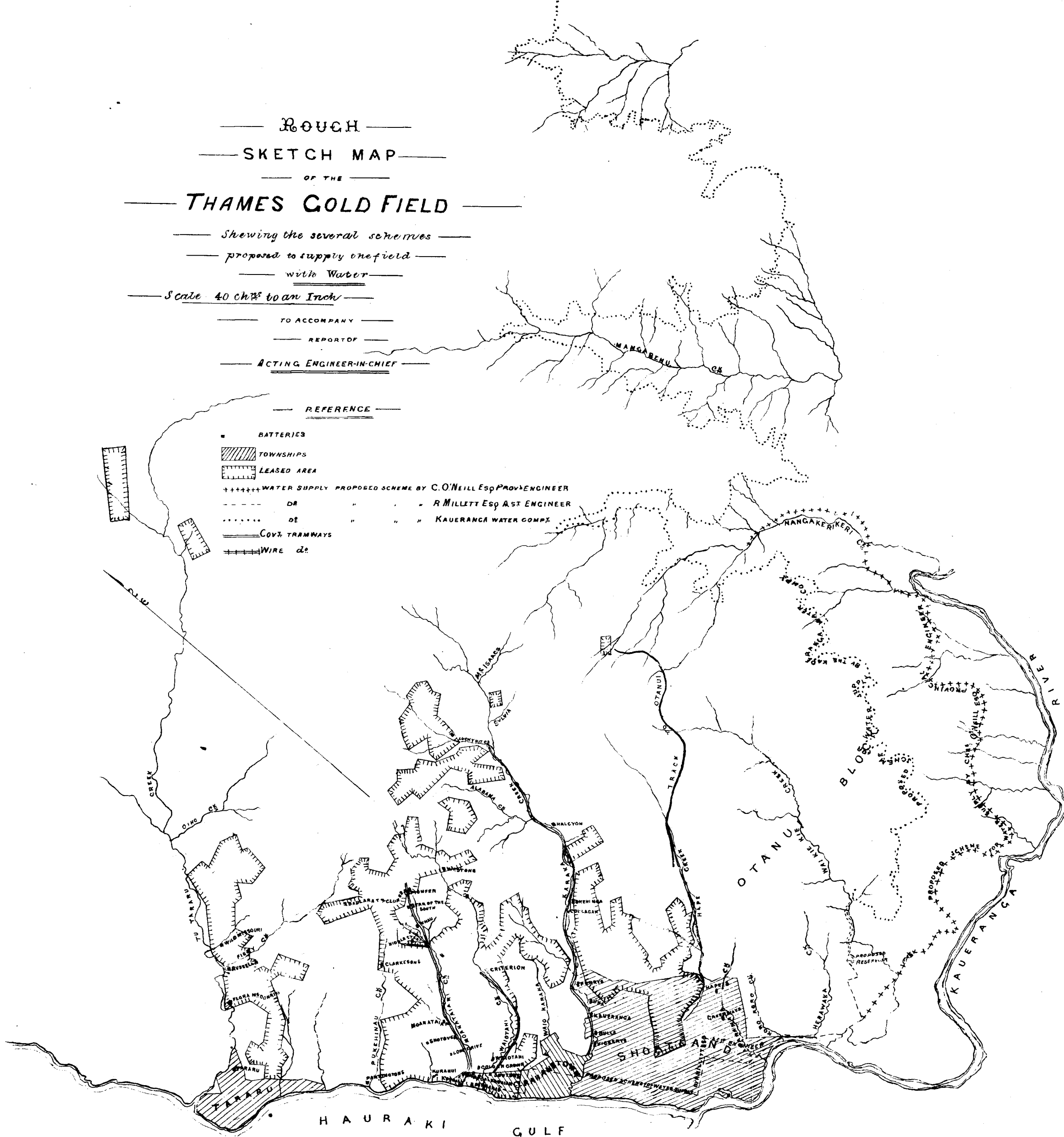
ROUGH
SKETCH MAP
OF THE
THAMES GOLD FIELD

— Shewing the several schemes —
— proposed to supply one field —
— with Water —
— Scale 40 chrs to an Inch —

_____ TO ACCOMPANY _____
 _____ REPORT OF _____
 _____ ACTING ENGINEER-IN-CHIEF _____

— REFERENCE —

- BATTERIES
 TOWNSHIPS
 LEASED AREA
 ++++++ WATER SUPPLY PROPOSED SCHEME BY C.O'NEILL Esq PROV^Y ENGINEER
 ----- DR " " " R MILLETT Esq AS^T ENGINEER
 DS " " " KAUAERANGA WATER COM^P
 ===== GOVT TRAMWAYS
 ++++++ WIRE d^o



calculation would stand thus :—Number of stamp heads now at work, say 460 ; increase of 25 per cent, 115 ; and as these will presumably be worked on poorer ground than the average, say one-half or $\frac{3}{4}$ ounce per ton; thus 115 stamps at 4 tons per week gives 460 tons, yielding at $\frac{3}{4}$ ounces = 345 ounces of gold, which at 2s. per ounce, average duty, will give £39 10s. per week.

Then, of these 460 stamps about 400 are worked by steam, and most probably would be worked by water when the supply was brought in ; these, with 115 heads of increase added, total 515, at the rate of 10s. per head per week (one half of the cost of steam power) would give a rent per week of £257 10s., to which add the increase of gold duty, £39 10s., making a total per week of £297 as income—amounting to £15,444 in the year (not reckoning another probable source of income on the high level scheme, viz., the conveyance of timber along the race, from the Kauri Ranges, for the use of the mines.

This estimate of income would be reduced say 20 per cent for management and repairs, leaving £12,356 per annum.

In the absence of any levels or measurements, I have not yet attempted to make an estimate of the cost of any scheme of water supply, but the above figures may be sufficient to shew that there is every probability that a well planned scheme for the supply of water would be reproductive, and that it will be worth while to have a careful survey of the ground made, and an estimate formed of the probable cost of the work, say on two lines of level—one at 500, and one at 100 feet of elevation—so that the costs of the two might be compared.

Economy of expenditure would point to the choice of the lower line, but it would not supply directly the higher claims in the different creeks: these would, however, even with a low level supply, be in a better position to work profitably after the introduction of a cheaper crushing power, even if the cost of carriage to the machine should not be reduced.

It may be asked whether those who now have steam power will be at all inclined to lay it aside, and adopt water power instead. This, I think, may be answered in the affirmative, not only on account of the immediate saving in coals and wages of engineers, but in the heavy repairs—now required in the boilers, which last but a short time on account of the prejudicial nature of the water employed in working them,—and in the long stoppages caused by their repair.

I may now say a few words on the tramways which have been constructed on the various creeks a total cost of about £31,000, the aggregate length being about $6\frac{1}{4}$ miles.

The facilities afforded by these for taking the materials to be crushed down to the batteries on a lower level appear not to be so great as was evidently expected and intended, and they are comparatively speaking little used, as the owners of the higher, and especially the poorer claims, complain that the charge for carriage—varying from 6s. to 7s. 6d. per ton—added to that of crushing—viz., 14s. to 15s. per ton—is too great to allow them to work their claims at any profit. It will be seen that should the high water supply scheme be carried out, the expenditure incurred on the tramways will be almost entirely thrown away, as regards those portions of them below the level of the race, and that they will then be merely required and used as walking tracks.

Before concluding, I may describe generally the schemes already reported on for the supply of water to Grahamstown and Shortland. The first is that of the Provincial Engineer, for conveying water from one of the principal branches of the Kaueranga, a distance of about $8\frac{1}{2}$ miles ; supply estimated at about 210 cubic feet per minute ; height of reservoir, 173 feet above sea level ; 11-inch pipes ; estimated cost, £20,000. This was not intended to supply any of the mines.

The second is that reported on by the Assistant-Engineer. Water to be taken from the Waikiekie, about 3 miles ; reservoir, 228 feet above sea level ; pipes, 4 inches diameter ; intended simply as a town supply ; estimate, not including cost of distributing through town, about £3,000.

In the event of the high level supply being carried out it might at first be made only to the nearest point at which a tolerably good supply could be obtained, say 20 heads, and on proving successful might be extended so as to increase the supply as the demand arose ; the race in this case should be so constructed as to be capable of being enlarged as the supply was increased. Judging from the steep and porous character of the ground generally, it appears that it will be necessary to construct a flume, say of timber, the entire length, as so much loss by leakage would result by the use of a ditch cut in the hill sides.

As regards the proposed survey, I think it highly probable that the natives will not allow it to be proceeded with at present.

The Hon. W. Gisborne, Minister for Public Works,
Wellington.

I have, &c.,
JOHN BLACKETT,
Acting Engineer-in-Chief.

P.S.—I enclose a tracing of the Thames Gold Field, shewing workings and line of proposed water supply, tramways, batteries, &c., &c.

No. 5.

His Honor T. B. GILLIES to Hon. Mr. GISBORNE.

SIR,—

Superintendent's Office, Auckland, 21st February, 1871.

I have the honor to acknowledge with thanks the receipt of your letter, dated the 13th inst., transmitting copy of report by the Acting Engineer-in-Chief, as to the construction of water works at the Thames Gold Field.

The Hon the Colonial Secretary,
Wellington.

I have, &c.,
THOS. B. GILLIES,
Superintendent.

PAPERS RELATING TO THE

No. 6.

THAMES WATER WORKS.

MEMORANDUM by Mr. PUCKEY for the PROVINCIAL ENGINEER.

THERE can be no possible objection on the part of the Natives with regard to the high level line for the water works, therefore the survey may be proceeded with at once. With reference to the other line, it would be advisable to defer survey of that portion of it which runs across the Native Reserve, until the consent of the Natives has been obtained.

February 2nd, 1871.

E. W. PUCKEY,
Native Agent, Thames.

No. 7.

HON. MR. GISBORNE to His Honor T. B. GILLIES.

SIR,—

Colonial Secretary's Office, Wellington, 21st February, 1871.

Adverting to former correspondence on the subject of the survey of the proposed line of the Thames Water Works, I have to inform your Honor that the General Government Agent at Auckland has forwarded to this office copy of a letter from Mr. J. J. O'Neill, covering an enclosure from Mr. Puckey, Native Agent at the Thames, showing that no difficulty exists in the way of the survey of the high level line, and stating that Dr. Pollen has instructed Mr. O'Neill to proceed with the work on that line.

His Honor the Superintendent, Auckland.

I have, &c.,
W. GISBORNE.

No. 8.

MR. LUSK to Hon. Mr. GISBORNE.

SIR,—

Superintendent's Office, Auckland, 6th March, 1871.

I have the honor to acknowledge the receipt of your letter (No. 50) dated the 21st ult., reporting that the General Government Agent at Auckland had instructed Mr. J. J. O'Neill to proceed with the work on the high level line of the Thames Water Works.

The Hon. the Colonial Secretary,
Wellington.

I have, &c.,
HUGH LUSK,
Provincial Secretary.

NELSON.

No. 9.

His Hon. O. W. CURTIS to Hon. Mr. GISBORNE.

SIR,—

Superintendent's Office, Nelson, 29th July, 1871.

I have the honor to forward to you herewith a copy of a resolution passed by the Nelson Provincial Council during its last session, relative to water supply upon the gold fields of the Province.

I also transmit printed copies of the Report of the Select Committee of the Council upon which the resolution was founded, together with a full report upon the subject by the Provincial Engineer.

These papers will put the Colonial Government in possession of all the trustworthy information I have as yet obtained, and I have only to add that I concur in the resolution of the Council.

I have, &c.,

OSWALD CURTIS,
Superintendent.

The Hon. the Colonial Secretary, Wellington.

Enclosure 1 in No. 9.

[Copy of a Resolution passed by the Nelson Provincial Council, on Thursday, 25th May, 1871, on the question of Water Supply.]

THAT in the opinion of this Council, the scheme for supplying water for mining purposes recommended by the Provincial Engineer, would be of advantage to the Province; and to such extent as funds can be obtained, this Council would desire to see these schemes carried out, and request the Governor to cause this to be done.

GEO. HODGSON.

Enclosure 2 in No. 9.

REPORT of the Select Committee on Water Supply for Gold Fields.

THE SELECT COMMITTEE appointed "to consider and report upon paragraph No. 10 of His Honor the Superintendent's speech," recommending an inquiry with regard to the extent to which application shall be made for a portion of the General Government loan for water supply for the gold fields of the Province, and the nature and position of the works to be executed, have the honor to report as follows:—

Your Committee are glad to find that the scarcity of water upon many parts of the gold fields of the Colony, and the consequent unproductiveness of much ground that would otherwise be profitably worked, has received attention on the part of the Colonial Parliament.

Your Committee have had under review the report of the District Engineer upon the question of water supply for the Nelson South-west Gold Fields, and have carefully considered the several sections alluded to in the said report, namely:—

"Districts requiring for their supply large works which can only be undertaken by Government or large companies;"

"Districts where," as it is alleged, "all the easily available streams and drainage areas are at present held by private holders; and those

"Districts which," it is said "do not at present offer any advantage for the expenditure of public capital, the works required being limited in extent, and within the means of parties of miners and small capitalists."

Your Committee have arrived at the conclusion that attention should be primarily directed to those districts which may be said to be comparatively without any permanent water supply, and in doing so have by no means overlooked the possible claims of other districts requiring a water supply, or those districts which, by the praiseworthy persevering efforts of private persons, happen to be more or less supplied with water.

With a view, therefore, of making some prompt provision for part of those districts which may be said to be without any adequate or permanent water supply, your Committee have selected the three schemes specially recommended by Mr. Dobson, namely, that of

"Napoleon Hill," which, according to the Engineer's report, will command the districts of Napoleon Hill, Noble's, Duffer's, Half Ounce, Musquito, and Topsy;

"Nelson Creek," which will command Baxter's, Sullivan's, Callaghan's, and other ground in that neighborhood; and that of

"Addison's Flat," which will command the workings from Dirty Mary's Flat, on the north, to the Shamrock Lead on the south, as the particular works which, in the opinion of your Committee, the Council should adopt, and request to be carried out with all convenient speed.

It will be observed that the cost of these several works has been roughly estimated by the Engineer at £95,000, and it is to that extent your Committee would recommend application to be made as Nelson's share, for the present, of the loan for water supply.

Your Committee are of opinion that the magnitude and assured importance of the Nelson Gold Fields would warrant them in claiming a much larger proportion of the loan than the sum here set down,

and it is confidently believed by your Committee that a much greater sum might, both with advantage to the Province and the Colony, be devoted to water supply purposes upon the Gold Fields of the Province ; but it was deemed unadvisable to follow the example of setting up relatively extravagant demands, and preferable to urge the carrying out only of such works as were believed to be of an immediately urgent character, leaving others less pressing for discussion and possible formation at some future period, when it is believed experience will have shewn the necessity for extended efforts in the direction of water supply for the gold fields of the Colony.

It was further deemed advisable by your Committee to recommend that the Superintendent should be requested to obtain a detailed survey and reliable estimate of the cost of creating other water supply for the Gold Fields of the Province, than that which it is proposed should be undertaken by the General Government, in accordance with the resolution arrived at by your Committee, who have endorsed the three aforesaid schemes with a view of, at some future sitting of the Council, considering other questions of water supply than those they have now thought fit to recommend for the Council's consideration.

The districts of Collingwood, Salisbury Open, No Town, and the Northern Terraces, it was thought might be considered in some form, if more complete and satisfactory data were but obtained in the interim for the Council's future guidance. In the important Gold Fields of Charleston and Brighton, also, in which district so much has been accomplished by private enterprise, it was thought probable that the supply of water might be improved to some extent, and the price consequently reduced at some future day, if it were found that satisfactory negotiations could be effected with regard to existing private rights. In which event, the whole of the proposed or actually existing chief supply works would be brought within the purview, and under the control of the Government.

Your Committee have the honor to recommend the following resolutions for the consideration of the Council :—

- "1. That, in the opinion of this Council, the three schemes for supplying water for mining purposes, recommended by the Provincial Engineer, would be of advantage to the Province ; and to such extent as funds can be obtained, this Council would desire to see the three schemes carried out, and request the Government to cause this to be done.
- "2. That the Superintendent be requested to obtain a detailed survey and reliable estimate of the cost of creating other water supplies on the gold-fields of the Province than that undertaken by the General Government, in consequence of the previous resolution, such surveys and and estimate to be laid before the Council at its next session."

Provincial Council Chamber, Nelson,
May, 1871.

GEORGE DONNE,
Chairman.

WESTLAND.

No. 10.

Hon. Mr. GISBORNE to CHAIRMAN COUNTY COUNCIL.

(Telegram)

Wellington, 21st October, 1870.

DR. KNIGHT, Auditor-General, proceeds in Alhambra to Hokitika. His mission is to report on what expenditure can be authorised under Public Works Act, on roads in Westland, and whether, on your recommendation, the construction of any water works for the gold fields there can be authorised. Please give him every assistance.

The Chairman of County Council, Hokitika.

W. GISBORNE.

No. 11.

Dr. KNIGHT to Hon. Mr. GISBORNE.

WATER SUPPLY.

SIR,—

County of Westland, 17th January, 1871.

In reference to the remaining subject on which I was directed to procure information while inspecting the Gold Field Accounts of the County of Westland—that of head water-races—it is not necessary to dilate on the importance of a good water supply for developing the workings of the West Coast gold fields. Sluicing is the principal mode of separating gold in the County districts, and the value of an ample supply for that purpose can scarcely be over-estimated. Surveyor Mueller, in his progress report, states that there are thousands of acres of terrace ground in the Waimea and Kanieri districts which would pay well, if a steady supply of water could be obtained. The scarcity of water for working ground not rich in the precious metal, is becoming a serious difficulty. At times, whole districts suffer severely. During the dry weather of 1869-70, many whims and smaller water-wheels ceased work altogether in the Waimea and Kanieri districts, and others were quiet for weeks for want of water, so that almost a stop was put to digging operations. For working rich grounds, little water may suffice. Miners can afford to lose some of the gold so long as what is saved repays their labor. But to make poor ground pay, large quantities of “stuff” must be sent through the boxes, and to do this effectually, an abundant supply of water is required.

Surveyor Mueller, in his report, also states that in the Waimea and Kanieri Districts each petty rill of water is utilized. In some parts the hill side is so thoroughly cut up by diminutive races, that it is impossible to get a supply of half a sluice head by going a less distance than three or four miles. The drainage of every knoll has been registered. Everyone in the districts holds a little water right; but very few can boast of a regular supply of water. Considering the comparatively small area which the workings in both districts occupy, it is apparent, now the best ground has been worked, that the largest population which those districts once supported can no longer be maintained, unless means are taken to bring in a plentiful supply of water.

Head water-races are the great need of the West Coast diggings. Companies will not venture on these speculations in the increasing depression of the gold fields without large guarantees from the Government. They will be still less able to do so as time creeps on, and the better grounds are exhausted. The pressing necessity is to prevent the dispersion of the mining population. It is the duty of the Government to step in, at any rate, before the population of the gold fields is seriously diminished, and, by bringing water from commanding heights, to enable miners to work the poorer but much more extensive grounds.

It is on the more elevated workings of the Waimea and Kanieri Districts that water is so much required. The returns from grounds that now pay the miner £2 or £3 per week with the totally insufficient supply, would be doubled, and gold fields would be worked which at present are almost untouched from the absolute impossibility of obtaining water for washing, and which miners in the locality unite in asserting contain the richest gold deposits in the districts.

It is stated in the reports of Wardens and others that the large district extending from the Mikonui River to Totara on the southern and northern slopes of the Greenland Range, is nearly deserted through a want of water.

The vast importance of a continuous water supply to the different mining centres has engaged the attention of a Select Committee of the County Council, and it came to the conclusion that, until some comprehensive plan is adopted and carried out with energy, the prosperity of the County would be seriously retarded. The Council, on the recommendation of the Committee, adopted the following regulations:—

- “1. That, in such cases as those alluded to in the following regulations, one-half the necessary capital may be guaranteed by the Council for the construction of head water-races.
- “2. The other half of the necessary capital shall be subscribed for, and at least one-fourth of the subscribed capital paid up by *bona fide* shareholders. Such money to be paid into a separate account in the name of the company and some person to be appointed by the County Chairman, and not to be drawn except by cheques signed by the Manager of the Company and the person appointed by the County Chairman, as above.

- "3. All money received by the company from whatever source shall be paid into the account of the company alluded to in regulation 2, and be subject to the restrictions contained in that section until the capital of the company be fully paid.
- "4 The company applying for aid to the Council shall be composed of at least 20 persons.
- "5. Each race to be constructed under these regulations shall carry not less than 30 Government head of water.
- "6. Each company applying for a guarantee shall be registered, or be in course of registration, under the 'Mining Company's Limited Liability Act, 1865.'
- "7. Each race which shall be constructed under these regulations, shall be constructed and maintained under the supervision, and subject to the approval, of the Mining Engineer of the County, and Mining Surveyor of the district.
- "8. The capital of each race company applying to the Council for a guarantee shall be not less than £10,000.
- "9. No company shall be guaranteed unless the race to be constructed by it shall be first approved by a Board to be appointed by the Council, consisting of three of its members (not including the Chairman), the Mining Engineer of the County, and another Engineer not employed by the Government.
- "10. The water brought in by any company obtaining the guarantee of the Council shall be sold to the miners, at rates to be fixed by the Council in each case.
- "11. No company shall receive a guarantee except on a vote of the Council.
- "12. In case the Council shall be called upon to pay any guarantee made under or by virtue of these regulations, and have to pay the same, the property held by the company for whom the said guarantee shall be paid, as aforesaid, shall become the property of the County Council and inhabitants of the County of Westland, in the same degree and to the same extent as the said property was held by the said company at the time of the forfeiture of the said guarantee."

No company has yet been formed under the above regulations.

The head water-races most warmly advocated, because they would serve to work grounds which are known to be auriferous, and are already the centres of considerable mining populations, are, the Mikonui, the Kanieri, and Waimea.

The proposed Mikonui Head Water Race, which is to carry 40 Government heads of water, would cost about £35,000, according to estimates based on detailed working plans in the Survey Office, Hokitika. The Kanieri Race, to carry the same number of heads of water, would cost about £19,000, according to estimates based on similar carefully-detailed plans. The estimates for the Waimea Water-race, amount to £29,600, but this calculation is based only on a reconnaissance survey.

These schemes are laid down on the map of the County deposited by me in the Public Works Office, Wellington, and the heights of each station above the sea shown. Mr. C. Y. O'Connor, C.E., the County Engineer, has furnished the accompanying estimates, shewing the cost of the proposed works, and their nature and extent.

I believe the time has arrived when the conservation of water should be brought under the powers of the General Government, with a view to its being utilized to the greatest possible degree, and at the lowest possible charge to the miners. The Colony has, in its water power, a most valuable means of increasing the industrial pursuits of the people.

I would earnestly recommend the Government to construct as early as possible the Kanieri Head Water-race.

It appears from replies to questions addressed to the County Engineer, that the average cost of maintenance of water-races in Westland, constructed with red pine timber in fluming, &c., is about 10 per cent. (query 1 per cent.) on the original outlay for the first year, and 3 per cent. per annum each succeeding year for four years. The decay of timber in fluming after the fifth year would necessitate the gradual renewal of all its parts, and would bring up the cost of maintenance to 7 per cent. per annum, at which it would probably remain.

Taking, then, the cost of constructing the Kanieri Race, as estimated by the County Engineer, at £19,000, and taking the cost of maintenance for four years at £3,600, and supervision and unforeseen expenses at £1,400, we have for the total outlay for four years the sum of £24,000.

On the other hand, we have to consider what would be the probable revenue derived from the sale of water for the same period. Mr. O'Connor states that the charge for water for mining purposes varies with the locality. At Ross, to the south of Hokitika, a Government head of water, of 40 superficial inches, gauged in the usual way, is sold for about £11 per week. As water always belongs to the race proprietor until it reaches a natural river bed, the same head is frequently sold twice, and occasionally even three times. At Pounamu the price paid for a Government head of water is £3 10s. per week for eight working hours a day, and the nature of the workings prevents its being sold more than once.

Between the above rates, which the County Engineer considers the extremes of high and low prices, there are in the different localities many intermediate prices. At the Kanieri, near Hokitika, where tailings are being worked over again, the price charged for water is about £6 10s. per head. No stronger proof can be offered of the amazing advantages derived from water power than this fact, that a high price can be paid with profit even in working old tailings.

The proposed Kanieri Head Water-race is to carry 40 heads of water. These, if sold at £3 per head per week, would give a revenue of £6,000 per annum, but as the working day is eight hours only, there would be sixteen hours every day during which the water would be running to waste; this would be equivalent to 80 heads of water. This waste might probably be prevented by collecting the water in reservoirs, if fortunately the nature of the country would admit of embankments being thrown up for the purpose. Throwing out of consideration any probable advantages from husbanding the water, the

revenue from the Kanieri Race would in four years amount to £24,000, so that, on the most moderate calculation the Government at the end of four years, would recoup the whole of the outlay, and would, even at the termination of three years, be prepared with the funds to commence the construction of a similar work in any other promising locality.

But this is not all. These works should be regarded as promoters of immigration. A race of 40 heads of water would, I believe, in the Kanieri District add to the mining population 100 souls, and would give occupation to at least an equal number of persons in furnishing supplies, &c. £10,000 per annum would be a low value to put upon this addition to the mining population of the country.

In addition to an ample supply of water, the cost of carriage of supplies must be reduced by constructing roads and tramways. Every reduction in the cost of food opens fresh fields for mining industry. Water power and main roads are the two means of developing the resources of the County and increasing the population. No doubt water-races are more immediately important than roads; but if the miners make no savings, or if they are driven to carry their savings to the neighboring colonies, because the country offers them no inducement to settle in it, from the mere want of roads to develop its agricultural resources, the ultimate welfare of the County is sacrificed. With good roads, the permanent working of the gold fields would be secured. The miners would purchase small allotments on the frontages of the main roads in the vicinity of their diggings, and would marry and settle down, as they are doing at Pounamu, since the road from Stafford to Pounamu was constructed. The necessity for roads is shewn by the fact that in the year 1869, at places to the north, between the Little Grey and the Buller districts, where parties were earning as much as £15 per man per week, not more than 100 diggers were attracted to the district, owing to the want of roads and the frightful expense of supplies. Or, taking the Inangahura diggings, in the Buller district, at the present day, I find that the charge for freight of goods to those grounds is £14 per ton from Westport.

I have, &c.,

CHARLES KNIGHT.

The Hon. the Colonial Secretary, Wellington.

Enclosure 1 in No. 11.

ESTIMATES OF WATER SUPPLY (WESTLAND).

Extracted from Detail Estimated for convenience of reference.

Mikomui Water-race, to carry 40 Government Heads.

	Miles.	Chains.	Rate per head.	£
Fluming, average 18½ feet high	...	1 8	£45	3,960
Boxing laid in side cutting	...	8 35	25	16,875
Tunnelling, timbered throughout	...	2 68	35	7,980
Ditching	...	6 9	6	2,934
Total	...	18 40		31,749
10 per cent. contingencies	...			3,175
				3,4924

Kanieri Water-race (with Branch to Big Paddock), to carry 40 heads.

Fluming, average 17 feet high	...	1 32	£40	4,480
Boxing laid in side cutting...	...	2 67	20	4,540
Tunnelling	...	1 40	35	4,200
Ditching	...	9 15	5 10s	4,042
Total	...	14 74		17,262
10 per cent. contingencies	...			1,726
				18,988

Hohonu Water-race (constructed by private enterprise), carries 35 heads.

Fluming, average 10½ feet high	...	0 49	£42	2,058
Boxing laid in side cutting	...	1 12	21	1,932
Ditching	...	3 42	5	1,410
Total	...	5 23		5,400
Dams and branch races for supply	...			1,500
				6,900

Waimea Water Supply.

Lines E, G, H, G, F, K, L, and Z (red) ... £29,600

Waimea Water Supply (continued).

Lines A B, C D, and Reservoir (blue) ... £37,100

Maori Gully Water Supply.

High level water race, to carry 20 Government heads ... £61,000

Maori Gully Water Supply (continued.)

Low level water race, to carry 40 Government heads ... £24,000

CHAS. Y. O'CONNOR,
County Engineer.

PAPERS RELATING TO THE

Enclosure 2 in No. 11.

WATER SUPPLY (COUNTY OF WESTLAND.)

ANSWERS TO QUERIES.

How many years will fluming last?—(See answer to next question.)

What is the usual cost per mile for repairs of water-races?—The average cost of maintenance of water-races in Westland, constructed with red pine timber, in fluming, &c., would be about 10 per cent. per annum on the original outlay the first year, and 3 per cent. per annum each succeeding year for four years. The decay of timber, in fluming, after the fifth year would necessitate the gradual renewal of all its parts, and would bring up the cost of maintenance to 7 per cent. per annum, at which it would probably remain whilst the present conditions of labour, and difficulties of access prevail. Laborers' wages in Westland at present are 10s. per day.

What is the usual charge for water for mining purposes?—Very variable. In Ross, the head of water usually sold is 30 superficial inches, gauged in the usual way, equal to about £11 per head per week for a Government head of water (40 superficial inches of water, gauged in the usual way) as water always belongs to the race proprietor, until it reaches a natural river bed, the same head is frequently sold twice, and occasionally even three times. It will thus be seen that as much as £33 per head per week has been realised for a Government head of water; that, however, is very unusual. At the Greenstone, the price paid for a Government head of water is £3 10s. per week, and the nature of the workings prevents its being sold more than once. When the miners were opening out their faces, water was occasionally sold for £2 per head. Between the above rates, which I believe represent the extremes of high and low prices, there are, in the different localities, many intermediate prices. At the Kanieri (one of the workings visited by Dr. Knight) the price charged for water is equivalent to £6 10s. per head of 40 inches.

C. Y. O'CONNOR, C.E.

How many years will fluming last?—Five years; after which it does not all go together, but the cost of repairs is doubled.

What is the usual cost per mile for repairs of water-races?—£1 per mile per week.

What is the usual charge for use of water for mining purposes?—From £2 to £10 for each Government head (40 superficial inches,) for eight hours.

What roads are under the management of road boards?—Four feet and six feet metalled tracks, and the main roads within the limits of townships.

What is the length of each road under the above management?—There are about 35 tracks, averaging about $1\frac{1}{2}$ miles each.

Are there toll-bars on any of them?—No; but some are maintained by contributions received from local storekeepers.

What revenue has each Road Board raised by local rates?—Paroa, £750; Arahura, £370; Kanieri, nil; Totara, £460; and Okarito, nil, in two years.

Where is the toll-bar on the Canterbury Road?—At $15\frac{1}{2}$ miles from Hokitika.

What is the amount of tolls received?—Average, £30 16s. per week, net.

No. 12.

Hon. Mr. GISBORNE to the CHAIRMAN COUNTY COUNCIL, Westland.

SIR,—

Colonial Secretary's Office, Wellington, 23rd February, 1871.

I have the honor to transmit to you the accompanying copy of a letter from Dr. Knight, the Auditor-General, dated the 17th ult., on the subject of the head water-races on the Gold Fields in the County of Westland, and to request that you will be good enough to favor the Government with an expression of your views, and those of the County Council thereon.

The Chairman of the County Council of
Westland, Hokitika.

I have, &c.,
W. GISBORNE.

No. 13.

Mr. LAHMAN to Hon. Mr. GISBORNE.

SIR,—

County Chairman's Office, Hokitika, 3rd March, 1871.

I have the honor to acknowledge the receipt of your letter of the 23rd Feb., 1871, forwarding a copy of a letter from Dr. Knight, the Auditor-General, on the subject of head water-races on the Gold Fields in the County of Westland, and requesting an expression of my views and those of the County Council on the subject.

In reply I have the honor to forward herewith copies of two resolutions, which have been carried by the County Council, on the subject.

The Hon. the Colonial Secretary,
Wellington.

I have, &c.,
H. H. LAHMAN,
Chairman of the County Council.

Enclosure 1 in No. 13.

Extract from the proceedings of the County Council.

Westland, 22nd February, 1871.

Resolved—That this Council recommends to His Excellency the Governor the lines of water-races

known as the Kanieri Lake, and Ross and Mikonui water-races, as works to be constructed under part III. of, "the Immigration and Public Works Act, 1870," and further, that detailed surveys be at once made for the necessary water-races for the Paroa, Arahura, and Okarito districts, as works to be undertaken under the above Act. (On the motion of Mr. Bonar.)

Enclosure 2 in No. 13.

Extract from proceedings of County Council.

Westland, 1st March, 1871.

Resolved—That this Council, after having read the report of Dr. Knight on the construction of head water-races on the gold fields of the County of Westland can but feel gratified with the same, because the said report embodies not only the same view expressed in a resolution of this Council on the 23rd February, but also points out the due necessity which exists as to the speedy construction of these water works, on which the future well-being of the County so much depends. (On the motion of the Chairman.)

(True Copy.)

No. 14.

MR. LAHMAN to Hon. Mr. GISBORNE.

SIR,—

County Chairman's Office, Hokitika, 19th May, 1870.

Referring to Dr. Knight's report on water-races in the County of Westland, and also to the resolution of the County Council, passed on the 22nd February last and forwarded in my letter of the 3rd March, 1871, recommending that surveys be at once made for the necessary water-races for the Paroa, Arahura, and Okarito Districts, I have the honor to request that you will move the General Government to undertake or guarantee the cost of the survey of the races in the Paroa and Arahura Districts, under the supervision of the County Engineer, as the present financial position of the County will not admit the necessary expenditure being incurred. The cost of these two races would be about £1,000 each.

With regard to the other races mentioned in the resolution, namely, the Kanieri Lake and Ross and Mikonui Water Races, complete surveys have been made by private individuals, under the supervision of the County Engineer, at a cost of about £800 or £900 each.

I would recommend to the Government that these lines of races should be purchased, and I have no doubt but that at present, and if the purchase was left to the County Government, they could be obtained at a low price.

In support of my request, I beg to lay before you the following remarks:—

1. That the construction of water-races on a gold field is a most desirable work under the "Public Works and Immigration Act, 1870."
2. That these works tend, not alone to retain the present population in the County, who would otherwise to a great extent be obliged to leave it but will also cause great numbers of miners from the neighboring Colonies to emigrate to Westland, and thus be the means of a considerable increase in the revenue of the Colony.
3. That there can be hardly any doubt but that the contemplated works will be highly remunerative and reproductive, more so than can be fairly expected from any other public works, and as a proof of this I may mention that in the Paroa District there is the Hohonu and Greenstone Water-race, owned entirely by a private company, which has not only proved very remunerative to the owners, but has also enabled ground to be worked with fair returns, which has hitherto been abandoned as unpayable. The same may be expected of all the races mentioned in the resolution, and it is worthy of notice that on the whole the miners in these districts work on an average not more than three days out of the six, in consequence of the scarcity of water.

I feel I cannot sufficiently impress upon you the urgent necessity that exists for the construction of these works, and I would refer you not alone to Dr. Knight's report on water-races, but also to the Hon. Mr. Sewell, who, no doubt, from his recent visit to the County, and from the great pains he took in collecting all necessary information, will point out to the Government the desirability of granting my request.

I have, &c.,

The Hon. the Colonial Secretary,
Wellington.

H. H. LAHMAN,
Chairman of the County Council.

No. 15.

DR. HECTOR and Mr. BLACKETT to Hon. Mr. GISBORNE.

(Telegram)

Hokitika, 7th June, 1871.

HAVE consulted with County Chairman and Engineer as to Water-races, and recommend:

- 1st. That County Chairman be authorised to secure for Public Works Department the plans of the Mikonui and Kanieri Races, which are at present private property.
- 2nd. That survey of race in Arahura District be authorised at cost not exceeding £1,000.
- 3rd. Of the two plans proposed for the Paroa District, the only water available for low level races has been already secured, and the cost of the high level race is too great for the supply it would afford. No plan for this district can at present be recommended.

Roads.—After conference we recommend trunk road as follows:—

PAPERS RELATING TO THE

Greymouth by Omutumutu, Marsden, Nemona, Hohonu, Goldsbrough, Stafford, Hokitika, Kanieri to Ross, by inland line, with junction line from four miles north of Goldsbrough to Christchurch Road, at seventeenth mile of above.

Following portions require survey at once, to obtain estimates :—

Marsden to Hohonu, 6 miles.

Junction with Christchurch Road, 6 miles.

Stafford to Arahura Bridge, $3\frac{1}{2}$ miles.

Section of Ross Road, 14 miles.

If approved, authority should be sent to County Chairman to have these surveys made, at a cost not exceeding £450. Have communicated this to County Chairman.

The Hon. W. Gisborne, Wellington.

BLACKETT & HECTOR.

No. 16.

Hon. Mr. GISBORNE to CHAIRMAN COUNTY COUNCIL, Westland.

(Telegram)

Wellington, 7th June, 1871.

Will you ascertain at what price you can secure for Public Works Department the plans of Mikonui and Kanieri races, sending at same time Mr. Blackett's and Dr. Hector's report as to the reasonableness or otherwise. Survey of race in Arahura District is authorised at cost not exceeding £1,000, such survey to be subject to direction of General Government. As the only water available in Paroa district for low level races has been already secured, and the cost of the high level race is too great for the supply it will afford, no plan for this district can at present be decided.

H. H. Lahman, Esq., County Chairman,
Hokitika.

W. GISBORNE.

No. 17.

MEMORANDUM by Mr. O'CONNOR relating to Surveys, &c.

WATER SUPPLY, WESTLAND.—ROSS AND MIKONUI WATER-RACE.

County Engineer's Office, Hokitika, 10th June, 1871.

The contour line for this race has been run throughout on the ground, and $8\frac{1}{2}$ miles at lower end have been checked. The whole is plotted to a three chain scale horizontal for both plan and section, and to thirty feet vertical scale for section. A specification is made out, but requires amendment, having been prepared for a smaller race than is now proposed. There are working drawings of the different classes of construction, viz., fluming, boxing, and ditching; but these require refiguring to suit increased capacity. Altogether, to complete plans for contract, and check the remaining 10 miles at upper end, would take about a week, and cost, say £30.

KANIERI LAKE WATER RACE.

This line has also been run throughout, and the whole of it was checked. There is [both plan and section, scales, horizontal three chain, and vertical thirty feet. The general specification is prepared, but several copies will be necessary, and the description of each section has to be put on a separate sheet, copied from the table of quantities. Working drawings for the fluming, &c., viz., a sheet of drawings shewing a specimen of each class of work, will have to be made out. The whole could be done in about four days, at a cost of, say £20.

There ought also to be for each of the above a form of tender, to avoid confusion when setting work, as there are about 120 sections in the Mikonui, and 150 in the Kanieri race. The reason for having so many subdivisions was to avoid mixing carpentering and purely labouring work, and to attain this, the ditching sections necessarily terminated wherever boxing was required.

I have, &c.,

CHARLES Y. O'CONNOR, C.E.

Enclosure in No. 17.

KANIERI WATER SUPPLY.

SIR,—

Survey Office, 19th March, 1868.

I have the honor to inform you that in accordance with your instructions, directing me to ascertain the practicability of forming a water-race from the Kanieri Lake to the Blue Spur Diggings, I have taken running levels from the Kanieri Lake to peg 0 of the Great Western Race Company's contour line, and again from peg 68 of same contour line to the Blue Spur; accepting the stated fall of contour line throughout at 53 feet as correct.

The levels being referred to a sea datum, I find the height of the different points above high water mark as follows :—

Kanieri Township	...	...	...	...	34 feet.
Peg 68 of Great Western Race Company's line	...	...	...	...	95 "
Peg 0	...	...	...	...	148 "
Water in Kanieri Lake, ordinary level	...	...	...	...	422 "
Highest diggings on ridges of Blue Spur Township	...	...	...	...	309 "
General level of Kellett's Terrace N	...	...	...	...	288 "
Level which would command the great mass of adjoining Terrace workings	...	...	...	...	270 "
Level of Blue Spur Township	...	...	...	...	132 "

You will perceive from the table of heights above given, that estimating the total length at 11 miles,

being an increase of three miles on the straight line from point to point, a fall of 10 feet to the mile could be afforded throughout, terminating the race at a level which would command the highest workings.

On the map delivered herewith I have put the levels of principal points in given figures, and shewn the natural features of the country, compiled from the most recent reconnaissance surveys with the view of determining the best route for a contour trial line, should you decide on prosecuting the investigation to such an extent as would admit of an estimate being formed of the probable cost of the undertaking.

I have &c.,

Malcom Fraser, Esq.,
Chief Surveyor.

C. Y. O'CONNOR, C.E.,
Assistant Surveyor.

KANIERI WATER SUPPLY.

The next step taken in this matter was the cutting of a trial line, with approximate levels, by surveyors in the employ of private individuals (Messrs. Ryan and Robinson). This line I inspected and reported practicable on the 6th February, 1869, but suggested improvements at various points. The approximate estimate furnished with this report was £16,100, for a race to Blue Spur and Big Paddock.

In the month of May, 1869, the promoters endeavored to form a company, and upon the application of the Provisional Directors the County Government gave instructions for the preparation of plans and sections.

These were finally completed in September, 1869, at a cost of £41 per mile of contour line, which was paid by the company. The amended estimate, made after the completion of the section throughout, amounted to £18,988. The difference in estimate was occasioned by the adoption of tunnel lines through spurs in place of contour race round same, but the advantage gained by reduction of distance and consequent decrease of fall, was estimated to be more than commensurate with the increase on cost.

C. Y. O'CONNOR, C.E.,
County Engineer.

24th October, 1870.

WAIMEA WATER SUPPLY.

SIR,—

Survey Office, Hokitika, 23rd November, 1868.

Pursuing the exploration of Waimea District, with the view of providing a water supply to the principal diggings, I have, since my last report on proposed race from Kawhaka to Italians' Gully, taken several lines of levels along the ridges and gullies of the Upper Waimea.

The levels obtained during the former survey, being chiefly derived from barometer readings, were not absolute enough to carry conviction. I have therefore taken the opportunity of testing them by levelling, and find that the average results are sufficiently accurate to enable me to confirm the report sent you on 1st August last, as to the feasibility of the undertaking referred to in it.

The estimate I now amend, as the possession of data enables me to complete the work with greater accuracy, and permits the discarding of a large per centage allowed for contingencies.

There are three feasible means of supplying the Waimea district with water at different altitudes.

First—A race to supply water to the Upper Waimea district at a level of 600 feet above the sea. Commencing on the Kawhaka at peg 82, crossing Christchurch Road near 17th mile post, following range to Greek's Gully No. 1, thence to range at head of Waimea branches, and continuing round spurs to Italians, Callaghans, Maori and German Gullies, terminating on Scandinavian Hill, at an elevation of 420 feet above the sea.

The cost of this would be about £25,800.

A branch race carrying water to right hand branch of Waimea, Liverpool Bill's, Pretty Woman's Gully, and Ballarat Hill, could be constructed at a cost of about £3,100, and the two smaller branch races shewn on plan could be made at a cost of about £700. This would complete the first system proposed for water supply. Total, £29,600.

Second—A reservoir, with a surface level of 490 feet above the sea, as shown on map, contained on all sides but one by natural ridges. To complete the basin a dam would be required 96 chains long, with an average height of 22 feet. The effect of this dam would be to turn almost the entire source of the Kapitia into the middle branch Waimea, and constructing a basin with a rainfall capable of supplying about 50 sluice heads of water. The cost of this work would be £22,000.

Third, dependent on Second.—A race to supply water to Upper Waimea District at a level of 540 feet above the sea, commencing on the Kawhaka Creek at peg 95, crossing Christchurch Road below point described for No. 1, following northern boundary of reservoir before described, fluming a long dam constructed for reservoir, and afterwards following the course described for No. 1, but at a lower level. Estimated cost, £15,100.

The respective merits of the different propositions would be as follows:—No. 2 and 3, if both carried out, would afford a complete water supply to all parts of the Waimea; and the high level water race, being thus founded on the dams for low level reservoir, could be made cheaper than if carried by the route first proposed; but the course of No. 1 race lies over terraces known to be auriferous, whilst that of No. 3 would be over untried or barren country. The height of supply proposed is much greater for No. 1, but the quantity of water available for lower workings would be much less. The No. 1 course also has the advantage of being feasible in itself, without the aid of works of a separate undertaking.

I have, &c.,

Malcolm Fraser, Esq.,
Chief Surveyor.

CHARLES Y. O'CONNOR, C.E.,
Geodesical Surveyor.

MIKONUI WATER SUPPLY.

SIR,—

Survey Office, Hokitika, 1st March, 1869.

I have the honor to report that, in accordance with your instructions, I have surveyed the country from Ross to the head of the Mikonui River, with the view of obtaining a water supply for working the auriferous terraces on Southern declivity of Greenland Range.

I have pleasure in being able to report that such a race is practicable, and that the cost will be moderate, taking into consideration its great elevation, the large area of ground it will command throughout, and the immense power derivable from it at the lower levels.

The race is purposed to commence at upper gorge of Mikonui, about 17 miles from the sea, with an elevation of 980 feet above high water mark. The fall will be at the rate of 30 feet per mile for the first 6 miles, and afterwards at the rate of 8 feet per mile. The terminating level on ridge near Ross will be 680 feet above sea, and the total distance 22 miles.

The cost of this trunk race, constructed to carry 40 Government sluice heads of water, will be about £17,500.

Starting from Trunk Race about $7\frac{1}{2}$ miles along its course, a branch race to supply the Totara Valley and terraces on north side of Greenland Range will be practicable; it would have a fall of eight feet per mile throughout, ending on terrace north of Donnelly's Creek, at an elevation of 666 feet above the sea; distance, $15\frac{1}{2}$ miles.

The steep nature of sidling on north face of Greenland Range would render this an expensive work as compared with the race on south side, and, at present, the country it would traverse does not give promise of as good returns, but in case of its becoming desirable to provide a water supply for the Totara Valley, it could be derived from the Mikonui Trunk Race at a less cost, and a higher elevation, than from the Totara or any other source I am aware of.

The cost of this branch, including the increased expenditure on main race to provide for its supply would be about £15,600. Total estimate, £33,100. The levels of principal points ascertained during the progress of the survey are as follows, the figures where the asterisk is used being deduced from barometer readings, and the remainder from absolute levelling:—

Malpoy's Race, near cemetery at Ross	...	...	310*	feet above sea level.
Ross Flat	...	...	105 to 170	" "
Donoghue's Flat	...	...	44*	" "
Energetic Company's Race	...	...	76*	" "
Redmond's Gully whim claims	...	...	130*	" "
Race crossing Redmond's Gully at junction with Black's	...	...	192*	" "
Level of water west end of Lower Gorge, Mikonui	...	...	98	" "
Level of water east end of Lower Gorge, Mikonui	...	...	264	" "
Lowest point on dividing ridge between Mikonui and Totara	...	...	710*	" "
Level of water in Mikonui at Forks	...	...	417	" "
Level of water in first town to north	...	...	584	" "
Level of water in flat west end of Upper Gorge	...	...	933*	" "
Level of water in junction of Totara and Smythe's Creek	...	...	601*	" "
Level of water in junction of Beaufill's Creek	...	...	443*	" "
Level of water in junction of Disappointment Creek	...	...	333*	" "
Level of water in junction of Duffer's Creek	...	...	277*	" "
Level of water in junction of Constitution Creek	...	...	221*	" "
Level of water in junction of Hatter's and Cameron's Creeks	...	...	370*	" "
Level of water in junction of Cameron's Gully at crossing of upper track	...	...	648*	" "
Level of water in junction of Frenchman's and Fox's Creeks	...	...	487*	" "
Top of ridge head of Harvey's Creek	...	...	1,377*	" "
Saddle, main branch of Harvey's Creek	...	...	803*	" "
Woolhouse's accommodation-house on the Totara	...	...	156*	" "
Highest point Greenland Hill	...	...	2,959	" "
Starting point of Calder's Race (supply two Government heads to Cameron's Gully)	...	...	1,483*	" "

I have taken the opportunity, while exploring the country, to run a line of levels, with beach marks, &c., along the Mikonui River, as a base of reference in laying out the work, should this race be undertaken.

I have, &c.,

C. Y. O'CONNOR, C.E.,
Mining Engineer.

Malcolm Fraser, Esq., Chief Surveyor.

MIKONUI WATER SUPPLY.

The detail survey for this race was commenced on 24th June, 1869, under the superintendence of Mining Engineer and Surveyors, whose salaries and expenses were paid by a company inaugurated at Ross. The cost of the survey and plans amounted to £38 per mile of contour line. The plans were completed in October same year, and an estimate made at that time for a race nine miles in length, with cuttings and fluming constructed for 10 heads, and with tunnels of sufficient size for 40 heads, amounted to £12,800. This race would have terminated in German Gully, above Ross, and would have been dependent for supply on artificial reservoirs and the creeks which it crossed. It was proposed as a temporary expedient, in order to assist in carrying out the main undertaking, and it most probably would have done so, as water 620 feet above the sea at German Gully was worth about £16 per head per week. The scheme, however, fell through, in consequence of want of funds on the part of the promoters.

L A K E K A N I E R I

SKETCH MAP

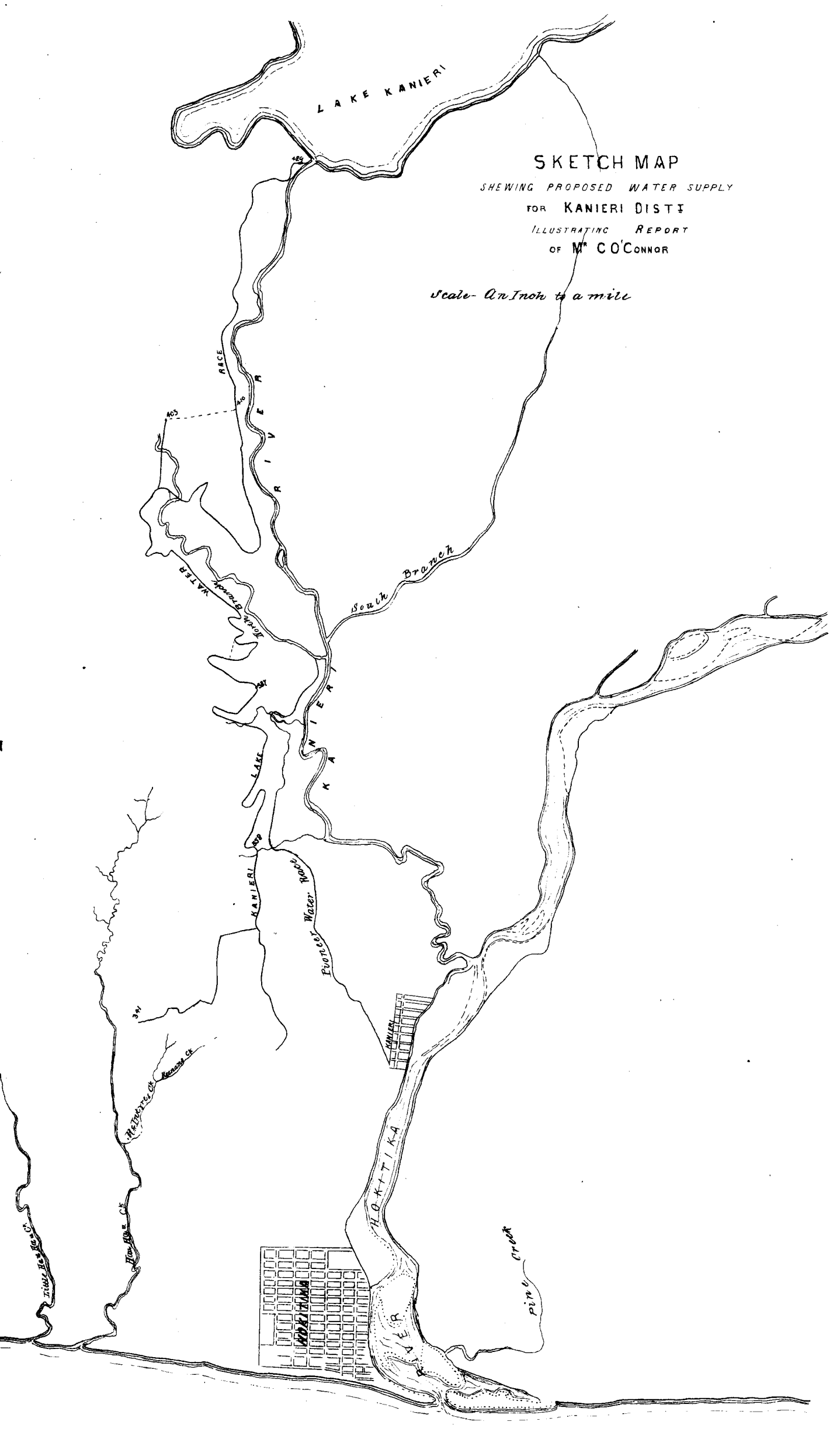
SHEWING PROPOSED WATER SUPPLY

FOR KANIERI DISTRICT

ILLUSTRATING REPORT

OF M^r CO'CONNOR

Scale- An Inch to a mile

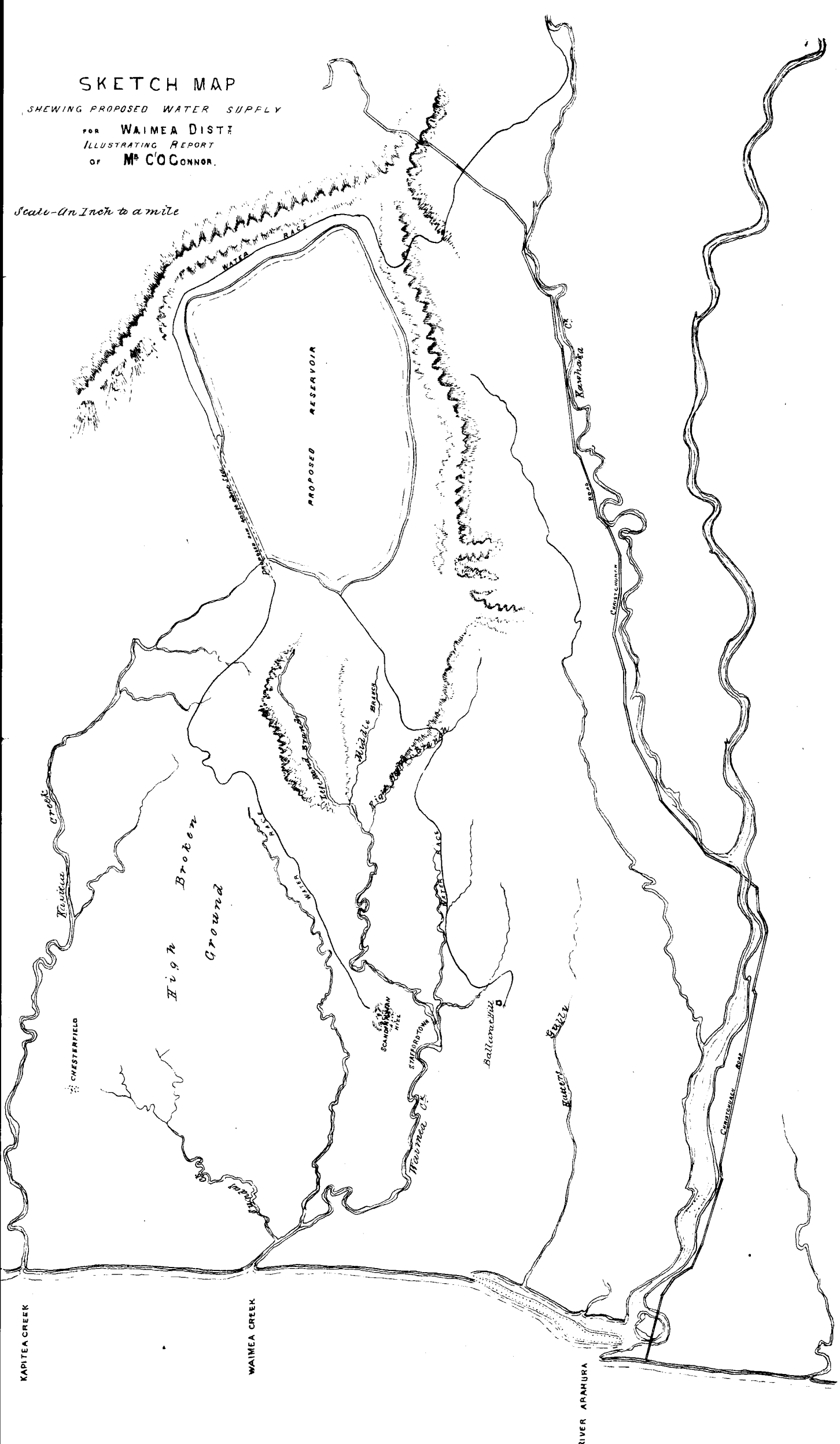


SKETCH MAP

SHOWING PROPOSED WATER SUPPLY

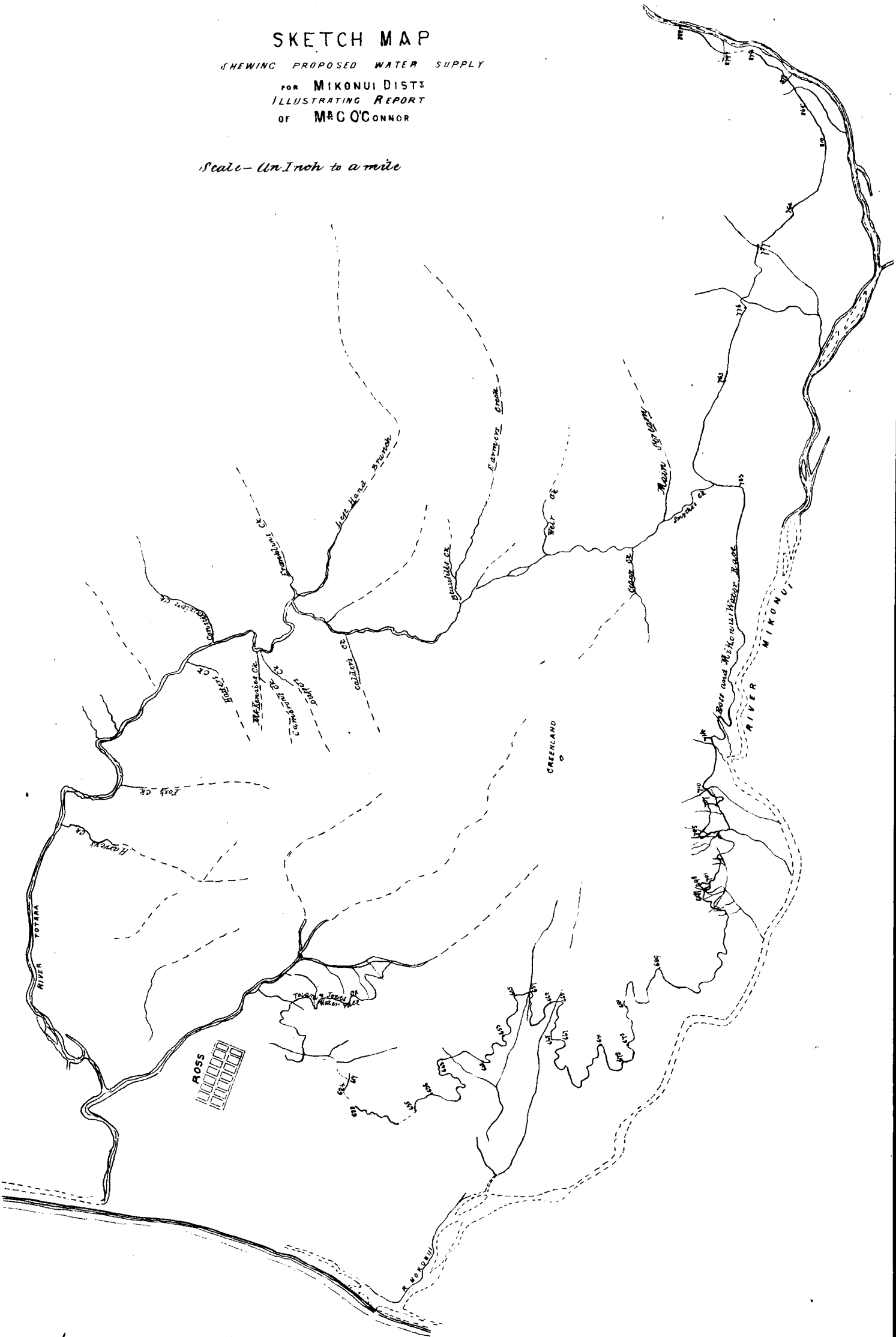
FOR WAIMEA DISTRICT
ILLUSTRATING REPORT
OF MR COCONNOR.

Scale—An Inch to a mile



SHOWING PROPOSED WATER SUPPLY

Scale - 1 in to a mile



An estimate of the main race proposed, based on the detail plans, amounted to £34,900.

I have, &c.,

CHARLES Y. O'CONNOR, C.E.,
County Engineer.

24th October, 1870.

WATER SUPPLY TO MAORI GULLY DISTRICT.

SIR,—

Survey Office, 10th July, 1869.

I have the honor to report that since the progress statement sent you on 22nd March, relative to the surveys instituted with the view to providing a water supply for Maori Gully District, levels have been taken in the Upper New River Valley to test the practicability of forming a reservoir at that point; but I regret to say that in this case also I have failed to hit upon any scheme which I could recommend for adoption at the present time.

The money spent upon the survey has not, however, been lost, as the results which I have roughly compiled and shewn upon the enclosed tracing have been handed over to Mr. Cooper, the Mining Surveyor at Greymouth, for more careful plotting and revision, and will be a great addition to the knowledge already possessed of that portion of the country.

I am still of opinion that a race crossing the ridge between Drake's track and AA line without high fluming would be inadequate to the requirements of Maori Gully and New River districts; but this is a matter for the determination of the residents themselves; being now in possession of levels of all the principal points, and their positions, they will be aware of the quantity of ground commanded by a race at the level shewn, and can readily decide if it would be reproductive.

With the view of providing all information which may possibly be useful, I have attached to the map sent herewith approximate estimates of the cost of three different schemes which may be weighed against their respective advantages; the first starting from the eastern Hohonu Water-race, at the point of its nearest approach to Maori Gully, and following the natural level of the country throughout, so as to avoid high fluming. The second commencing on the Hohonu River, about two miles above the head of eastern Hohonu Water-race, and having been carried along the low saddle in syphon pipes to the ridge at peg 109, following the ridge from thence to the New River, &c. Third, a race commencing at same point as No. 1, and following its course to the point C. At this place (point C), the water might be raised out of the race, a height of 200 feet, by steam pumps, and then carried in a cut parallel with the line No. 1 to the terminating point. In each case the estimate is made for race to Maori Gully, and levels are shewn along what may be regarded as an approximate idea of the course they would follow.

I have, &c.,

Conrad Hoos, Esq.,
Chairman County Council, &c.

C. Y. O'CONNOR, C.E.
Mining Engineer.

Extract from Mining Engineer's Report to County Council, 31st December, 1869.

Mikonui Water-race, to carry 40 Government Heads.

	Miles.	Chains.	Rate per head.	£
Fluming, average 18½ feet high	1	8	£45	3,960
Boxing laid in side cutting	8	35	25	16,875
Tunnelling, timbered throughout	2	68	35	7,980
Ditching	6	9	6	2,934
Total	18	40		31,749
10 per cent. contingencies				3,175
				34,924

Kanieri Water-race, to carry 40 heads.

Fluming, average 17 feet high	1	32	£40	4,480
Boxing laid in side cutting...	2	67	20	4,540
Tunnelling	1	40	35	4,200
Ditching	9	15	5 10s	4,042
Total	14	74		17,262
10 per cent. contingencies				1,726
				18,988

Hohonu Water-race, carries 35 heads.

Fluming, average 10½ feet high	0	49	£42	2,058
Boxing laid in side cutting	1	12	21	1,932
Ditching	3	42	5	1,410
Total	5	23		5,400
Dams and branch races for supply				1,500
				6,900

Grey District, March, 1869.

High level race, to carry 20 heads	...	...	...	£61,000
(Not recommended) low level race, to carry 40 heads	...	...	...	£24,000

PAPERS RELATING TO THE

Waimea District, November, 1868.

E G H line, &c., red, race most recommended	...	...	...	...	£29,600
A B C line (and reservoir), blue, higher and more complete, but over ground less known, and so not recommended	...	...	...	...	£37,100
C. Y. O'CONNOR, C.E., County Engineer.					

24th October, 1870.

OTAGO.

No. 18.

Hon. Mr. GISBORNE to His Honor the SUPERINTENDENT of Otago.

SIR,—

Colonial Secretary's Office, Wellington, 12th November, 1870.

I have the honor to transmit to you the accompanying copy of a letter dated the 5th September last, from Mr. C. E. Haughton, enclosing a memorandum from Mr. L. Broad on the subject of water supply for the Twelve-mile District, Wakatipu Gold Fields. In order that steps may be taken by the General Government, under the "Public Works and Immigration Act, 1870," it will be necessary that your Honor and the Provincial Council should concur in a recommendation as provided in section 26 of the Act.

His Honor the Superintendent, Otago.

I have, &c.,

W. GISBORNE.

Enclosure in No. 18.

Mr. HAUGHTON to Hon. Mr. VOGEL.

SIR,—

Wellington, 5th September, 1870.

I have the honor to enclose, for your consideration, a memo. with regard to the supply of water in the Twelve-mile District, Wakatipu Gold Fields, in the Province of Otago, by Mr. Lowther Broad, the late Warden.

From my own knowledge of the country, I can fully confirm his statements; nor am I aware that any other similar work in the Lake country would be so immediately and certainly remunerative.

You are no doubt aware that action is already being taken in Otago to secure portions of the money to be expended on the water supply for the several gold fields districts. I would venture to suggest to the Government that, as a preliminary step to an engineering flying survey, some gentleman acquainted with the subject should be commissioned to travel through the country to see personally the various local bodies, and report as to the localities in which it would be most advantageous to the public interest that the works should be initiated, and under what arrangements the miners themselves might be willing to render assistance in labour or otherwise.

The Hon. Julius Vogel, M.G.A.

I have, &c.,

C. E. HAUGHTON.

Sub-enclosure to Enclosure in No. 18.

MEMORANDUM by Mr. LOWTHER BROAD.

A TRACT of country extending from the Falls, from thence to the Twelve-mile and Upper Arrow River—a distance of about 15 miles—has remained unworked in consequence of the want of water for sluicing purposes.

Prospecting tunnels have been driven at intervals into the hills, and the existence of leads of wash dirt proved. It would not pay, however, to take out such small quantities as can be done by tunnelling, and then have to convey the earth a considerable distance to wash it, but it would pay beyond all doubt if water power was available for ground sluicing.

The gold is found in regular runs or gutters, 50 to 100 yards apart, from the foot to the summit of the loftiest hills; the country is, in fact, a succession of alluvial mountains, with bands of payable wash dirt running round them.

These bands or leads have on the low levels been worked with great profit since 1863, and still continue to pay.

In 1864, when I was Warden of the Districts, I went with two miners (accustomed to the construction of water-races in California and Australia) over the whole of the neighboring country to ascertain if a constant supply of water could be brought from the head of the Shotover River at a sufficiently high level to work the topmost leads of gold. We concluded that the scheme was perfectly practicable, and that it was simply a question of expense. That the race would pay as a speculation, we believed, as water was then (and I believe still is) selling for £3 and £4 per sluice head per week of six days of 12 hours each; that is, the owner of the race got from £6 to £8 for each sluice head weekly. The discovery of quartz reefs and the construction of races nearer the Capital, absorbed most of the money in the hands of private speculators, and it was deemed hopeless to try and form a company to construct a race in a remote and comparatively unknown locality. The miners on the spot were getting some good returns from the low levels, and were too busy to care about spending three or four months in the construction of a new race; the scheme was therefore abandoned, but the high leads have continued to yield wages to the few who would go through the tedious and unsatisfactory process of tunnelling the ground.

To render the race of real service to the locality, it would be necessary to construct it at the highest attainable level, forming a large reservoir at the Twelve Mile, from which miners might construct branch

racers to their claims. The amount of new ground rendered available for mining would be very considerable; a thousand more miners could set to work at once (if water was to be had), in addition to the population already there. I do not think the people would give any monetary assistance in carrying out this scheme, because they have not the means; but I feel sure they would find a certain proportion of the labor, provided those who thus contributed were guaranteed a certain quantity of water at a reduced rate.

I estimated the cost of the race and reservoir at £15,000; of this the miners would probably contribute £3,000 in labor, leaving the actual cost to the Government £12,000. Say 60 heads of water were brought in, half might be readily let for six days a week of 24 hours each, for £4 per sluice head, the other half might be given to those who had assisted in constructing the race, for three years, at the reduced rental of 10s. per head (24 hours per day) per week, producing together a return of £135 per week, or £7,020 per annum for the first three years. This is a very moderate calculation, as most of the large races in California, although comparatively useless now, recouped the cost of construction during the first 18 months after they were finished.

I have made the above calculation for 60 heads, but if there was a demand for more, a hundred heads could be brought in with very little additional expense.

Mining and farming have been extensively combined in Otago, and I believe the facility with which good agricultural land can be obtained would attract many of the best class of miners in the neighboring colonies to come here and settle, provided there was a chance of finding payable ground for their sons and relatives to mine.

LOWTHER BROAD.

No. 19.

His Honor J. MACANDREW to Hon. W. GISBORNE.

SIR,—

Superintendent's Office, Dunedin, 22nd July, 1871.

I have the honor to forward herewith for your favorable consideration resolution passed by Provincial Council of Otago on the subject of gold fields water supply in the District of Dunstan, Mount Ida, and Tuapeka; also, resolution with respect to the application of a portion of the Public Works Loan to the drainage and improvement of land.

The Hon. the Colonial Secretary,
Wellington.

I have, &c.,
J. MACANDREW,
Superintendent.

Enclosure 1 in No. 19.

GOLD FIELDS WATER SUPPLY.

That this Council, in accordance with Part III. of "The Immigration and Public Works Act 1870," desires to recommend, under the provisions of the said Act, that the following works be without delay initiated for water supply on the gold fields, with a view to their construction under subsidy or rate of interest on the amount expended:—

1. Head race from Coal Creek to Bannockburn Ranges, Dunstan District.
2. Head race from the Little Kyeburn to the working above Naseby, to be used as flushing water; Mount Ida District.
3. Reservoir in the Tuapeka Basin, Tuapeka District, and such works as may be deemed advisable by the Government.

That a respectful address be presented to His Honor the Superintendent, requesting him to forward the foregoing resolution to the General Government. (Mr. Haughton.)

Passed the Provincial Council, 13th July, 1871.

CHARLES SMITH,
Clerk of Council.

JOHN B. GILLIES,
Speaker.

Enclosure 2 in No. 19.

DRAINAGE AND IMPROVEMENT OF LAND.

1st. That in the opinion of this Council it is desirable that the attention of the General Assembly should be directed to the Acts of the Imperial Legislature, intituled "The Lands Improvement Company's Act, 1853;" "The Scottish Drainage and Improvement Company's Act, 1865;" and "The Scottish Drainage and Improvement Company's Amendment Act, 1860," with a view of obtaining an Act of the Assembly under which similar provisions for the drainage and improvement of lands in the various Provinces of New Zealand desiring to adopt the same to those contained in the above mentioned Acts, may be made available to any company or person willing to undertake and assist in the execution of any such works.

2nd. That this Council is of opinion that it is desirable to encourage the improvement of agricultural lands throughout the Colony, and, with that view, would respectfully recommend that a sum of £100,000 of the proposed loan should be made available for that purpose; such sum to be advanced on loan to persons who may be desirous of effecting improvements of a permanent and reproductive character, upon terms and under conditions similar to those contained in the above mentioned Acts; the principal and interest to be made a first charge on the property or properties upon which the money is to be expended, and to be made repayable by annual instalments until both are repaid.

3rd. That His Honor the Superintendent be requested to take such steps as he may consider necessary to give effect to the above resolutions. (Provincial Secretary).

Passed the Provincial Council, 13th July, 1871.

CHAS. SMITH,
Clerk of Council.

JOHN B. GILLIES,
Speaker.

No. 20.

His Honor J. MACANDREW to His Honor W. GISBORNE.

SIR,—

Superintendent's Office, Dunedin, 24th July, 1871.

I have the honor to forward herewith copy of my message to Provincial Council of Otago, relating to the application of a portion of the Public Works Loan being applied to the construction of sludge channels, and other works necessary for the development of the gold fields, together with the resolution passed by the Provincial Council on this subject.

Trusting that this suggestion will meet with the favorable consideration of His Excellency's advisers,

The Hon. the Colonial Secretary,
Wellington.

I have, &c.,
J. MACANDREW,
Superintendent.

Enclosure 1 in No. 20.

MESSAGE NO. 7.

THE Superintendent submits for the consideration of the Provincial Council the advisability of recommending such a modification of the "Immigration and Public Works Loan Act, 1870," as that a portion of the loan authorised to be expended on water supply on gold fields may be diverted towards the construction of sludge channels and other works necessary for the development of the gold fields—such, for example, as at Naseby, where mining operations must very soon cease, and one of our most productive gold fields collapse, unless a suitable sludge channel is provided.

Dunedin, 16th June, 1871.

J. MACANDREW, Superintendent.

Enclosure 2 in No. 20.

No. 44, Superintendent.

"Immigration and Public Works Loan Act, 1870."

(Reply to Message No. 7)

THAT this Council agree with the suggestions contained in His Honor's Message No. 7, and resolve that in the opinion of this Council it is desirable that "The Immigration and Public Works Loan Act, 1870," and Part III. of "The Immigration and Public Works Act, 1870," should be amended, and provision made to the following effect, viz., That out of the sum or sums to be applicable to the construction of water-works on gold fields, a portion may be made available for the construction of sludge channels and other works which may be found necessary for the development of the gold fields.

This Council is further of opinion that out of the sum of £300,000 to be made available under the said Act to the construction of water works on gold fields, a sum of £150,000 should be placed at the disposal of this Province, to be administered by the Superintendent and Provincial Council.

That a respectful address be presented to His Honor the Superintendent, requesting that he will forward the foregoing resolution to His Excellency the Governor, with a request that he will be pleased to take steps to give effect thereto.

Passed the Provincial Council 20th June, 1871.

CHAS. SMITH,
Clerk of Council.

JOHN B. GILLIES,
Speaker.

