Dams

Water power was critical for early developments, and continued to play a role till the major companies were gone.

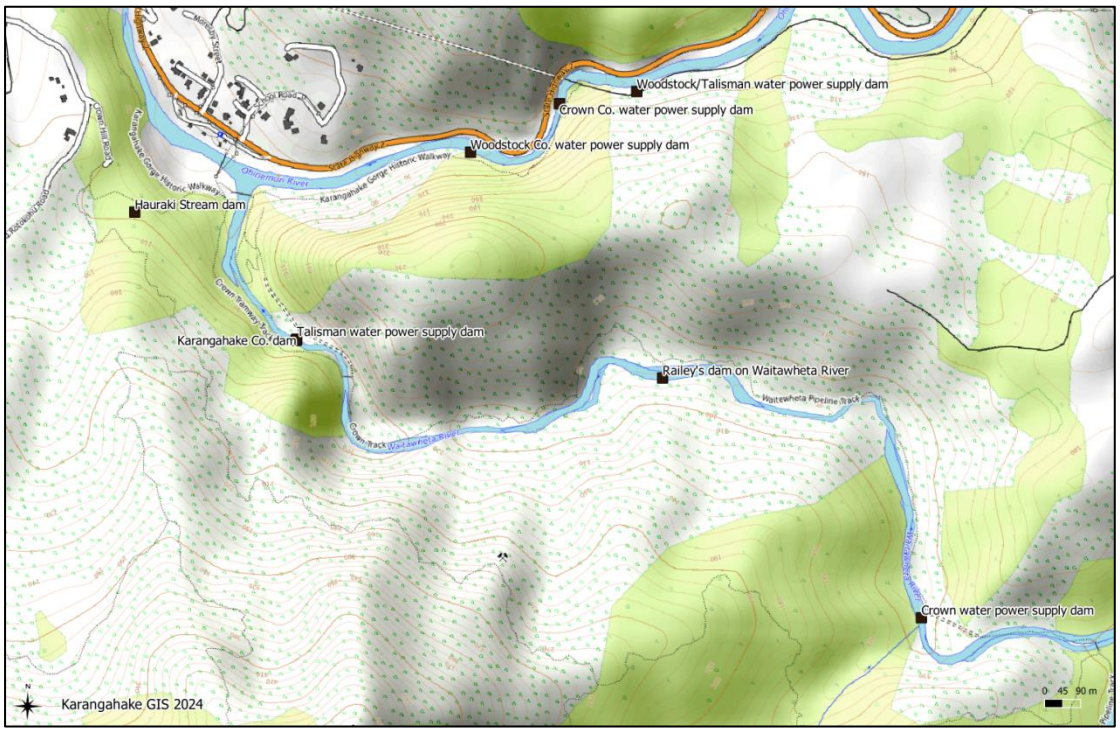
There were six major dams built at Karangahake. They were all wooden, and most had open wooden flume water races.

Three on the Waitawheta River:- Karangahake/Talisman, Railey/Crown, Crown.

Three on the Ohinemuri:- Woodstock, Crown, Woodstock/Talisman.

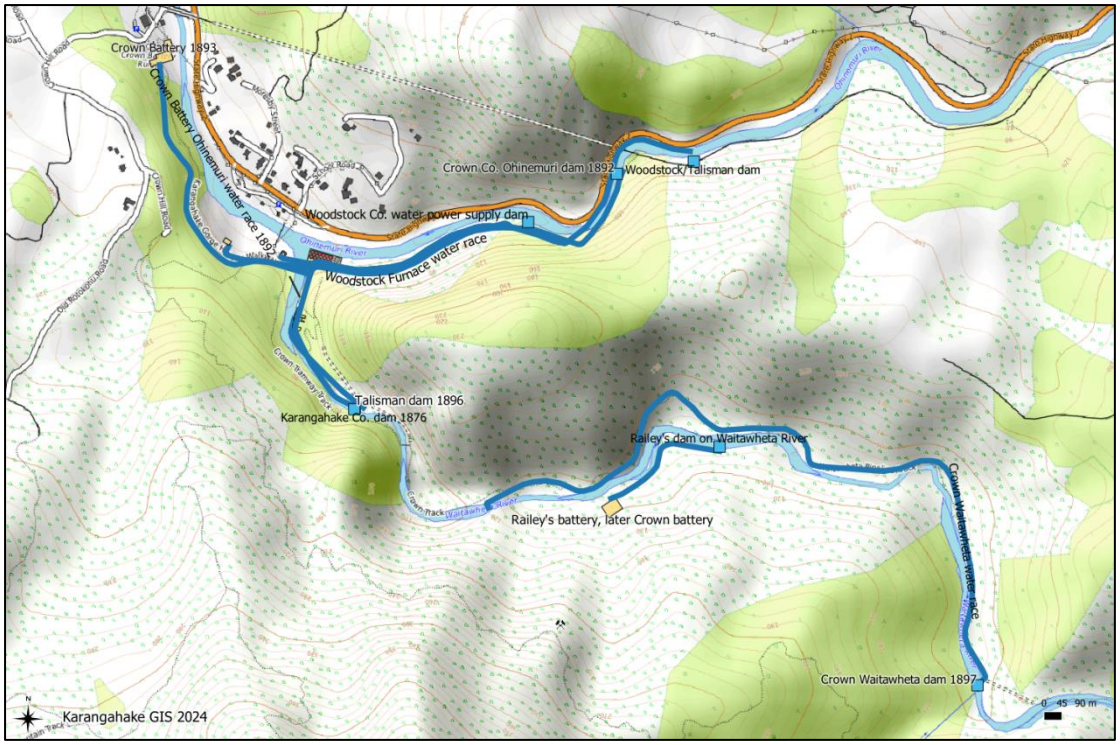
There was also one or more on the small Hauraki Stream in Scotchman's Gully. The current remains are a small concrete structure.

The Crown Company installed a c.12 inch pipe to take discharge water from their large pelton wheel, at their river level adit, to their battery to run more wheels[1]. Parts of this pipe remain, sometimes confused with the Paeroa municipal water supply pipeline. Sadly, no specific reference to this has been found again. The pipe shows in several photographs, beside the Crown tramway.



Six main water power supply dams at Karangahake. Plus Hauraki Stream.

[1] From memory of the writer.



All the water races and dams are rendered here, less the Crown pipe[2], and the Hauraki Stream mini dam.

They are discussed in the rest of the document.

[2] Without documentary evidence, I feel loath to include it.

Dams and water races	
1876	Karangahake Company erect dam and wooden water race on Waitawheta River. The first in Karangahake.
1885	Woodstock Company dam and wooden water race for the Furnace late 1885. First and lowest on the Ohinemuri River.
1886	Railey's Battery dam and wooden water race late 1886. This is the second dam on the Waitawheta River.
1892	Crown Company Ohinemuri dam and water race 1892. The water race will be a wooden flume from a dam just below the future eastern portal of the railway tunnel.
1894	Woodstock Battery water race 1894. A shortened and refurbished version of the Furnace water race. Same dam.
1895	Woodstock's open wooden flume replaced by 1m diameter steel pipe.
1896	Talisman Company dam and water race 1896. This is a reuse of the original Karangahake battery dam and headworks, the flume being replaced by a 4 ft [1.2m] diameter pipe. Crown Company Waitawheta dam and water race 1896. This long wooden flume will power the large air compressor at the river level entrance.
1900	Woodstock water race extension and new dam 1900. On the Ohinemuri River, upstream of the future eastern portal of the railway tunnel.
1904	Talisman buy Woodstock for £7000, and take over the Woodstock dam.

Karangahake Company Dam

Lowest on the Waitawheta River.

1876

18 April

Reporting on the Karangahake Company:-

> Mr. Cornes mine manager…
>
> The millhouse is erected—framing, logs, stamper-boxes and tables, with berdans, in position. The stamper-rods and other items require to go up, but all are on the spot. The motive power is water driven by turbine. The erection of this part has been let to Mr. Coote, who proceeds at once with his job. The water race is in hand, partially done, and will comprise 1700 feet [518m] of fluming. The completion of the mill and the first crushing from the mine will probably be six weeks hence.[3]

The wooden water race can be seen in the lithograph No.1, and dam in No.2[4]. This is the Waitawheta River. The water race length strongly suggests the dam is at the location of the later Talisman dam (probably the same dam).

The remains to be seen today are the wooden bed log with some planking, the tunnel in the cliff, concrete by-wash and gate structure, and steel pipe. Other than the steel pipe (a Talisman addition in 1896), how much of this dates to this time is unclear (but see below).

9 May

A slightly longer length is given for the water race by the Thames Advertiser.

> Mr Cullen has also the contract for the water race, and it is now in a very forward state. The length is about 1,800 feet [549m], and one portion of it required some heavy rock cutting on an almost perpendicular face. There is a good deal of trestle work in it, and the whole is being done in a most substantial manner, which reflects great credit on the contractor. The contract for fixing the turbine and cutting the tail race is being rapidly carried out by Mr Coutts…[5]

The heavy rock cutting is presumably where the water race collects its water from the dam via a tunnel in the cliff (can be seen today), in which case, this at least would be an original feature. The photograph Waitawheta Gorge 485[6] shows the dam and wooden flume. Note no Crown tramway in cliff on right.

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[3] https://paperspast.natlib.govt.nz/newspapers/NZH18760418.2.25
New Zealand Herald, Volume XIII, Issue 4502, 18 April 1876, Page 3
[4] https://paperspast.natlib.govt.nz/newspapers/new-zealand-herald/1885/12/24/19
New Zealand Herald, Supplement, 24 December 1885
[5] https://paperspast.natlib.govt.nz/newspapers/THA18760509.2.15
Thames Advertiser, Volume IX, Issue 2352, 9 May 1876, Page 3
[6] https://digitalnz.org/records/30085605/waitawheta-gorge
http://www.aucklandcity.govt.nz/dbtw-wpd/exec/dbtwpub.dll?BU=http%3A%2F%2Fwww.aucklandcity.govt.nz%2Fdbtw-wpd%2FHeritageImages%2Findex.htm&AC=QBE_QUERY&TN=heritageimages&QF0=ID&NP=2&MR=5&RF=HIORecordSearch&QI0=%3D%224-RIC356%22

485 RIC 356 Waitawheta Gorge dam 485 AkLib JD Richardson.

Looking upstream Waitawheta River. The water race wooden flume can be glimpsed at the image bottom, to right of the punga. Date not determined.

First Infrastructure at Karangahake

The dam on the Waitawheta, wooden flume, hoppers, chutes, tramways, trestle bridges across the river, and of course the battery, are the first infrastructure constructed at Karangahake for mining.

3 June

> Karangahake.—The battery would have made a start by this time, but, unfortunately, the fluming was carried away for about 130 feet, and, as the timber will have to be supplied from Shortland, some short time must elapse before damages are repaired. Stone is being broken down from the intermediate level, and the large quantity in paddock will be sledged down to the mill this week.[7]

[7] https://paperspast.natlib.govt.nz/newspapers/NZH18760603.2.43
New Zealand Herald, Volume XIII, Issue 4541, 3 June 1876, Page 6

6 June

> At the Karangahake the manager and men are busy blasting the rocks near the dam to make a good channel for the flume.[8]

26 June

> The Karangahake Battery, Ohinemuri, was successfully started on Saturday, for the satisfaction of directors and valuers. It was run up to 90 strokes a minute with only a third of the water power available. It will be immediately taken over by the Company and started to crush quartz.[9]

The 26th was a Monday, so the battery "started" June 24 1876, but not an official opening yet? See below: 11 July.

11 July

> We are requested to state that the official start of the Karangahake Company's battery, which was to take place to-morrow, has been postponed until further notice, and the reason is this: A portion of the fluming which conveys the water to the turbine wheel is too low. It is believed to have sunk, but at all events the fact remains that it is too low, and the water, which it should convey to the battery, is wasted over its side. In consequence of this there does not appear to be sufficient water conveyed to drive the full force of the battery at proper speed. Of course had there been timber available the sides of the flume could readily be raised to a sufficient height to prevent overflow, but unfortunately there was none available in Mackaytown. The manager had therefore to send to Shortland for some boards. Those will not leave the Thames until to-morrow, and it will be impossible therefore to have the necessary work done in time to effect a satisfactory start on the day originally named. We make the announcement so that there may be no disappointment, for a considerable number of people from the Thames had made arrangements to be present at the opening ceremonies.[10]

Karangahake Battery opens

The battery, powered by a turbine, will use amalgamated mercury plates to recover the gold from the crushed ore (the "ordinary battery process").

No date for the official opening of the battery, but on or before July 19?

19 July

> The Karangahake battery, as I told you in my last, after crushing, a few tons of quarts had to knock off for want of power. Mr. Gibbons has during the last, few days been engaged in enlarging the race, and intends raising the height of the dam 18 inches, as in his opinion it is the want of water that is the cause of

[8] https://paperspast.natlib.govt.nz/newspapers/DSC18760606.2.18.3
Daily Southern Cross, Volume XXXII, Issue 5195, 6 June 1876, Page 3
[9] https://paperspast.natlib.govt.nz/newspapers/AS18760626.2.21.1
Auckland Star, Volume VII, Issue 1990, 26 June 1876, Page 3
[10] https://paperspast.natlib.govt.nz/newspapers/THA18760711.2.9
Thames Advertiser, Volume IX, Issue 2364, 11 July 1876, Page 2

the want of power. This will be accomplished by the end of the week should the weather prove favourable, which is rather unlikely.[11]

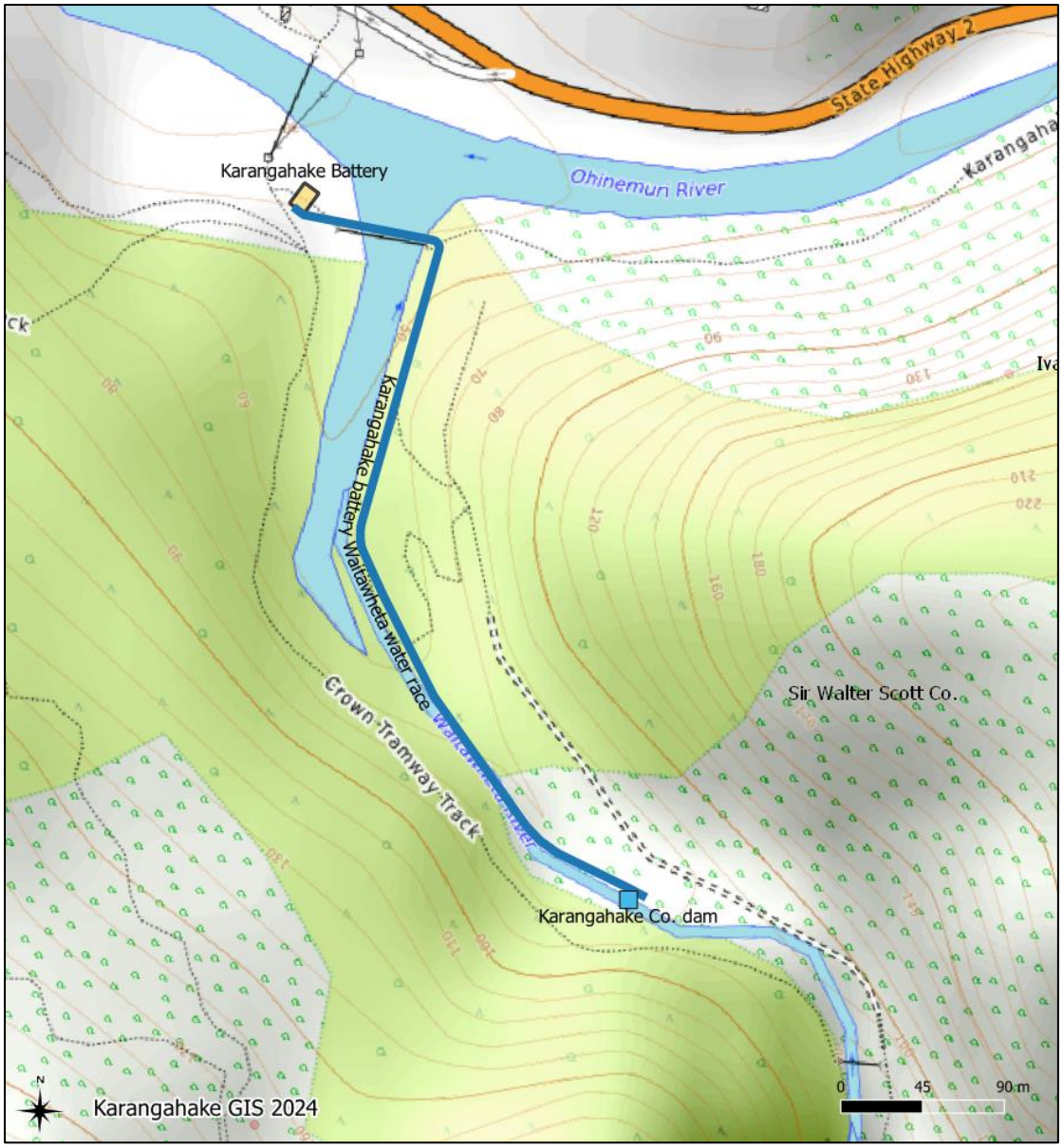
9 August

The Karangahake battery is working full swing in capital order.[12]

10 August

Ohinemuri, August 7. The Karangahake battery has made a start with 12 head stampers; it seems the driving belt is too light to serve the other four. A new belt has been sent for, and when it arrives, the whole force of the mill will be set and kept going. The race has been considerably enlarged, and there is water to spare.[13]

[11] https://paperspast.natlib.govt.nz/newspapers/NZH18760722.2.24
New Zealand Herald, Volume XIII, Issue 4583, 22 July 1876, Page 3
[12] https://paperspast.natlib.govt.nz/newspapers/NZH18760809.2.17
New Zealand Herald, Volume XIII, Issue 4598, 9 August 1876, Page 3
[13] https://paperspast.natlib.govt.nz/newspapers/NZH18760810.2.19
New Zealand Herald, Volume XIII, Issue 4599, 10 August 1876, Page 1 (Supplement)



Karangahake Company water race and dam, 1876.

Water race is 507 m by GIS.

Karangahake Company dam on the Waitawheta River, looking upstream from the Woodstock tramway of 1885. The wooden flume captures water from the left of the dam via a tunnel cut into the cliff (at least that's what we see today).

Date unsure, but after 1885, before the Crown tramway of 1892. So this may be the dam of the Karangahake Company, Hauraki Co. or Ivanhoe Co. The Talisman Company take over the dam in 1895/6. A.M. Bowater.

Woodstock Company Dam, for the Furnace, late 1885

Lowest on the Ohinemuri River.

1885

4 June

> The proprietors of the Woodstock claim, Karangahake, have lost no time in setting in motion the arrangements for the erection of the LaMonte smelting furnace. Application was made at the Warden's office yesterday for a machine site on the flat near the Hauraki company's battery, and also for the right to the necessary water-race, from which power will be taken for driving the blast connected with the furnace.[14]

24 June

Advertisement in the Thames Star: Application to form a water race.

> Warden's Office, Thames, 24th June, 1885.
>
> APPLICATION has been made by John McCombie to construct a Water Race for mining purposes, commencing at a point on the Ohinemuri River, about half-a-mile above the Hauraki Battery Site, and terminating at a point near La Monte's Furnace Site, as shown on the plan. The length of such race is half a mile or thereabouts [805m], and its intended course is south west. The mean breadth and depth of such race is 4 feet by 2 feet; it is capable of carrying ten sluice heads of water, and the number of sluice heads, of forty inches each, which it is proposed to appropriate, is ten.[15]

4 September

> Woodstock. —The furnace…
>
> Of course water will be required, but of this, happily, an ample supply is available. An excellent natural dam, about two chains wide, has been found in the Ohinemuri River. A water-race from this dam, 145 chains [2917m, error?] in length, will convey ten or twelve sluice heads to the furnace. From the head of the dam to the junction of the Waitawheta and Ohinemuri Rivers is 28 chains [563m]. At this point (the junction) a bridge will be necessary to carry the flume across. The water-race will require some 7500 feet of timber. The fall of water from the dam will be about 40 feet, and a Pelton wheel is expected to generate about 40 h. p. [16]

The “excellent natural dam” on the Ohinemuri is the lowest on this river, and remains can be seen today. It was a low wooden structure, and contained four angles, "bending" downstream. One photograph shows this well. Elements of this image suggest that the original “dam” may indeed have been “natural”, ie without the subsequent timbering (but see 24 September 1886 report below).

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[14] https://paperspast.natlib.govt.nz/newspapers/THA18850604.2.6
Thames Advertiser, Volume XVI, Issue 5185, 4 June 1885, Page 2
[15] https://paperspast.natlib.govt.nz/newspapers/THS18850624.2.20.3
Thames Star, Volume XVI, Issue 5128, 24 June 1885, Page 3
[16] https://paperspast.natlib.govt.nz/newspapers/NZH18850904.2.49
New Zealand Herald, Volume XXII, Issue 7424, 4 September 1885, Page 6

The first Woodstock dam on the Ohinemuri River. 1898[17]

M. Roycroft collection.

Below the dark tree trunk can be seen a row or fence of metal posts, which are being used as a sieve to prevent debris from entering the water intake structure to the right. This "fence" can be seen today. The Crown water race flume is prominent, as is the mullock tip from the adit above it. Photograph taken from the side of the road. Understand that this image is much later than 1885.

This shows some of the timber remains of this dam, planking in foreground, timber beam and concrete top left. This is on the true left bank of Ohinemuri River. The "fence' of metal posts are nearby, and in the river are still some large securing bolts, and grooves chiselled into river boulders. March 2019.

[17] From an album of 1898 photographs.

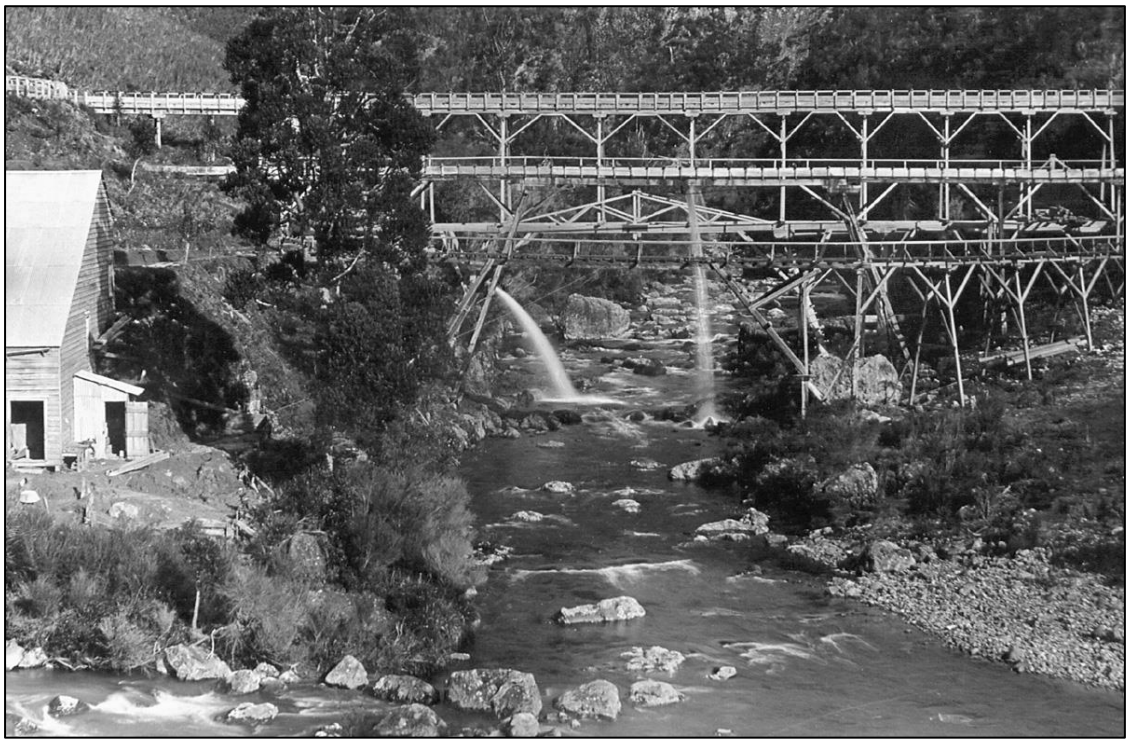
"From the head of the dam to the junction of the Waitawheta and Ohinemuri Rivers is 28 chains [563m]" confirms this dam site. A report of 12 September puts the entire length of the flume at 40 chains (805m).

7500 feet of timber. Presumably board feet, or 144 cu. ins, eg a 12x12x1 inch piece of wood. So 7500 feet of 12x1 inch timber, or 2286m of 300x25mm planks. Anyway, quite a lot.

The flume across the Waitawheta will be the second across this river (by end 1885).

7 November

> KARANGAHAKE, Friday. The furnace is in a forward state…
>
> The motive power will be water, of which there in an ample supply in the Ohinemuri River, the motor being a Pelton wheel, already in position. From the dam, built in the creek, the water will be led to opposite the furnace by fluming, 42 chains [845m] in length, 18 [362m] chains of which are on trestles, in one place there being a span of 90 feet [27m]. Where the fluming ends 20-inch wrought iron pipes convey the water into the furnace. [18]



This appears to be the earliest image of the flumes crossing the Waitawheta at the confluence. M.M. White photograph B3575. 1892-4.

The lowest bridge (dark) is the ore tramway for the Ivanhoe. The top flume is the Crown water race (1892) which we should ignore in this instance. It adds confusion because it has a lower level with a distinctive A-frame support in the middle. It is intended to provide tramway connection across the river.

Below this is the flume bringing water from the Ohinemuri to the furnace house.

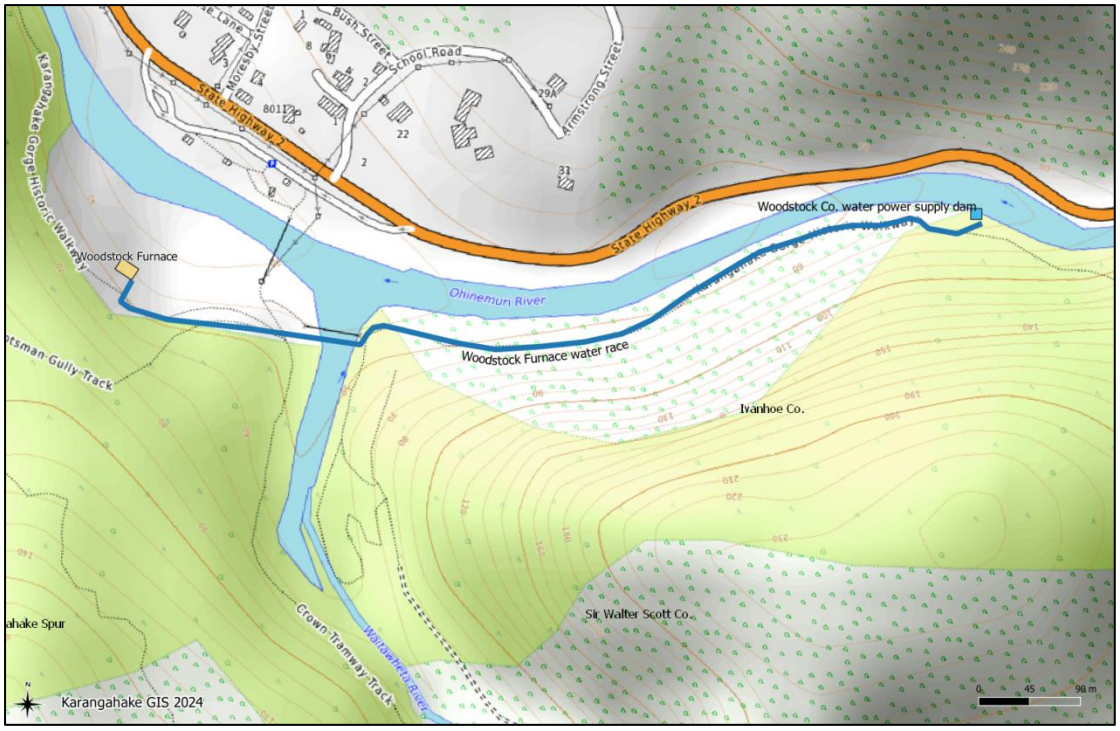
[18] https://paperspast.natlib.govt.nz/newspapers/NZH18851107.2.35
New Zealand Herald, Volume XXII, Issue 7479, 7 November 1885, Page 6

This description from 24 September **1886**:

> The water to drive is taken from the Ohinemuri river, which runs close in front of the furnace house, and is brought down a distance of 42 chains [845m], in fluming three feet wide, and one foot six inches deep. This flume or race, is of timber all the way, the sides being 18 x 1¼, and the bottom, three boards of 12 x 1¼. For a distance of 18 chains [362m] it has to be supported on trestle work, the trestles varying in height from 4 to 30 feet and averaging 22 feet apart. One of the spans, where it crosses the Waitawheta River, is 90 feet between the sole plates, and 47 feet above the river. The building of this bridge was quite an undertaking in itself. The legs, which are over 40 feet long, are 10 inches square, and rest on sole plates about seven feet above the summer level of the river. These legs lean in towards the centre, 15 feet off the perpendicular, which reduces the span at the top to 62 feet, and this is bridged over by two stringers, each of which is composed of two pieces of 14 x 4, strapped and bolted together, and supported underneath by a straining rod of 1½in. iron. The feet of the legs and the sole plates are securely bolted down to the rock, so as to resist the freshes in the river during the winter.
>
> When the flume is full of water every ten feet of it holds over a ton weight, so it will be seen that this bridge would have a steady weight on it of over six tons, but by giving the flume more fall here than it has elsewhere the water rushes over quicker, and the flume is never more than half full, thus reducing the weight one half. When the bridge was finished it was tested with the flume full to make sure that it was fit for the work. The rest of the flume from the dam down has a fall of 1 in 500, or a shade more than ½ of an inch to every 20 feet, which makes the water run at about the same pace as a person at a smart walk.
>
> The whole of the timber used in the flume is the best heart of kauri, of which there is over 80,000 feet. At the top of the flume a dam had to be built, so as to raise the river about three feet above its ordinary level. This dam is over 100 feet across, and is built of kauri logs 18 inches square, bolted down to the rock, and planked with slabs three inches thick, and cross-planked with sawn timber 1½ inches. The bed of the river here is so uneven that some of these slabs are only three foot long, and some of them are 15 feet. The water is led into the flume through an iron grating of five-eighth inch bars, one inch apart, and is controlled by the usual floodgates, traps, overflow, &c. [19]

Iron bars, standing upright, are still at this site today.

[19] https://paperspast.natlib.govt.nz/newspapers/NZH18860924.2.48
New Zealand Herald, Volume XXIII, Issue 7751, 24 September 1886, Page 6



Woodstock Furnace water race 1885.

This water race will be shortened to reach only the Woodstock battery in the future (1894).

Railey's Battery dam and water race late 1886

This is the second dam on the Waitawheta River.

1886

21 September

> New Quartz Reduction Works.— Mr Railey reports good progress considering the adverse weather. The fine weather now apparently coming on, will enable Mr Railey to finish the dam and water race, which is the chief work to be done.[20]

23 October

> The whole machinery will be driven by water power, a 6ft pelton wheel being used. This wheel is fixed at the bottom of an upright shaft 46ft deep 8ft x 3ft 6in connected with the creek by a tunnel, for the discharge of the water after it leaves the pelton-wheel. The water will have a direct fall to the wheel of about 44ft; being conveyed by iron pipes from the termination of the water race…
>
> The water supply is derived from the Waitawheta river, by means of a water race 20 chains [402m] in length 3ft x 2ft composed entirely of kauri (sawn on the spot) [ie pit sawn] boards 2in thick at bottom l½in at top. The dam across the Waitawheta river is at its widest part about 120 ft [36.5m] at top, and at bottom about 100 ft. Its construction has been a work of great difficulty, and the many occasions when a considerable amount of work has been undone by successive floods, would have disheartened many less determined men. The

[20] https://paperspast.natlib.govt.nz/newspapers/THS18860921.2.16
Thames Star, Volume XVIII, Issue 5508, 21 September 1886, Page 2

main stays are all of kauri or totara 12in to 14in square; and faced to 8ft above ordinary water level, with 2in kauri boards, the lower portion being double faced. There is also a break at the side 6ft higher than the dam, to protect the flume. The greatest height of the cross pieces is about 16ft. [21]

AJHR 1887

Railey's Plant.

The machinery is driven by a Pelton water-wheel 6ft. in diameter and 18in. in breast, working under a head of water equal to 44ft…

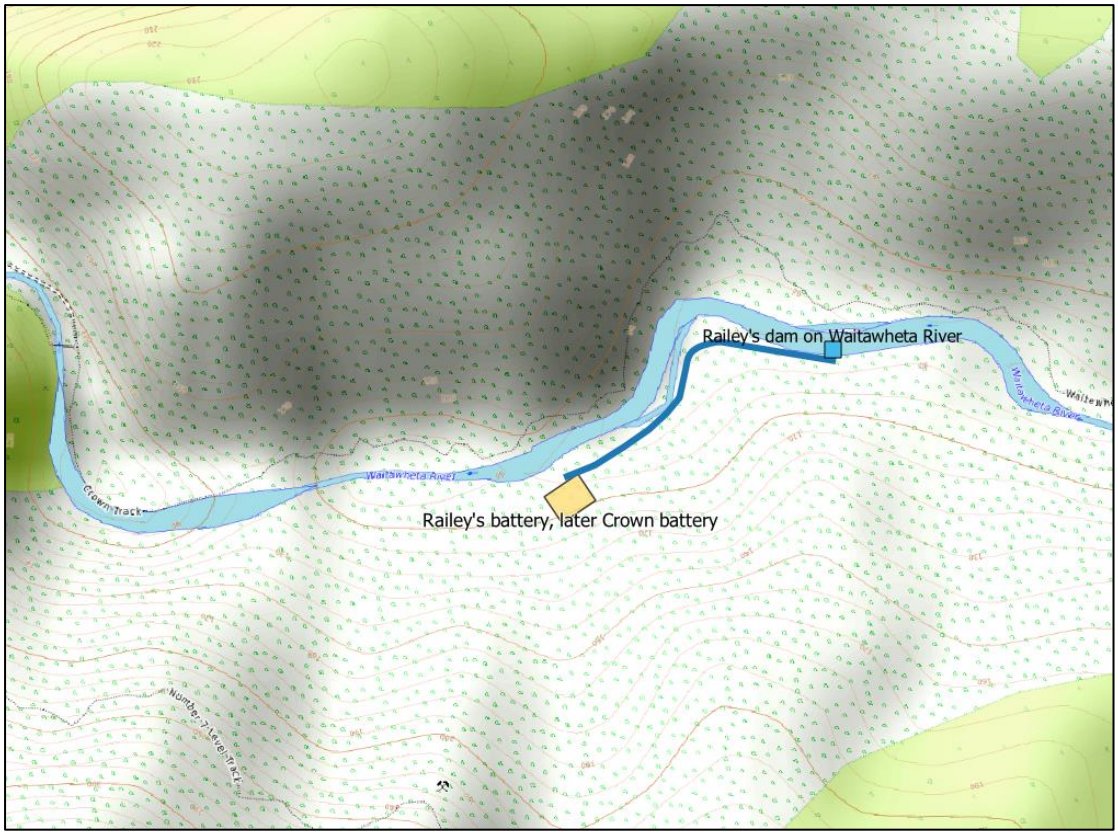
This water-wheel is placed at the side of the Waitawheta Creek, at as low a level as can be got for floods not to interfere with its working. It is geared with bevel-wheels to a vertical shaft, about 60ft. in length, which in its turn is geared to a horizontal shaft with bevelled gearing, on which shaft pulleys are fixed for belts to work to drive the whole of the machinery.

In order to lift the water out of the Waitawheta Creek for the purpose of driving the machinery, Mr. Railey constructed a timber weir across Waitawheta Creek, which raises the level of the water 9ft. This weir is on a similar principle to the timber dams that are constructed in canyons in the mining districts of America. It is made of frames of squared timber of 12in. by 10in. and 12in. by 13in., set about 5ft. apart, and standing edgewise up the stream. The up-stream side has a slope of 1 to 1, and the uprights, which are three in number, are standing at right angles, to this slope. The ends of the sloped beams, as well as the bottom of the upright pieces, are well stepped into the bed-rock. There are longitudinal beams bolted on the face of the frames about 3ft. apart, the ends of these beams being let into the rock on the sides of the creek; and on to these beams are spiked two thicknesses of 2in. planking, to make the dam or breast of the weir water-tight. There is no puddle or concrete used to make it watertight, but simply some loose stuff thrown in on the bottom end and at the side of the planking where it butts on to the rock.

At one side of this weir there is a sluice-gate constructed to regulate the flow of water into the flume which conveys it to the battery. The width of the weir on top is 130ft., and since its construction there has been as much as 4ft. deep of water flowing over this width, and the structure shows no signs of weakness. This is a cheaply-constructed weir where there is solid rock to be got in the bottom and sides, but it is not suitable when there is only a loosely-cemented gravel bottom and similar sides.[22]

[21] https://paperspast.natlib.govt.nz/newspapers/TAN18861023.2.11
Te Aroha News, Volume IV, Issue 175, 23 October 1886, Page 2

[22] https://paperspast.natlib.govt.nz/parliamentary/AJHR1887-I.2.1.4.5/3
GOLDFIELDS, ROADS, WATER-RACES, AND OTHER WORKS IN CONNECTION WITH MINING (REPORT ON)., Appendix to the Journals of the House of Representatives, 1887 Session I, C-05



Railey’s battery water race and dam. Representational only.

The Crown Company take over this power supply in 1889, first to run their battery, and then the air compressor plant.

Railey's/Crown dam images

Margaret Matilda White photographs.

Although some/all of the following images were thought of as of Railey's battery and dam, it is probable that the dam and race were actually in Crown ownership when these photographs were taken.

This image was taken from the Crown water race bench on the true right bank looking upstream; we can stand there today. It shows the wooden flume on the river's edge. The two large boulders are still present in the river.

Two cables can be seen crossing the river, from the dark headland on the right.

The bench that held the wooden flume is also still present, and more or less navigable on foot. One or two posts of the dam also remain.

The dwelling that we see in a later photograph may already be there, just out of shot to right.

Note the raised section of dam to protect the flume intake.

Vegetation debris in the foreground, suggesting recent work.

A close-up of the dam, highlighting its construction. Some timbers of the dam remain today, both sides of the river. Margaret Matilda White photograph.

Some of the wooden remains of Railey's dam, on the true right Waitawheta River. Planking, longitudinal beam, and angled upright post. March 2019.

This dam becomes part of the Crown battery, and later Crown compressor installation.

Crown Company Ohinemuri dam and water race 1892

The water race will be a wooden flume from a dam just below the future eastern portal of the railway tunnel.

1892

4 May

New Zealand Herald:-

> THE CROWN COMPANY'S MINE…
>
> The water-race contract was let to Mr. McCormick. This is taken from the Ohinemuri River, and its entire length is 83 chains [1670m]. It is almost completed, the floor structure being laid for the greater part of the distance from the Waitawheta to the headwater where the dam is to be constructed, being nearly finished. The race is four feet wide, and is to be three feet high, the frames providing for that height, but for the present the top planks will be omitted, leaving the race two feet high, quite sufficient to carry water power for the plant in course of erection. The frames are placed three feet six inches apart, the floor planking being 16in by 1¼ and the sides 12in by l¼in. It will take 180,000 feet of timber, the whole of which is hand-sawn in the Waitekauri Forest. The bridge across the Waitawheta is not yet commenced, further than the work of blasting the foundations for the supports. It will be a double structure, the upper portion to carry the water-race, and the lower, which will not be finished at present, is intended to bring ore from the Ohinemuri section of the district into the tramway level at the junction of the two rivers should it—as it probably will—be required. Mr. McCormick's contract for the race and bridge is £1704. [23]

AJHR 1893

> Plant. —Included under the head of plant may be classed a water-race and tramway. The water-race is taken from the Ohinemuri River in the Karangahake Gorge, about one mile above the battery-site. The water is taken from the river by means of a short tunnel through a rocky point. The bottom of the tunnel being a little below the bed of the river there is no need for any dam or weir to turn the water into the race [tunnel still exists]. From the end of this tunnel the water is conveyed in a wooden flume 4ft. wide and 2ft. deep, having a carrying capacity of twenty-four sluice-heads of water. At the upper end of the flume it is covered over on the top, and is secured to the rock, so that in time of freshes or floods in the river the water flows over the top of the fluming. This top covering is carried down to such a distance as to admit of the flume being a sufficient height above flood-level before the boxing is left open on top. The boxing is laid along the face of the hill for the whole of the distance, on stringers laid on the ground, with the exception of trestle-work where the flume crosses the Waitawheta Creek. The actual head of water at the battery-site on the jets of the Pelton wheels is 69ft.[24]

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[23] https://paperspast.natlib.govt.nz/newspapers/NZH18920504.2.47
New Zealand Herald, Volume XXIX, Issue 8869, 4 May 1892, Page 6

[24] https://paperspast.natlib.govt.nz/parliamentary/AJHR1893-I.2.1.4.5

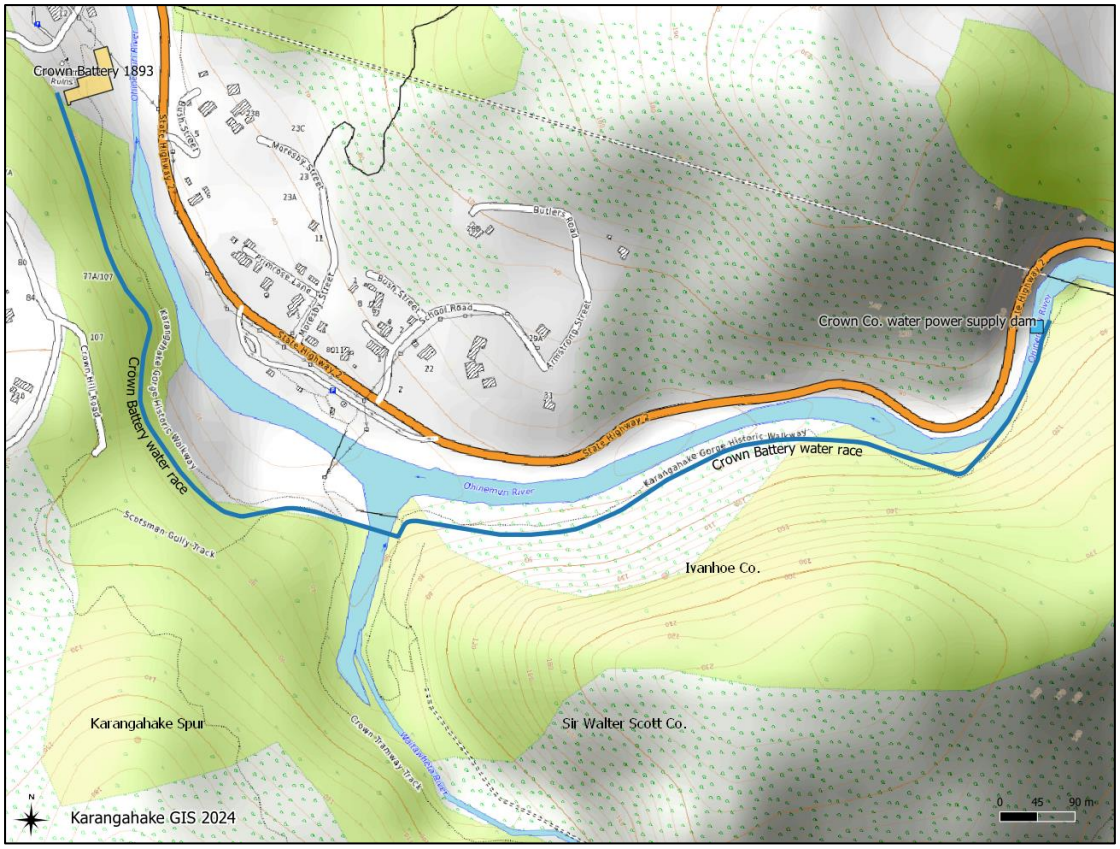
The Crown Company dam. Part of a stereo pair, Staples Collection. C. 1902.

The spoil on the right is from the railway tunnel excavation (eastern portal). The river will take this away and distribute it along the stream bed further downstream.

The Crown dam is the break of flow in the river in the foreground. It was only a low dam; the bed log and some planking remain to this day. At the extreme left of the dam a short tunnel takes the water, delivering it to a wooden flume which sat on a bench cut into the river bed. The entrance to the tunnel was protected by railway irons. These, and the cut bench, remain today. The flume is just visible on the left of the river in the distance.

Crown dam Ohinemuri, true left bank. Planking in the foreground, headworks tunnel with protecting railway irons. The tunnel took the water from the dam, delivering it into the wooden flume.

February 2024.



Crown Company dam and water race, 1892.

Late in 1894 the water race is tunnelled through the ridge behind the enlarged Woodstock battery. [25]

Woodstock Battery water race 1894

A shortened and refurbished version of the Furnace water race. Same dam.

1894

The Woodstock Company erect a new 10 stamp battery, beside the original 5 stamper. This will entail altering the Furnace water race, but it will remain a wooden flume, for the present.

13 August

> MINE MANAGERS' REPORTS. Woodstock United (Karangahake, 9th August).
>
> …As it will be necessary to remove a portion of the water race before starting excavations for the new plant, I will stop the mill on the 11th instant, when a general cleaning up will take place.[26]

23 October

> Woodstock United (Karangahake, October : 18). —

[25] https://paperspast.natlib.govt.nz/newspapers/NZH18940924.2.48
New Zealand Herald, Volume XXXI, Issue 9624, 24 September 1894, Page 6
[26] https://paperspast.natlib.govt.nz/newspapers/NZH18940813.2.5
New Zealand Herald, Volume XXXI, Issue 9588, 13 August 1894, Page 3

> …The water-race is getting a thorough over haul, which should be finished early next week, and then the fluming will be in a better state of repair than it ever was before.[27]

1895

24 December

> Woodstock United G.M.CO.
>
> Active preparations are in progress for the erection of the additional crushing plant, 30 head of stampers in addition to the 10 now at work…
>
> The whole battery of 40 head will be driven by Pelton wheels…The water race is to be 40 inch iron pipe, the distance from the dam to the mill being 25 chains [503m], and it will be constructed of 1/16 inch wrought iron. In most respects this will be preferable to open fluming, and less liable to accident, and it is expected that the power obtainable from the race will be equal to 100 h.p. [28]

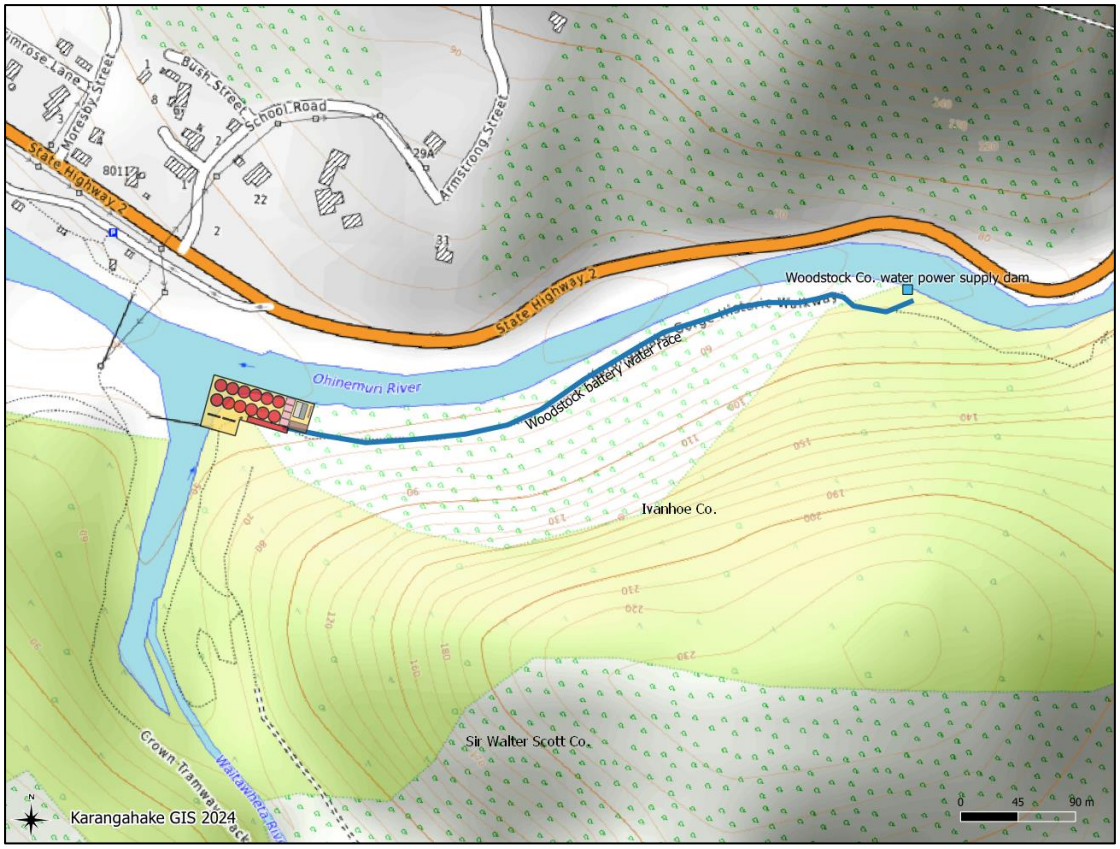
The open wooden flume to be replaced by 1m diameter steel pipe. Some pieces of this pipe remain.

1896

12 October

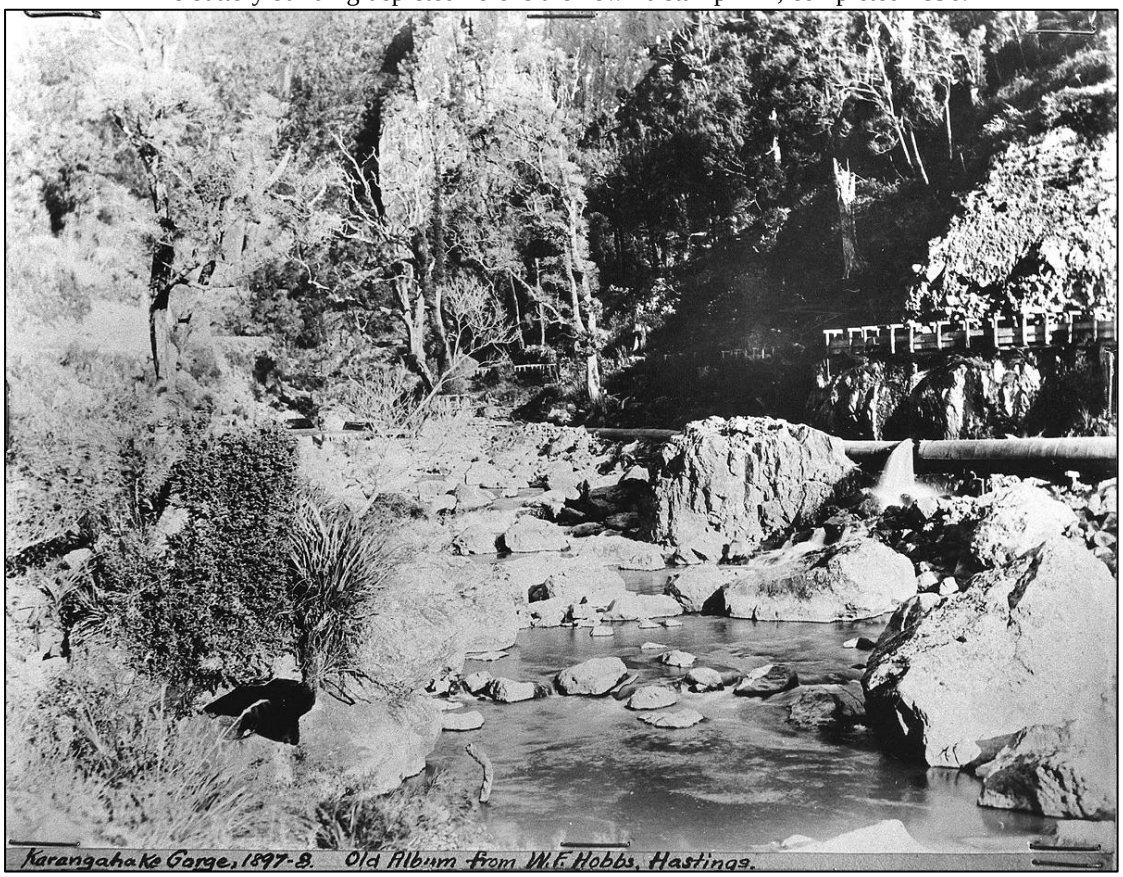
> The Woodstock Battery. The water race also being altered, and instead of the usual wooden fluming iron piping having a diameter of 3ft 6in is being put in its place. [29]

[27] https://paperspast.natlib.govt.nz/newspapers/NZH18941023.2.5
New Zealand Herald, Volume XXXI, Issue 9649, 23 October 1894, Page 3
[28] https://paperspast.natlib.govt.nz/newspapers/NZH18951224.2.74
New Zealand Herald, Volume XXXII, Issue 10011, 24 December 1895, Page 6
[29] https://paperspast.natlib.govt.nz/newspapers/BOPT18961012.2.7
Bay of Plenty Times, Volume XXII, Issue 3461, 12 October 1896, Page 2



Woodstock battery water race pipe, 1896.

The battery building depicted here is the new 40 stamp mill, completed 1896.



Ohinemuri River, looking upstream to the first Woodstock dam. The pipe discharging water is the new Woodstock water race pipe. Above it, on the cliff, is the Crown Company water race wooden flume.

The walkway makes use of the pipeline bench. Where it passes behind the large boulder, concrete which held the pipe in position still remains.

Photograph taken from the edge of the road (SH 2).

1897-8. DoC Thames

Talisman Company dam and water race 1896

This is a reuse of the original Karangahake battery dam and headworks, the flume being replaced by a 4 ft [1.2m] diameter pipe.

1896

AJHR 1896

> Talisman Mine. —… The water-race has been finished, and the 10-stamp mill can soon be ready if it is wanted. [30]

AJHR 1897

> Water for the driving of the mill is conducted from the company's dam on the Waitawheta River first through a tunnel 90 ft. in length, then through an open cutting 20 ft. in length, passing finally into a wrought-iron pipe 4 ft. in diameter and 925 ft. in length, delivering the water into a concrete-walled turbine-pit 28 ft. in depth. [this infrastructure remains] The motive-power is generated by means of two Victor vertical turbines, 21 in. and 12 in. in diameter respectively, the latter being used for the operation of a dynamo generating electric light for the works and offices, and for the transmission of power to the cyanide works on the special site.[31]

15 February

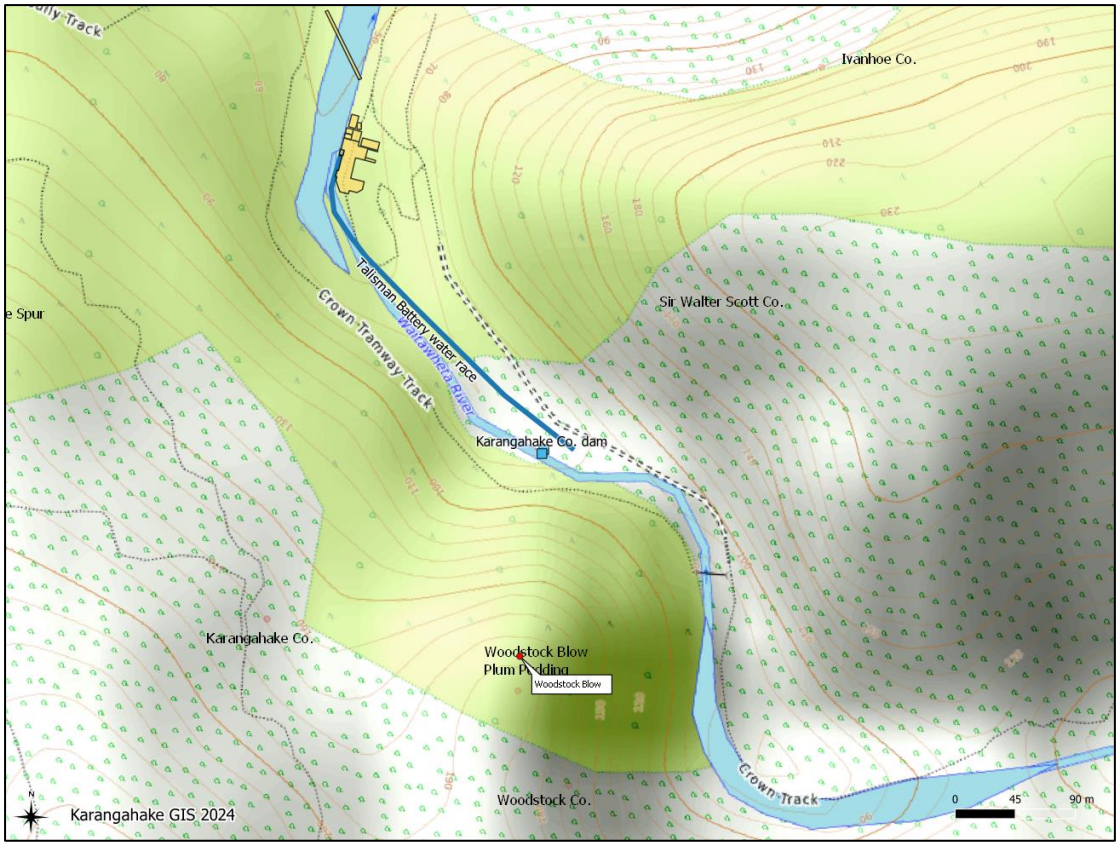
> TALISMAN G.M. CO., LIMITED
>
> Battery: A good ten stamper battery and cyanide plant has been erected, and a good substantial iron water-race has been erected to bring in the water, of which there is an ample supply.[32]

The head-works infrastructure remains, though difficult to access today. A substantial iron water-race. We see this today, unloved and dissolving.

[30] https://paperspast.natlib.govt.nz/parliamentary/AJHR1896-I.2.1.4.3
THE GOLDFIELDS OF NEW ZEALAND: REPORT ON ROADS, WATER-RACES, MINING MACHINERY, AND OTHER WORKS IN CONNECTION WITH MINING., Appendix to the Journals of the House of Representatives, 1896 Session I, C-03

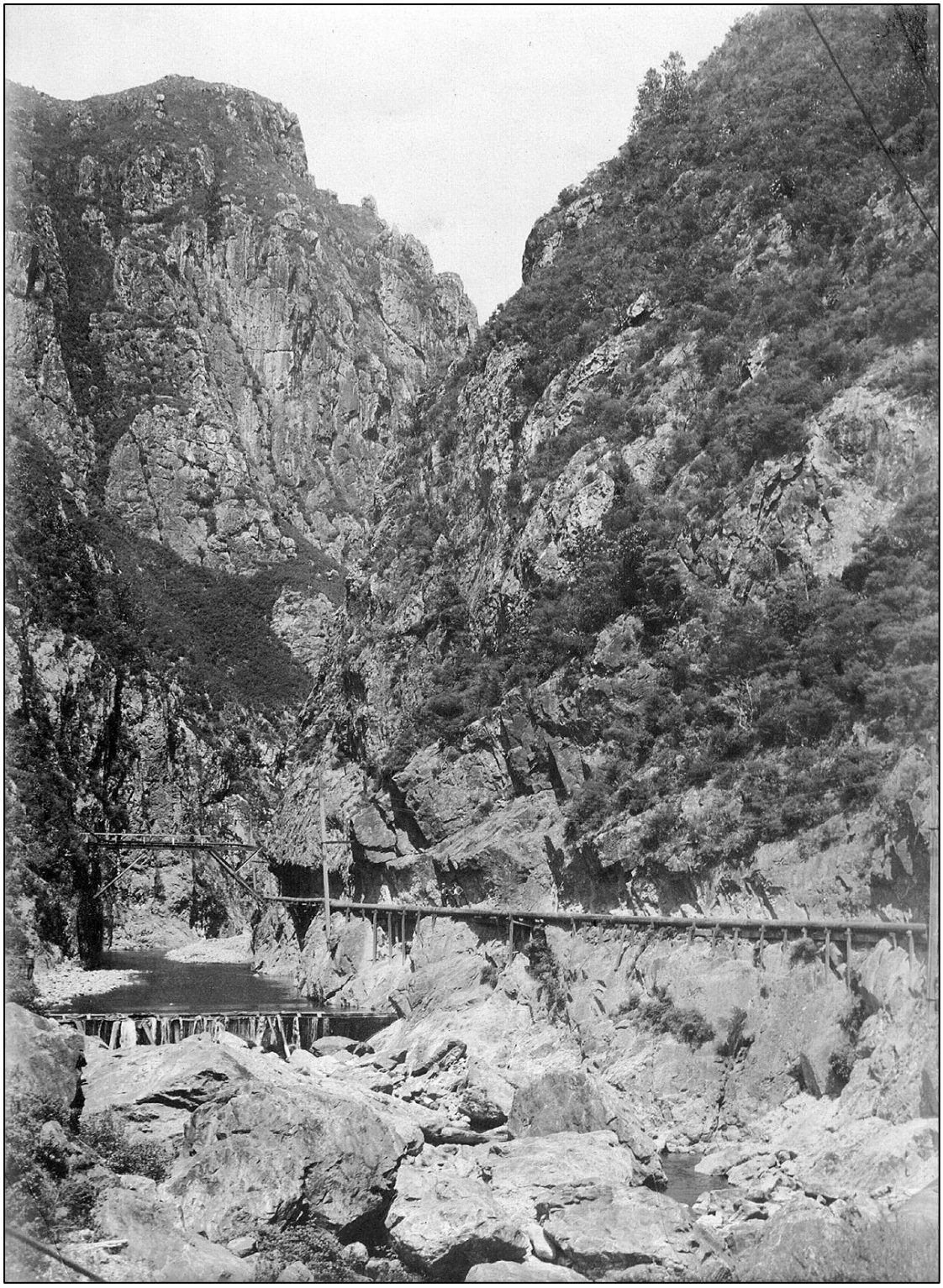
[31] https://paperspast.natlib.govt.nz/parliamentary/AJHR1897-II.2.1.4.3/4
THE GOLDFIELDS OF NEW ZEALAND: REPORT ON ROADS, WATER-RACES, MINING MACHINERY, AND OTHER WORKS IN CONNECTION WITH MINING., Appendix to the Journals of the House of Representatives, 1897 Session II, C-03

[32] https://paperspast.natlib.govt.nz/newspapers/NZH18960215.2.40
New Zealand Herald, Volume XXXIII, Issue 10055, 15 February 1896, Page 5



Talisman water race pipe and dam.

The dam is a reuse of the old Karangahake battery dam, a pipe replacing the probably long gone wooden flume. The Talisman battery portrayed here is the 1896 ten stamper.



Talisman dam on the Waitawheta River, looking upstream.

Dam bottom left, above that the compressed air pipe of the Woodstock (1901), and to the right the Crown tramway. The pipe beside the tramway takes water discharged from the pelton wheel on to the Crown battery.

There are many photographs from a similar angle; from the Crown tramway.

Date, after 1901. Staples collection.

Crown Company Waitawheta dam and water race 1896

This long wooden flume will power the large air compressor at the river level entrance.

1896

21 February

> The New Zealand Crown Mines Gold Mining Company's works are all in full swing…
>
> A commencement has also been made to construct a large water-race in the Waitawheta, which will give an additional 180 effective horse power for the development of the mine below the No. 6 tunnel.[33]

14 May

> NEW ZEALAND CROWN MINES COMPANY.
>
> A large water race, one and a-quarter miles long [2012m], is being constructed from the upper end of the Waitawheta, for utilisation in a more extensive scheme of pumping and winding. A tunnel 112 feet long, is being driven through the hill, and a natural dam will then be available, giving a fall of 74 feet and 30 sluice heads of water, which will prove equal to 252 theoretical horse power, out of which the Company will be able to utilise a power of 180 effective horse power.[34]

Crown Waitawheta water race under construction.

The water race headworks are at the swimming hole immediately below the Paeroa municipal water supply pipeline route tunnel. The tunnel mentioned above discharges water to this day. Evidence of the headworks remain.

AJHR 1897

> Crown Mine. —…The winding and pumping machinery will be driven by means of compressed air. Water will be brought in at the high-level race to drive the machinery for the air-compressors.[35]

1897

15 April

> The New Zealand Crown mines…
>
> The construction of the large flumes for the conveyance of water to the large Pelton wheel to be used in connection with the new development works in hand at No. 6 tunnel, has been commenced, and over 300 feet of the fluming has been partly completed. The Kauri Timber Company has delivered about 80,000 feet of timber for this work out of a total quantity of about 280,000 feet. The excavations of the chamber for the pumping plant are completed,

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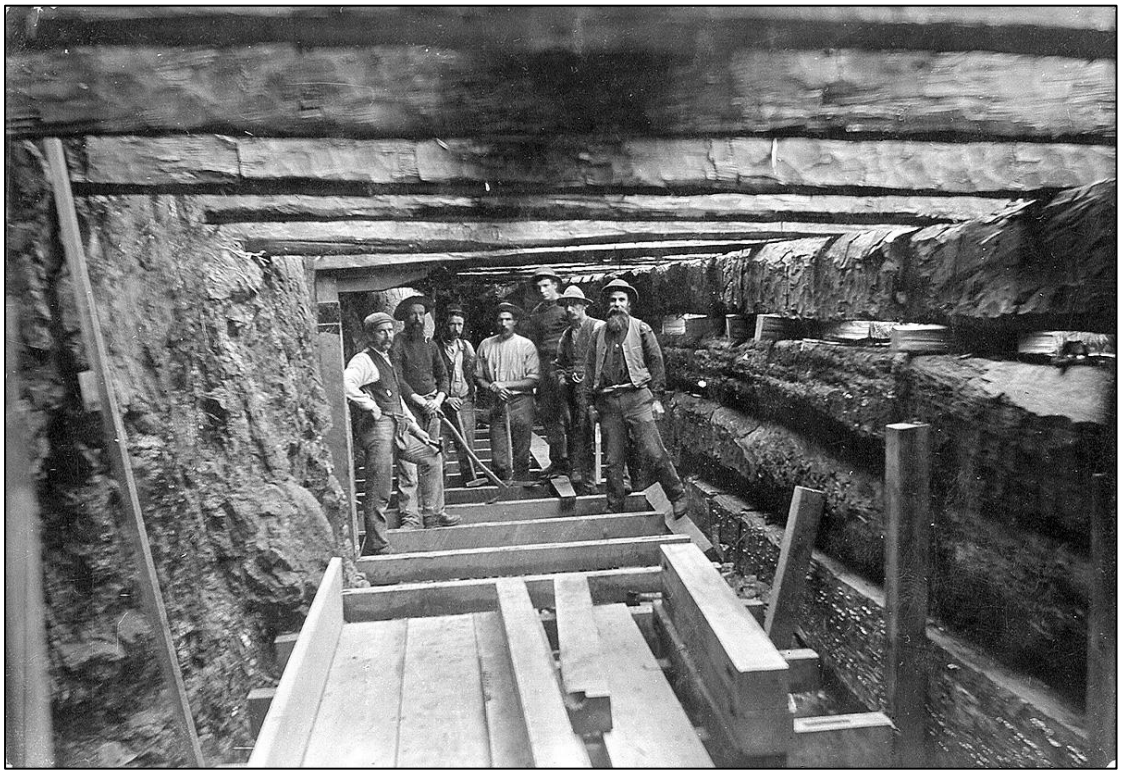
[33] https://paperspast.natlib.govt.nz/newspapers/NZH18960221.2.71.12
New Zealand Herald, Volume XXXIII, Issue 10060, 21 February 1896, Page 2 (Supplement)
[34] https://paperspast.natlib.govt.nz/newspapers/AS18960514.2.36.13
Auckland Star, Volume XXVII, Issue 112, 14 May 1896, Page 6
[35] https://paperspast.natlib.govt.nz/parliamentary/AJHR1896-I.2.1.4.3
THE GOLDFIELDS OF NEW ZEALAND: REPORT ON ROADS, WATER-RACES, MINING MACHINERY, AND OTHER WORKS IN CONNECTION WITH MINING., Appendix to the Journals of the House of Representatives, 1896 Session I, C-03

while the excavations for the compressor and winding engine are very nearly so.[36]

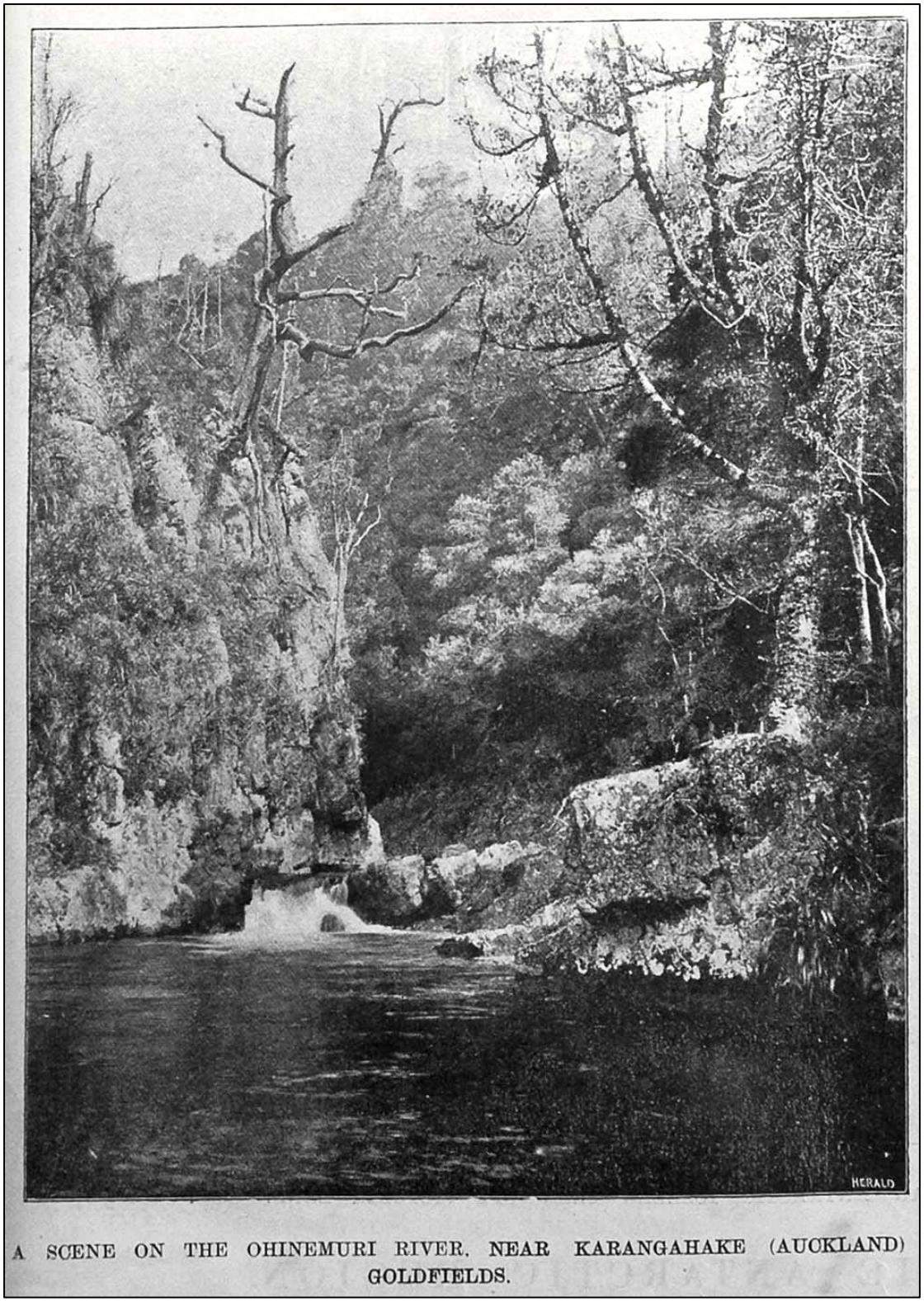


Workmen constructing to head of the water race. Behind the men is the tunnel that collects the water from the dam on the Waitawheta River. The heavy beams are to protect the more vulnerable sawn timbers of the flume, under construction. This area is susceptible to damage from flooding. The top beams are let into the cliff with chiselled cut outs. These are still visible today.

The timbers shown here were positioned on a cut bench, and also mounted on substantial logs. Parts of these logs remain, as well as mounting bolts let into rock.

Staples collection. 1896.

[36] https://paperspast.natlib.govt.nz/newspapers/NZH18970415.2.63.4
New Zealand Herald, Volume XXXIV, Issue 10417, 15 April 1897, Page 1 (Supplement)



A SCENE ON THE OHINEMURI RIVER, NEAR KARANGAHAKE (AUCKLAND) GOLDFIELDS.

AWNS 06 July 1900 Auckland Library.

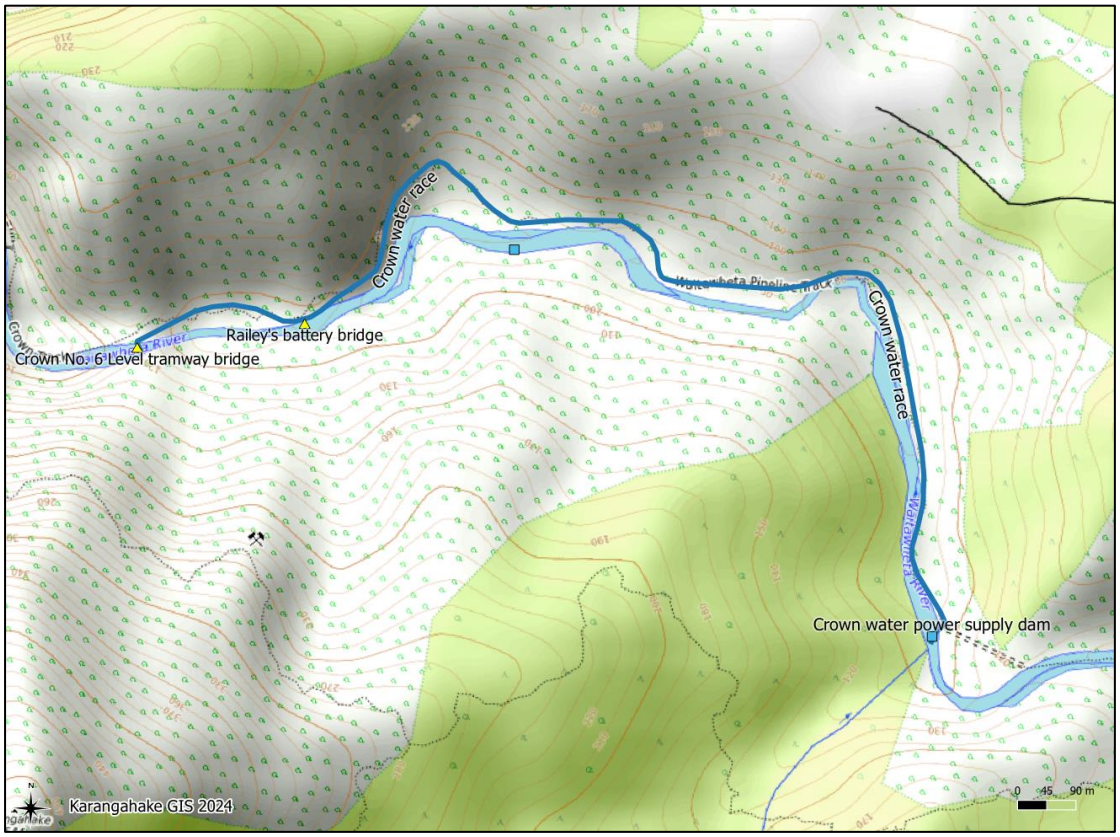
This is the pool directly below the Crown dam, hidden behind the cliff on the left. The flume is out of frame to left.

This is a popular swimming pool.

George Chappell photograph. That is him on the left?
A section of the Crown water race. Imagine the timber required for 2,000 m.

Crown Waitawheta headworks area. The bench in the foreground and left of image supported the wooden flume. Large logs were bolted to the rocks. The tunnel delivered water from the dam behind the headland, into the flume. March 2019.

The top beams of the heavy armouring timbers are let into the cliff with chiselled cut outs. March 2019.



Crown Waitawheta water race 1896.

The current walkway follows most of this water race bench.

Crown Company 12 inch pipe, pelton discharge water

The Crown Company installed a 12 inch pipe to take discharge water from their large pelton wheel, at their river level adit, to their battery to run more wheels. Parts of this pipe remain, sometimes confused with the Paeroa municipal water supply pipeline.

Sadly no specific reference to this has been found again. It will not be mapped for this reason.
The following may reference this water pipe.

1900

8 June

> Woodstock battery
>
> …the trucks are now landed, on the same floor as the mortar-boxes, and from here are hauled up an incline-tram to the top floor of the mill. The hauling engine is worked by two Pelton wheels, each turning in opposite directions, but attached to the same shafting. They are splendid wheels, and are capable of doing all the work required with three-quarter sluice heads of water per minute. A large hopper is now being erected at the head of the incline-tram, and when completed will enable the management to deal with a much larger quantity of ore than is now being sent up, whilst the tipping and emptying of the large ore waggons will be automatically managed, thus effecting a further material saving on the cost of handling the ore …[37]

KARANGAHAKE the years of the gold 1875 -1935. Goldmining Methods.

> The Crown Battery machinery was driven by both steam and the Pelton Wheel. Its water supply came from a long way up the Waitawheta Stream and followed down the tram track in a nine or ten inch pipe. Coming as it did from a great height, it developed its greatest pressure at its lowest point - the Battery. [38]

Woodstock water race extension and new dam 1900

On the Ohinemuri River, upstream of the future eastern portal of the railway tunnel. The water pipe from this dam is connected to the old pipe of the earlier dam.

1900

11 May

Woodstock construct new dam on Ohinemuri

> The Woodstock Gold Mining Company…
>
> The battery has been renovated, and made ready again for the resumption of crushing operations. A large dam has also been constructed across the Ohinemuri River, some distance above the Crown Company's race, and, I understand, the management intend extending the large mains from the old dam to the new.[39]

The remains of this wooden dam can still be seen a little upstream of the later eastern rail tunnel portal.

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[37] https://paperspast.natlib.govt.nz/newspapers/NZH19000608.2.73.3
New Zealand Herald, Volume XXXVII, Issue 11393, 8 June 1900, Page 1 (Supplement)
[38] https://www.ohinemuri.org.nz/historic-texts/karangahake-the-years-of-the-gold-1875-1935/goldmining-methods
Goldmining Methods. KARANGAHAKE the years of the gold 1875 -1935
[39] https://paperspast.natlib.govt.nz/newspapers/NZH19000511.2.55.3
New Zealand Herald, Volume XXXVII, Issue 11369, 11 May 1900, Page 1 (Supplement)

6 July

> The Woodstock Gold Mining Company…
>
> …whilst during the past month repairs to the new dam have been effected, and the latter, with 120 ft of an overflow, is now one of the finest dams to be found in any of the goldfields districts. [40]

AJHR 1901

> Woodstock Mine. —Considerable development-work and improvements have been carried on during the past nine months. The dam and penstock to which the new pipe-line (extension of old line) is to be connected has been completed. The dam is 140 ft. long over all, has 120 ft. overflow, and in flood-time has carried a crest of 8 ft. of water. The grade-line for this new pipe-line of about 1,800 ft. has been completed, being built up of rubble-work, walling, and trestling. To carry the pipe-across the Ohinemuri Gorge a Warren truss-bridge of 80 ft. span has been built. This bridge has a 7 ft. wide decking in the clear between the trusses, and the bottom chord is 24 ft. above ordinary water-level, and 6 ft. above the highest known flood-level. The water-pipe which this bridge carries is 3 ft. 9 in. in diameter, and is now being connected up on the gradeline. This extension gives a head of 80 ft. at the Pelton wheel (which is to be erected under the battery building), more than doubling the old pressure-head. The old water-power main has been shifted to a lower level at the battery end in order to make room for the air-compressor and steam plants. [41]

1901

18 January

> At the Woodstock mine the work of extending the main pipe-line between the new dam and the mill is being actively carried on....[42]

12 April

> Woodstock… The water mains between the dam and the mill are all but completed, the contractors being now engaged on the last section. Everything is, therefore, proceeding satisfactorily, and it is anticipated that a turn will be taken out of the small compressor in less than a fortnight's time. [43]

The new dam and “water main” have been designed to run air compressors at the Woodstock battery, via pelton wheels. The wheels remain today.

10 May

> At Karangahake the Woodstock Gold Mining Company are pushing ahead as expeditiously as possible the various works connected with the new development scheme. The main pipe line, connecting the large dam in the

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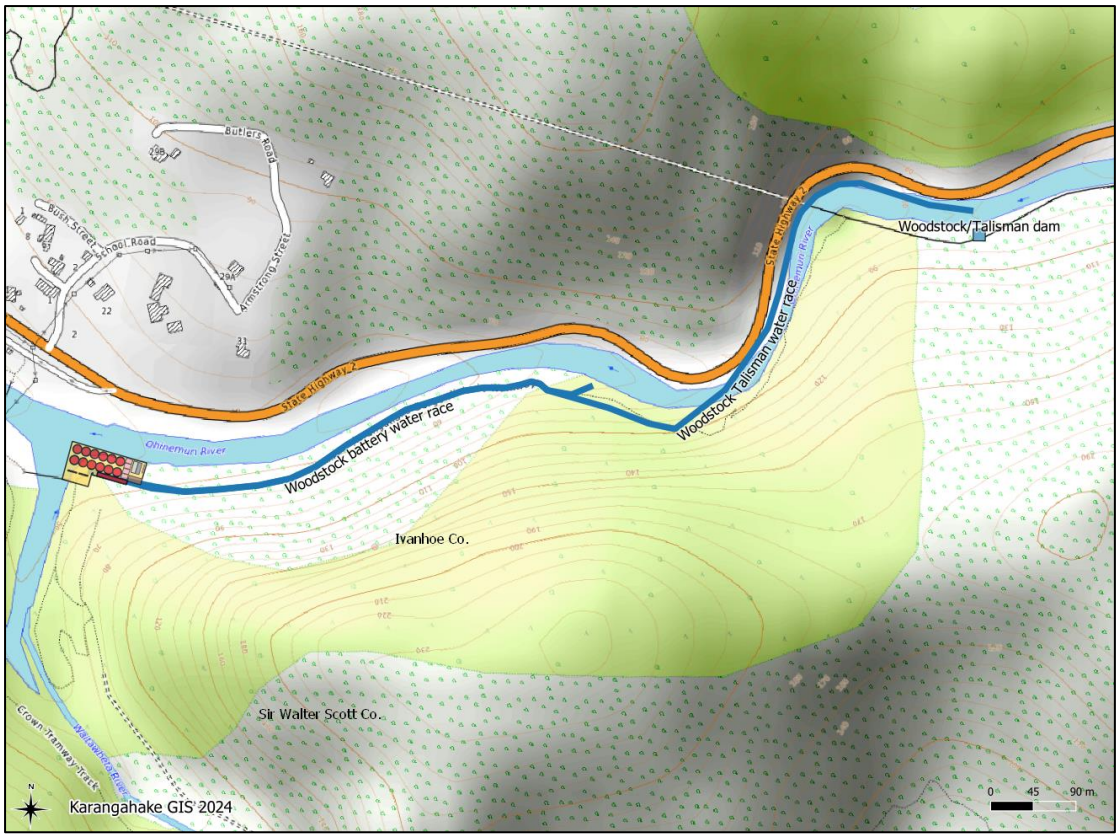
[40] https://paperspast.natlib.govt.nz/newspapers/NZH19000706.2.65.3
New Zealand Herald, Volume XXXVII, Issue 11417, 6 July 1900, Page 1 (Supplement)
[41] https://paperspast.natlib.govt.nz/parliamentary/AJHR1901-I.2.2.2.4
THE GOLDFIELDS OF NEW ZEALAND: REPORT ON ROADS, WATER-RACES, MINING MACHINERY, AND OTHER WORKS IN CONNECTION WITH MINING., Appendix to the Journals of the House of Representatives, 1901 Session I, C-03
[42] https://paperspast.natlib.govt.nz/newspapers/NZH19010118.2.74.3
New Zealand Herald, Volume XXXVIII, Issue 11554, 18 January 1901, Page 1 (Supplement)
[43] https://paperspast.natlib.govt.nz/newspapers/NZH19010412.2.77
New Zealand Herald, Volume XXXVIII, Issue 11625, 12 April 1901, Page 1 (Supplement)

Ohinemuri River with the battery has been completed, and other works are showing that good progress is being made…[44]

AJHR 1902

Woodstock Gold-mining Company (Limited), Karangahake.—A very large amount of work has been done by this company in improvements and development-work. The 4 ft. main water-power pipe-line extension has been completed, connecting the new dam with the old pipe-line, a distance of 1,800 ft. A new water-power plant has been installed, and consists of two Pelton type wheels—one 11 ft. 8in. diameter, and the other 11ft. 4 in. diameter—the main driving-pulley for the air-compressors being 12ft. 3in. in diameter and 38 in. face for a 36 in. (10-ply) Balata belt[45], and the mill is driven by a 32 in. face 7 ft. 6in. diameter pulley and a 30 in. (8-ply) Balata belt. Two air-compressors have also been installed—one an Ingersoll-Sergeant compound, rope-driven, low-pressure cylinder 24 1/4 in. diameter, high-pressure cylinder 15 1/4 in. diameter, 18 in. stroke, ordinary capacity 1,170 cubic feet free air per minute; and the other a Schram single-compressor cylinder 14 in. diameter, 24 in. stroke. [46]



[44] https://paperspast.natlib.govt.nz/newspapers/NZH19010510.2.80.4
New Zealand Herald, Volume XXXVIII, Issue 11649, 10 May 1901, Page 1 (Supplement)
[45] Balata belting is a tough, robust belt that has a rubber friction surface on both sides. It is constructed from premium quality high tensile cotton and natural rubber.
https://www.par-group.co.uk/rubber-and-polyurethane/conveyor-belting/balata-conveyor-belting/
[46] https://paperspast.natlib.govt.nz/parliamentary/AJHR1902-I.2.1.4.3
THE GOLDFIELDS OF NEW ZEALAND: REPORT ON ROADS, WATER-RACES, MINING MACHINERY, AND OTHER WORKS IN CONNECTION WITH MINING., Appendix to the Journals of the House of Representatives, 1902 Session I, C-03

The Woodstock water race pipe was extended to the new dam, upstream of the later railway bridge. In 1904 the Talisman Company took over the Woodstock mine, including this dam and race.

1904

Talisman buy Woodstock for £7000

3 June

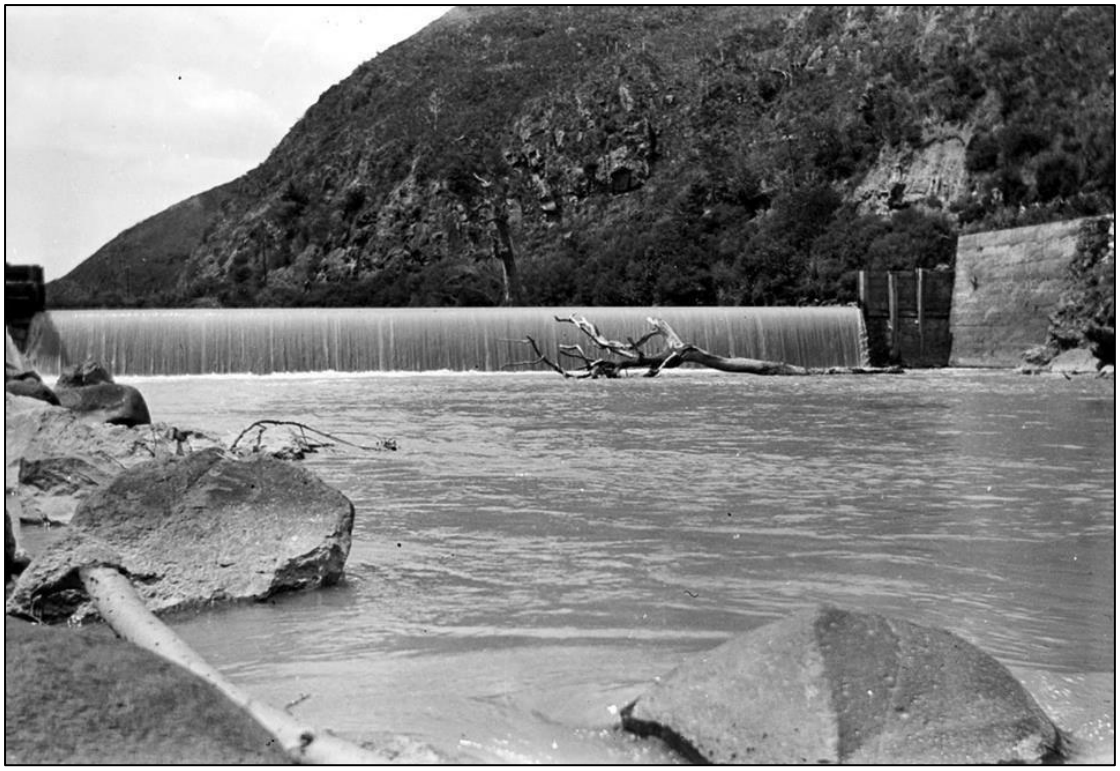
> The news of the acquisition of the Woodstock mine, battery, etc., by the Talisman Company for £7000 was definitely confirmed by. Mr. Stanfield. No scheme has been decided upon so far as to the use to be made of the Woodstock area, but it will serve for the opening up of No. 12 level from the north end, though for no level below that.[47]

The Woodstock dam becomes the property of the Talisman Company.

When the railway is constructed on the true left bank of the Ohinemuri, the dam had to be shortened to allow for the railway.

Looking upstream from across the river. It is not clear whether the railway is present.
Notice the head works structure at the left of the dam, and how close to the road.
DoC Thames. ATL.

[47] https://paperspast.natlib.govt.nz/newspapers/NZH19040603.2.64
New Zealand Herald, Volume XLI, Issue 12590, 3 June 1904, Page 6

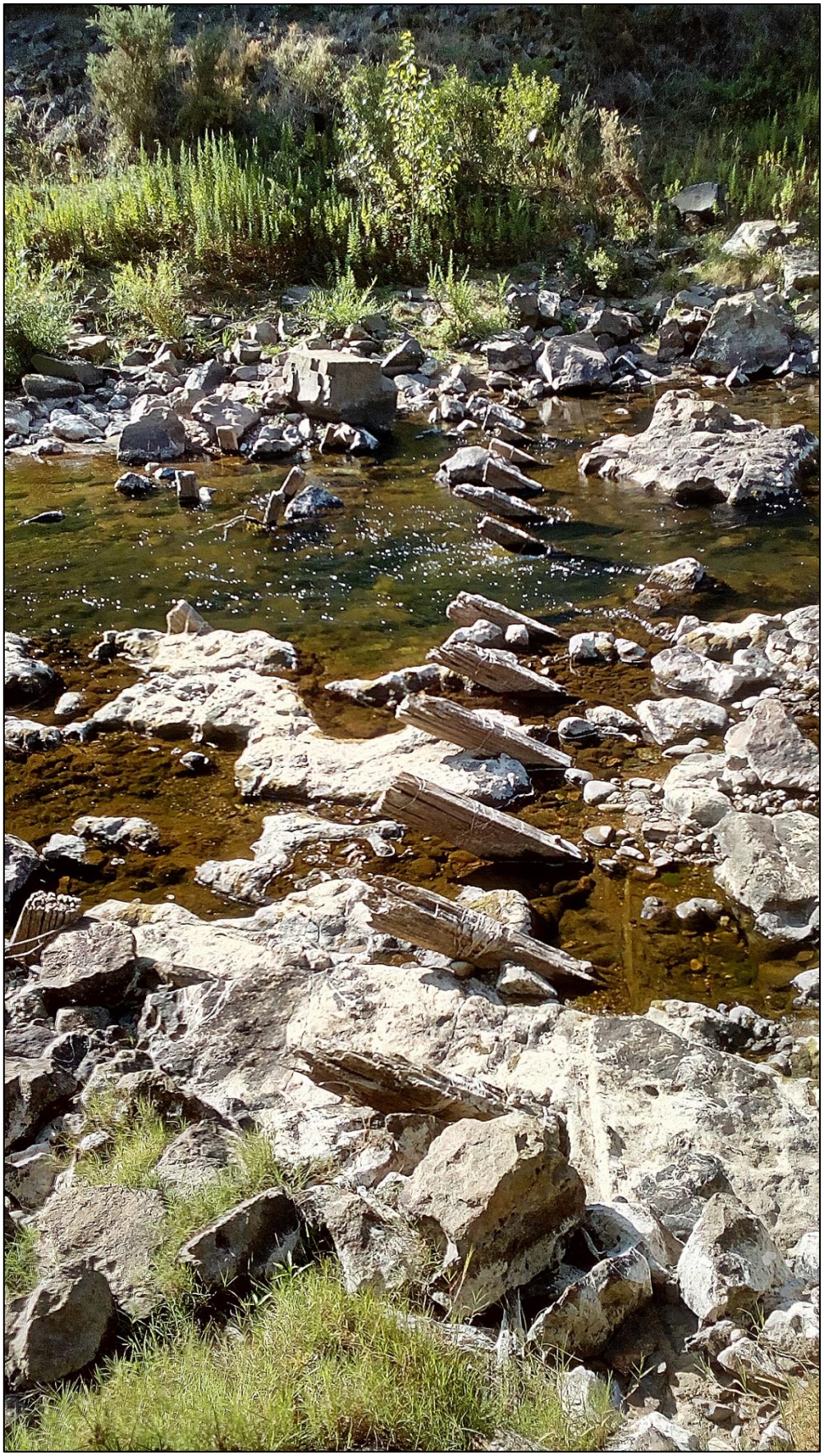


Looking upstream from the side of the river below the road. The concrete wall at right was added to support the railway. It is still there.

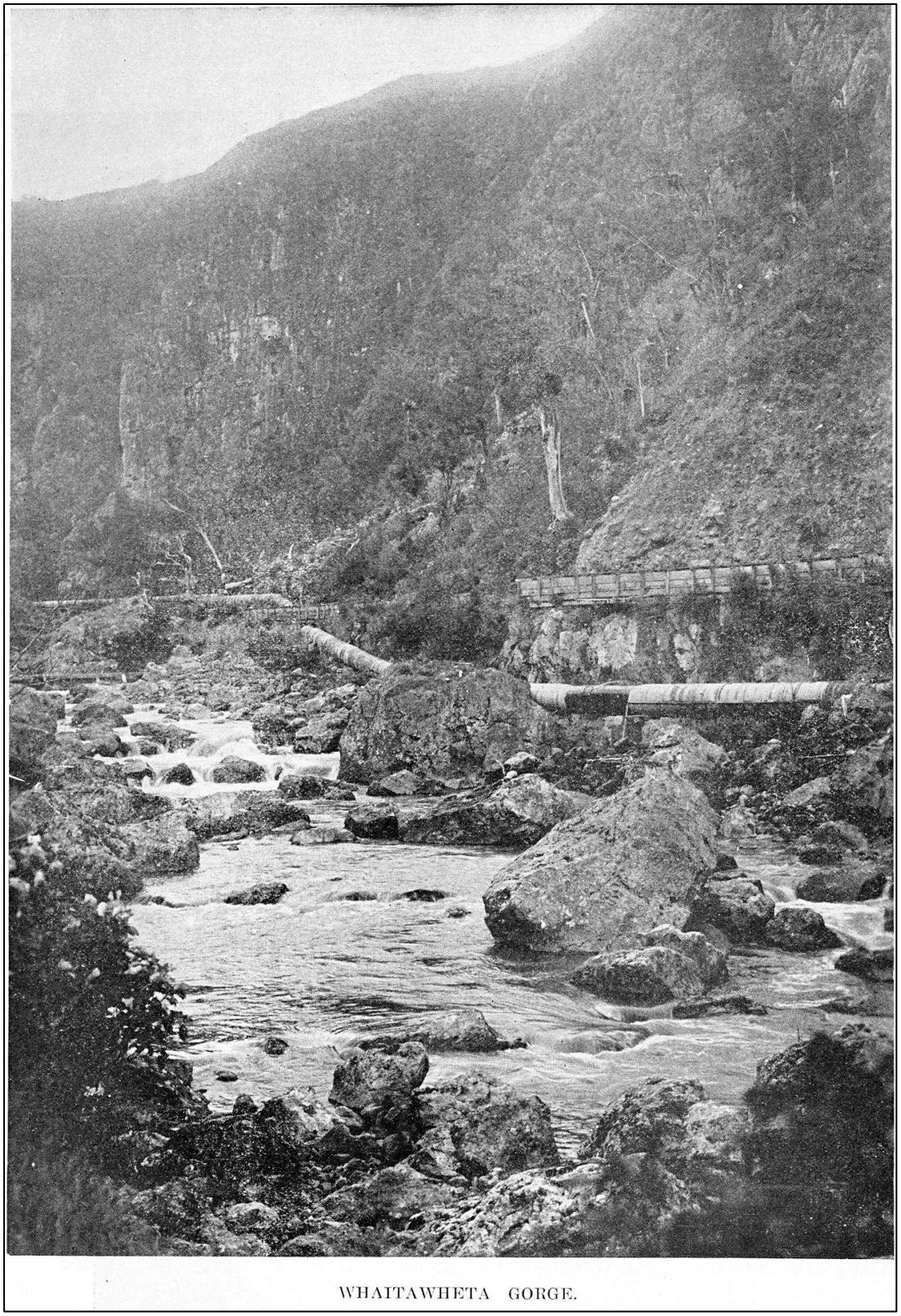
A.M. Bowater.

Detail of the Woodstock Talisman dam. Bed log in foreground, angled uprights bolted to the bedrock.

March 2019.



Woodstock Talisman dam remains, viewed from true left bank Ohinemuri River. March 2019.



WHAITAWHETA GORGE.

1902 03 22 Auckland Libraries Heritage Collections NZG-1902 03 22-0552-01.

Looking upstream on the Ohinemuri River from the roadside. Pipe from the new Woodstock dam, wooden flume the Crown water race. This is a later version of the same view provided above for the Woodstock battery water race (1897-8 image).

Just beyond where the two races cross is the area where the slip closed the walking track in 2023.

1925

3 July

OHINEMURI COUNTY. MONTHLY COUNCIL MEETING.

REMOVAL OF DAM.

The Mines Department, replying to a request for permission to remove a dam constructed in the Ohinemuri River by the Talisman Gold Mining Co. many years ago, advised that after consultation with the Railway Department no objection would be made to the removal of the dam provided the council was prepared to take all responsibility for any damage resulting both to the railway property and any other property, and that it was removed entirely at the risk of the council.

In reply to Cr. Morgan the engineer said that it was not possible to remove the dam until the summer, when there would be no damage.

Cr. Morgan thought that some of the centre boards might be taken away when the river lowered sufficiently.

The matter was referred to the engineer, Cr. Robinson remarking that it was necessary to choose carefully the state of the river before removing the dam.[48]

1926

8 January

THE TALISMAN DAM.

DEMOLITION BY DYNAMITE. WATER RELEASED SAFELY.

After functioning for nearly twenty years the Talisman dam, situated in the Karangahake Gorge across the Ohinemuri River, was freed by Mr E. Shaw, Ohinemuri county engineer, and his staff on Wednesday.

Owing to the heavy damage done to the adjacent road and railway line by the dam overflowing at its wings whenever there was a fresh on in the river in the past, representations were made by the Ohinemuri County Council to the owners, Messrs R. M. Aitken and Son, for its removal. Having no further use for the structure, the owners were agreeable to the council effecting the demolition, with the consent of the Mines Department. The necessary permission having been obtained, Mr Shaw took advantage of the fine weather and the low state of the river to carry out the work. The task of releasing the water from the dam, which measured about two chains across, and varied in depth up to 12 feet, was no easy task. After certain preliminary work had been done Mr Shaw laid several charges of dynamite in front of the main dam gateway and several more charges round various parts of the dam. At a given signal these charges were exploded, the result being highly satisfactory. The pent-up water got away with a rush, but the river-bed provided ample space for the sudden volume, and no damage was caused.

Much valuable timber will be taken from the dam when it drains sufficiently. This has been purchased by the county council, and will be useful for bridge repair work.[49]

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[48] https://paperspast.natlib.govt.nz/newspapers/HPGAZ19250703.2.14
Hauraki Plains Gazette, Volume XXXVI, Issue 4848, 3 July 1925, Page 3
[49] https://paperspast.natlib.govt.nz/newspapers/HPGAZ19260108.2.18

1948

24 March

BEING REMOVED

PIPES AT KARANGAHAKE

FORMER WATER SUPPLY. RELIC OF OLD MINING DAYS

Another of the few remaining signs of the one-time very extensive goldmining activity of Karangahake is now passing away.

The four-foot diameter sheet iron pipes which have lain neglected in the Karangahake gorge on the far side of the Ohinemuri river from the highway, are now being disconnected, hauled across the river on a rope and carted to the railway station by a gang of men who are camped at Karangahake. Even allowing for the present cost of sheet metal and the extreme difficulty of procuring it there has been much speculation as to what use could be made of this battered, rusty, old pipe-line.

The explanation is that the Tauranga Borough Council is salvaging it to provide boxing for the concrete lining of a new diversion tunnel for its McLaren's falls hydro-electric scheme.

The pipe-line at Karangahake was constructed over forty years ago to carry water from a dam in the Ohinemuri river a few chains above the railway tunnel to the Woodstock battery at Karangahake, and it was used for about ten years till the Woodstock was taken over by the Talisman which had a better water-power supply of its own from the Waitawheta gorge. The dam was demolished about a quarter of a century ago by the Ohinemuri County Council as it was a potential menace in flood-time and at various times since then the very solid totara timber it contained has been salvaged by county employees for the repair of bridges, etc.

The removal of the pipe-line will recall to old residents a peculiar occurrence when the supply was first used. The pipe withstood satisfactorily its initial pressure tests and then it collapsed and much of it had to be rebuilt. Current rumour had it that the engineer in charge, Mr Frank Rich, was kept short of money for the job so provided metal of the minimum thickness and this proved of insufficient strength to hold up the weight of the water when the pressure was reduced, but the real explanation was that as no air vents were provided a vacuum was created inside the pipe when the water was turned off at the dam and allowed to drain out of the pipe at the battery.[50]

Hauraki Creek dam

1896

16 December

A contract has been let to Messrs Griffiths Bros., of Paeroa, for laying a 1½ inch pipe from a creek above the Tramway Hotel at Karangahake, to the

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Hauraki Plains Gazette, Volume XXXVII, Issue 4923, 8 January 1926, Page 2

[50] https://paperspast.natlib.govt.nz/newspapers/HPGAZ19480324.2.21

Hauraki Plains Gazette, Volume 57, Issue 3974, 24 March 1948, Page 5

middle of the Karangahake township. The pipe is to bring in a temporary water supply for that township, and the work is to be completed before Christmas.[51]

1897

19 June

OPENING OF THE TALISMAN BATTERY.

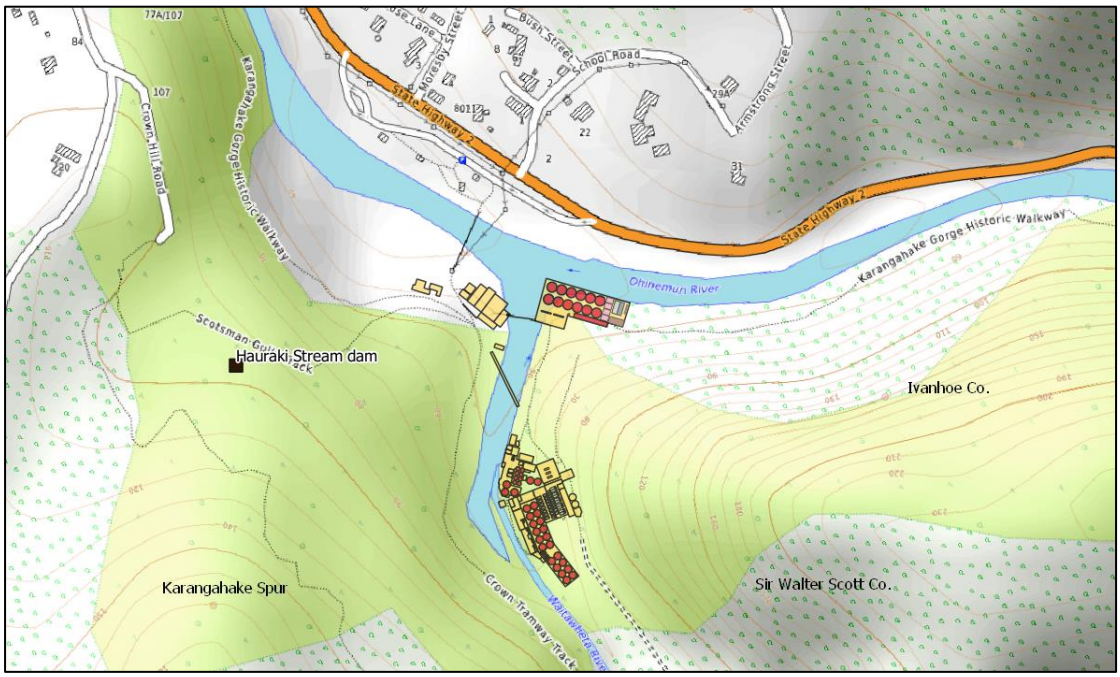
Water for vat sluicing, etc, is brought to the special site from the Hauraki Creek by means of a pipe 3 inches in diameter. [52]

This is the creek in Scotchman's Gully. Some concrete remains.

1906

AJHR 1907

Comstock United Gold-mining Company.—In the early part of the year a company was formed to raise capital to carry on further development-work, and to enable this to be done a larger supply of fresh air had to be forced into the face of the low level, and to do this a small dam was constructed some distance up the small creek adjacent to the mine, and from the dam water-pipes were laid down to the mouth of the level, which conveys sufficient water to be used for a water-blast to force the quantity of air required through an 8 in galvanised pipe, there being now abundance of air in the drive. [53]



Small dam on the small Hauraki Stream that flows down Scotchman's Gully.

The Comstock mine adit is in this gully.

[51] https://paperspast.natlib.govt.nz/newspapers/THA18961216.2.10
Thames Advertiser, Volume XXVIII, Issue 8612, 16 December 1896, Page 2

[52] https://paperspast.natlib.govt.nz/newspapers/OG18970619.2.18
Ohinemuri Gazette, Volume VII, Issue 400, 19 June 1897, Page 5

[53] https://paperspast.natlib.govt.nz/parliamentary/AJHR1907-I.2.2.2.7
THE GOLDFIELDS OF NEW ZEALAND: REPORT ON MINES, ROADS, WATER-RACES, AND OTHER WORKS IN CONNECTION WITH METALLIFEROUS MINING., Appendix to the Journals of the House of Representatives, 1907 Session I, C-03