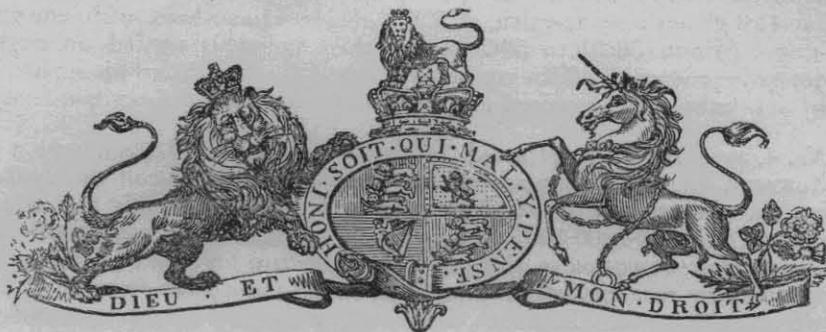


(No. 54.)



MOUNT CAMERON WATER RACE.

PRELIMINARY REPORT BY MR. K. L. RAHBEK, M. DAN. ASS. C.E.

Office of Mines, Hobart, 25th August, 1900.

SIR,

IN accordance with your instructions to me, I left Hobart for the Mount Cameron Water-race on the 23rd July, accompanied by the Secretary for Mines, for the purpose of examining the syphons, and to see whether it would be possible to increase the supply to the aforementioned water-race.

On these subjects I now have the honour to present my preliminary Report.

In accordance with your wishes I examined, first of all, the syphons, six in number, of which numbers 1, 2, and 3 belong to the upper or southern half of the water-race, and Nos. 4, 5, and 6 to the lower or northern half.

Syphon No. 6 has at present a length of about 47 chains, and a water-head of about 6.05 feet. The pipes, which are said to be made of steel plates $\frac{1}{8}$ in. thick, are 20 feet long, consisting of 5 sections, which are rivetted together; they are 3 feet in diameter, and of the spigot and faucet type, joined by yarn and lead-wire packing. The appearance of the pipes in this, and No. 5 and No. 4 syphons, makes it clear that they cannot possibly last for any length of time. Corrosion has apparently been going on for some considerable time, and has only been partly checked by occasional coatings of tar or asphalt. Many of the pipes have a very weak and decomposed appearance at the rivet-joints; others, again, have their spigot-ends corroded to such an extent that the yarn and lead-packing cannot be driven properly home, the result being that many of the packing joints are leaking freely.

The syphon is not buried in the ground, but placed on sleepers, 4 to 5 feet apart, and carried on trestle-work over the deepest parts of the gullies; and, to allow for the "creeping" of the pipes, on account of the difference in temperature during the different seasons, and during day and night, an expansion-joint, 18 inches wide, has been placed at 26.5 chains, reckoned from the intake. At 24.5 chains there is a scour-valve, and at 6.80 chains, an air-valve. On the syphon I counted twenty places where breaks of the pipe-shell have taken place, in sizes from $\frac{1}{2}$ an inch to 8 or 9 inches, and which have been stopped temporarily, as far as the smaller leakages are concerned, by driving wooden pegs into the openings; and in case of the larger breaks, when on the underside of the pipe, by placing a sleeper below, and, by means of wooden wedges, pressing sackcloth, saturated in tar, against the breakage; and, again, in other places a more rational method has been adopted by using iron bands, made of iron plate $\frac{1}{16}$ inch thick, which, by means of lugs and bolts, were strapped round the pipe, using sackcloth as packing material.

In many places the pipes scale off to an alarming extent; I have picked up scalings in extent, say, 5" x 9", and $\frac{1}{8}$ inch in thickness, made up of corroded iron, or steel and tar combined. A great many blisters can be found all along the pipes, and when broken by the pressure of a finger, water freely oozes out. Corrosion has progressed so far, that it would be unwise, now, to scrape the pipes before applying any fresh coating. I should not estimate the lifetime of these pipes to be more than twelve to eighteen months, and then it will only be possible to keep them in working order by using iron bands already partly in use, and to use felt and tar as a means of packing. It is most fortunate that these pipes are under a maximum hydrostatic pressure of 13 lbs. only per square inch.

The general description of the pipes which has been given here also holds good for those in syphons No. 5 and No. 4.

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Syphon No. 5 has a length of 4,200 feet, and a waterhead of 13.95 feet. The pipes are of similar size, construction, and in the same state as described for syphon No. 6. At a distance of 20 chains from the intake there is a scour-valve, at 27.80 chains an air-valve, at 36.5 chains an expansion-joint, and at 41.8 chains a scour-valve, at 50.90 chains a man-hole, with cover, and at 52.33 chains an air-valve. From 56.40 to 59.7 chains this syphon is carried on trestle-work. The maximum hydrostatic pressure is 36 lbs per square inch. I counted, on this syphon, 78 breaks or leakages of the same nature, and repaired mostly in the same way as described for syphon No. 6.

Syphon No. 4, as originally constructed, a length of about 3730 feet, and a water-head of 12.64 feet. However, some years ago an opening was made in the side of the syphon, 1.71 chains from the intake, for the purpose of admitting the water from reservoir No. 2 (the capacity of which, I understand, is about 4,000,000 gallons), and which has been constructed to act as a kind of regulator. When the consumption of the water from the race for a certain time is not so heavy as usual, the water from the race, instead of running to waste, is sent into reservoir No. 2, from which it is again drawn on as required. However, by constructing this reservoir, more than 8 feet in water-head for the syphon was lost, and the reservoir could not have been made to operate at all if it had not been for the fact that the syphon pipes are so large that they are comfortably sending the 40 to 45 sluice-heads through, although the water-head has been decreased from 13.74 to 5.18 feet.

The pipes in syphon No. 4 are made to the same size and constructed in the same way as described for syphon No. 6.

At 1.67 chains, reckoned from the original intake of syphon, there is the present intake from reservoir No. 2, at 15.92 chains expansion-joint, at 18.67 chains air-valve, at 22.27 chains man-hole, with cover, at 26.72 chains scour-valve, at 35.32 chains air-valve, at 37.87 chains man-hole, with cover, and at 41.87 chains scour-valve. From 25.17 to 28.16 chains, and from 39.57 to 44.47 chains, the syphon is carried on trestle-work, but especially is the lastnamed trestle-work exceedingly weak, and seems ready to collapse at any time. The maximum hydrostatic pressure is 36 lbs. per square inch.

On this syphon I counted 28 places where the pipes had been leaking, and which had been attended to in the same way as described for syphon No. 6.

Syphon No. 3 has a length of about 354 feet, and a water-head of 4.02 feet. The pipes here, as well as those of syphons No. 2 and No. 1, are 2½ feet in diameter, and are said to have been made of steel plates one-eighth of an inch thick; they are spigot and faucet pipes, and otherwise constructed in a similar way as described for syphon No. 6.

At 2.55 chains there is a scour-valve, and the syphon is resting on trestle-work from 1.41 to 3.19 chains. No break or leakage has, as yet, taken place in this syphon. The pipes here have not the same corroded and blistered appearance as was the case for Nos. 4, 5, and 6 syphons. The lifetime of this syphon I should judge to be three or four years.

Syphon No. 2 has a length of about 362 feet, and a waterhead of 5 feet, the pipes being of the same size, kind, and made of a similar kind of material as described for syphon No. 3.

At a distance of 2.70 chains there is a scour-valve, and the pipes are carried on high trestles from 1.79 to 3.25 chains.

There has been one leakage on this syphon, near the intake, which has been packed by means of an iron band; otherwise, these pipes have the same good appearance as described for syphon No. 3, and I should also judge their lifetime to be three to four years.

Syphon No. 1 has a length of about 463 feet, and a waterhead of 5.80 feet, the pipes being in every way as described for syphon No. 3.

At 3.80 chains there is a scour-valve, and the syphon is carried on trestle-work from 2.60 to 5.26 chains.

On this syphon I found three leakages, and I was informed that it was about three months since the first leakage took place; otherwise, the pipes of this syphon have nearly the same appearance as syphon No. 3. With care, they may, perhaps, last for three years.

As it is asserted that syphons Nos. 1, 2, and 3 were made at the same time, and of the same kind of materials as syphons Nos. 4, 5, and 6, and, since it is obvious that the three lastnamed syphons have suffered considerably more than the firstnamed, I thought it possible (though it is, perhaps, not likely) that the water drawn into the race, between syphons Nos. 3 and 4, perhaps contained some mineral or organic acids, the presence of which might account for the rapid decay of syphons Nos. 6, 5, and 4, and I therefore took one sample of water from the Great Mussel Roe River, at the intake, and another sample from the race in front of syphon No. 6. The two samples of water were kept in sealed bottles, and I have handed them to the Secretary for Mines for the purpose of having the samples of water analysed.

I am under the impression that it is only about ten years since the syphons were constructed, and, unless the analysis should prove a marked difference in the nature of the water taken in front

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of syphon No. 1, and the water drawn in between syphons Nos. 3 and 4, I think there can be only one of two reasons, or, perhaps, both combined, which is the cause of the short lifetime of the pipes in syphons Nos. 6, 5, and 4; viz. :—

- (1.) The steel plates used may have been of inferior quality;
- (2.) The coating of the pipes (which ought to have been asphalt, mixed with only a small percentage of coal tar, but which, I understand, was coal tar only) was, perhaps, carried out under difficult circumstances, as I believe the pipe-bathing was executed at the different sites of the syphons, and for these reasons it is possible that the coating has not been of a character suitable to protect the pipes against chemical action.

In accordance with what has been stated above, I beg to recommend that syphons Nos. 6, 5, and 4 should be removed. As the maximum hydrostatic pressure at the syphons in question is only 36 lbs. per square inch, I therefore cannot see any reason for using steel, and I beg to recommend that the new syphons should be ordered of best rolled wrought-iron plates, of tough and ductile quality, of ultimate strength not less than 55,000 per square inch, and that will elongate at 15 per cent., and reduce in sectional area 25 per cent before fracture.

In the Appendix attached to this Report I have stated, for convenient reference, what diameter of pipes in the syphons it will be necessary to employ under different conditions.

Leaving syphons Nos. 3, 2, and 1 out of consideration, I shall apply myself only to the three lower syphons. But, before proceeding further, I shall use this opportunity, and state here that I understand that a Tasmanian statute sluice-head is equal to 24.168 (twenty-four one hundred sixty-eight thousandth part) cubic feet per minute, and, if I am under a misconception, I beg to be corrected.

I understand that the Mount Cameron Water-race was originally intended to carry 50 sluice-heads, but I do not think the water-race at present is able to carry more than, say, 40 to 45 sluice-heads. I gauged the water in the race in front of syphon No. 6 on the 30th July, and found $19\frac{3}{4}$ sluice-heads running; I gauged in the outlet box of syphon No. 5 the next day, and found 27 $\frac{1}{2}$ sluice-heads, and on the 1st instant I gauged in front of syphon No. 4, and measured 41 $\frac{1}{2}$ sluice-heads; and I believe that 3 or 4 sluice-heads more here would have sent the water over the embankment in several places; but it is also quite easy to understand that the race, during, say, 10 years' operations, may have silted up a few inches.

To be able to determine the best way of renewing the three lower syphons, surveys of these should be made, drawings for new syphons put in hand, and the following points should be settled:—

With regard to syphon No. 6—

1. How far this syphon could be shortened in length by carrying the race forward on an embankment.
2. Whether this syphon should be computed to carry 30 sluice-heads; or,
3. Whether it would be less expensive to construct the syphon for a carrying capacity of 21 sluice-heads only, and taking advantage of the water-head lost by the "drops" to be found at about 15 miles 71 chains, constructing a race which would be, more or less, 2 miles 10 chains long, and which would carry the balance of the water from the inlet of syphon No. 6 to reservoir No. 1, at the northern or lower end of the Mount Cameron Water-race; or
4. Whether it would be practicable to construct a small reservoir at the outlet of the syphon, the capacity of which needs to be only 125,000, in which case the syphon could be reduced to carry only 7 sluice-heads.

With regard to syphon No. 5—

1. To choose a more direct line than used for the existing syphon; and
2. Whether this syphon should be computed to carry 40 or 45 sluice-heads.

With regard to syphon No. 4—

1. To choose a more direct line for syphon.
2. Whether this syphon should be computed to carry 40 or 45 sluice-heads.
3. To examine whether it would be less expensive to abandon the present small reservoir No. 2, and regaining over 8 feet additional water-head for the working of the syphon, by which means the diameter of pipe necessary will be considerably reduced, or to keep reservoir No. 2, and employ larger pipes for syphon on account of reduced water-head. (See Appendix.)

With a view of ascertaining whether it is practicable to increase the present supply to the Mount Cameron Water-race during the dry season, I examined:—

1. The Great Mussel Roe River, above the intake to the race, but found there is no site for dam or weir available.
2. The Little Mussel Roe River is at present drawn upon as a feeder for the Mount Cameron Water-race; maximum supply drawn is stated to be 12 sluice-heads, and minimum at

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3 sluice-heads. There are 2 or 3 places where a small concrete weir could be constructed for a comparatively small expenditure, but the body of water a weir would keep back would also be small; so this water-course is hardly available for storing purposes, but, as it is a perennial stream, it is important as a feeder, and its use in this capacity may be increased.

At a distance of $\frac{1}{2}$ to $\frac{3}{4}$ miles up-stream from the present intake, 2 waterfalls, within about 50 feet of each other, will be seen; the drops are 10 to 12 feet each.

3. The Old Chum Creek is also said to be perennial, and is not at present drawn upon as a supply. Two apparently good sites were found here.

The one is within a distance of about $\frac{1}{2}$ mile up-stream from where fluming of the race crosses the creek; and this site would essentially be for an earthen dam, with a by-wash at one end. The length of the dam would possibly be about 150 feet, and greatest height about 20 to 25 feet. It seems as if a large body of water could be stored by such an embankment, as the fall of the creek immediately above this site seems small.

The other site found is about $\frac{3}{4}$ mile further up-stream, and is decidedly a site for a concrete weir, as both the bottom and the side of the creek here are composed of solid rock (granite), and both banks coming together leave an opening in width of only about 60 feet.

The length of the weir would probably be about 70 feet, and greatest height about 20 feet, and while the ordinary flow of the stream, after the reservoir had been filled, would be allowed to escape over a small by-wash, the configuration of the river banks is such, that the weir must be designed to allow any flood coming down the creek to pass over the weir in its entire length. Although the bed of the creek in this case seems to rise quicker than at the site for the earthen dam, yet it is evident a good storage will be found up-stream from the proposed site for weir, as the river banks here abruptly widen out, especially so to the western side. However, it is impossible for me to say for certain, until surveys have been made, and drawings prepared, which (if any) of the 2 sites would be the more practicable to adopt, and whether the benefit derived from such impounding reservoir would warrant the expenses being incurred.

I am under obligation to Mr. Griffin, the Manager of the Mount Cameron Water-race, for although he, at the time of my visit, was not in the best of health, yet he accompanied me daily over the race, assisted me in every way, and gave me all possible information.

In conclusion, I beg to say that this temporary report has grown to a greater length than I intended it to be; but this has happened only by a desire to give you all possible information in my power on the subjects under review.

I have the honour to be,

Sir,

Your obedient Servant,

K. L. RAHBEK, *M. Dan. Assoc. C. E.*

NOTE.—I have just received attached report from Mr. Ward. Although the report states that the water drawn between syphons Nos. 3 and 4 contains some dissolved carbonic acid, and a perceptible amount of sulphuric acid, yet they seem to be in such small quantities that they probably could not wholly account for the rapid decay of syphons Nos. 6, 5, and 4.

K.L.R.

APPENDIX.

RETURN showing the Size of Pipes necessary to be used in the Syphons, under different conditions, as stated.

Syphon No. 6.—Length assumed to be 3105 feet, and the working water-head = 6.58 - 8% = 6.05 feet.

Supplying 50 sluice-heads, diameter of pipe = 30 inches.

" 40 " " " = 28 "
" 30 " " " = 25 "
" 20 " " " = 22 "

Waterhead, in this } " 7 " " = 16 "
case, only 4.21 ft. }

Syphon No. 5.—Length assumed to be 4200 feet, and the working water-head = 15 feet - 7% = 13.95 feet.

Supplying 50 sluice-heads, diameter of pipe = 27 inches.

" 40 " " " = 25 "

Syphon No. 4.—Length assumed to be 3730 feet, and the working water-head = 13.74 - 8% = 12.64 feet.

Supplying 50 sluice-heads, diameter of pipe = 27 inches.

" 40 " " " = 25 "

Syphon No. 4.—Length assumed to be 3618 feet, and the working water-head = (13.74 - 8.11) - 8% = 5.18 feet.

Supplying 50 sluice-heads, diameter of pipe = 32 inches.

" 40 " " " = 29 "

Syphon No. 3.—Length assumed to be 354 feet, and the working water-head = 4.02 feet.

Supplying 50 sluice-heads, diameter of pipe = 23 inches.

" 40 " " " = 21 "

Syphon No. 2.—Length assumed to be 362 feet, and the working water-head = 5.00 feet.

Supplying 50 sluice-heads, diameter of pipe = 23 inches.

" 40 " " " = 21 "

Syphon No. 1.—Length assumed to be 463 feet, and the working water-head = 5.80 feet.

Supplying 50 sluice-heads, diameter of pipe = 23 inches.

" 40 " " " = 21 "

Approximate Proportionate Cost of Pipes of different Sizes, taking a Pipe with a diameter of 36" as a unit.

Table with 4 columns: Diameter in Inches, Proportion, Diameter in Inches, Proportion. Rows show diameters from 36 down to 27 and their corresponding proportions.

Government Laboratories, Hobart, 23rd August, 1900.

DEAR SIR,

THE samples of water received from you on the 18th instant, and stated to be from Mount Cameron Water-race, have been examined, with results following:—

- 1. From channel at inlet of Syphon No. 6.
2. From intake of race from Great Mussel Roe River.

Table showing analysis results in grains per gallon for No. 1 and No. 2 samples, including Total Solid Matter, Organic Matter, Total Mineral Matter, and Chlorine and Chlorides.

The residues from both waters were alkaline after ignition; the waters were neutral, even when concentrated. No. 1 contains more organic matter and dissolved carbonic acid, also a perceptible amount of sulphuric acid, probably as sulphate of iron, derived from the oxidation of pyrites.

Yours faithfully,

W. F. WARD, Government Analyst.

To the Secretary for Mines, Hobart.

COPY

RE MOUNT CAMERON WATER RACE.

Mines Department
Hobart 20th December, 1900

Sir,

In continuation of my preliminary report dated 25th August last, I have now the honor to lay before you the results of the permanent surveys, which, in accordance with your instructions, were carried out during the months of September and October last.

From these surveys the accompanying drawings, six in number, have been prepared and of which:-

Drawing	No 1	shows the proposed Syphon	No 6.
Do	No 2	do	No 5.
Do	No 3	do	No 4.
Do	No 4	shows the proposed Reservoir on Old Chum Creek.	
Do	No 5	shows details for the Reservoir, and	
Do	No 6	is a general plan showing the locality of Reservoir with inlet and outlet races.	

All the drawings have been made in such large scales that all essential details can be clearly discerned, and I shall, therefore, only briefly explain the designs.

Syphon No 6 as proposed has a length of 2917 feet and a diameter of 27 inches. As arrangements have been made for continuous gauging of the water, the water head working the syphon has been decreased from 6.62 to 4.40 feet; the syphon will forward 31 sluice heads which is one more than required.

It was found that the expenditure which would be saved by making the syphon for a carrying capacity of 21 sluice heads only, would be less than the cost of constructing the alternative race for a length of about 2 miles 10 chains for the purpose of carrying the balance of water from the inlet of syphon No 6 to Reservoir No 1; neither would it pay to construct a small Reservoir at the outlet of the syphon for the purpose of further reducing the diameter of the pipes.

The syphon is proposed to be made as faucet and spigot pipes of $\frac{1}{8}$ inch thick W.I. plates.

As shown on the drawings the syphon is to be partly buried in the ground, partly enveloped by an embankment, the object being to keep the iron from the fatal influence of the atmosphere

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and if the works are carried out as shown on the drawings the embankment in which the syphon is buried will be well drained. Nowhere are the pipes to be laid on made ground. No provision has been made for expansion joints as the variation in the temperature for the buried pipes will be only slight, and the pipes will not be subject to the hurtful daily creeping on account of expansion.

The inlet and outlet as shown are to be constructed of cement-concrete, earth and stone work, and will be absolutely permanent. A measuring chamber has been provided; the caretaker when passing on his daily tour of inspection notes down the water-level on the gauge rod, and by consulting a table he will learn how many sluice heads are passing, and can make his arrangements accordingly.

Syphon No 5 as proposed is to follow a straighter course than the existing one and has a length of 4120 feet, a diameter of 27 inches and is made of the same material and in the same way as mentioned for syphon No 6.

The water-head is 15.30 feet and its carrying capacity has been computed to be 51 sluice heads.

The inlet and outlet are to be made of the same permanent material as for syphon No 6 but it is not proposed to make arrangements here for water measurement, as there is only a short distance from the outlet of syphon No 4 to inlet of this syphon, and, moreover, the configuration of the country would make the named works here somewhat expensive.

Syphon No 4 is shown to be carried alongside the present syphon, and is proposed to be made as a 27 ~~as a 27~~ inch pipe of the same kind and material as mentioned for the two other syphons.

The length as proposed is 3665 feet, the water-head is 11.65 feet and its carrying capacity is computed at 47 sluice heads.

Both the intake and outlet are proposed to be made in the same way and of the same kind of material as mentioned for syphon No 6. Arrangement for water measuring has been made at the intake.

The syphon as described here has been designed under the

assumption that the proposed Reservoir on Old Chum Creek will be constructed, and the existing small Reservoir No 2 has been abandoned to regain full water-head for the working of the syphon. In case that the Old Chum Creek Reservoir should not be constructed, then can we not afford to abandon the small Reservoir No 2, and in that case the intake for syphon No 4 will have to be moved 1.73 chains along the present syphon and where the fluming-outlet from the small Reservoir enters the present syphon.

Two or three "drops" will have to be constructed between the present intake of syphon and this new place, and the water-head will decrease from 11.65 feet to about 4.5 feet, and consequently the diameter of the syphon will have to be increased from 27 inches to 33 inches.

Old Chum Creek Reservoir

In my preliminary report I mentioned that two sites on the Old Chum Creek were found, and where I thought it likely that water could be stored with advantage.

The first site is about $\frac{1}{2}$ mile up stream from where the Main Race crosses it, and this site is for an earthen^{Dam}; the other site is about $\frac{3}{4}$ mile higher up stream, and would essentially be for a concrete weir.

The surveys which have been carried out disclosed that the lower site is by far the better, and this is the place chosen and shown on the general plan (Drawing No 6)

Drawing No 4 shows clearly the embankment, the Reservoir (with equi-distant curves for every foot), the bye-wash is shown, and so is the end of the proposed Inlet Race from the Little Mussel Roe River, and the beginning of the Outlet Race which terminates about $\frac{1}{2}$ mile from the embankment emptying itself in the Main Race at the beginning of the fluming which carries the race over the Old Chums Creek.

For supplying the Reservoir we do not only rely upon the Old Chum Creek catchment area of 6.12 square miles, but we also draw water from the Little Mussel Roe River.

Having fixed the site for embankment I had a number of trial pits sunk to ascertain the nature of the foundation for

same. In all the pits decomposed granite mixed with clay was met with, and also boulders in different depths; the material is good for the construction of embankment. As shown in Drawing No 5 I do not propose to put any artificial puddle-wall in the centre of the embankment, but to place a 5 ft thick layer of "selected material" on the front slope and immediately under the stone pitching and toe it down to a depth of at least 4 ft at the toe of the front-slope. As the Reservoir, while using it, will now be filled with water, then partly emptied, then filled again, and so on, the water-level will continuously travel up and down the front slope and it is therefore necessary to have this well protected by stone pitching to guard the slope against action of the waves. The front-slope is 3 to 1, the back slope is $1\frac{1}{2}$ to 1 till the 480.00 level from which height it goes down with slope 3 to 1 and is protected by stone pitching.

On 3 different places I had surveys carried out for finding the best site for Bye-wash, which is about the most important work for a Reservoir. The place chosen for the Bye-Wash is some 6 chains to the west from the western end of the embankment. The material found in trial pits sunk here showed good serviceable filling material, and all the material used for the embankment is to be obtained from here. What is termed "selection material" indicates that that part of excavation which contains decomposed granite and clay mixed in about proportion of 2 to 1 shall be taken care of and applied as shown.

The catchment area already mentioned is 6.12 square miles and about $\frac{2}{3}$ of its area consists of conglomerate rock covered with a thin layer of decomposed conglomerate with thick scrub along the water courses and on the high country; the remainder of the $\frac{1}{3}$ part of the area is composed of low ridges with fairly open scrub.

If we reckon that the flow-off from this catchment area during the heaviest rain-storm may amount to 350 cubic feet per second per square mile then the Bye-wash should be able to receive and send forth $350 \times 6.12 = 2142$ cubic feet per second.

I also took a cross-section of a flood in the Creek; the area was found to be 130.65 square feet and the water was said during such a flood to have travelled with a velocity of 7 miles an hour or say $10\frac{1}{2}$ feet per second; this would amount to 1339 cubic feet per second but I was informed that heavier floods had been known. The Bye-Wash as designed has a bottom width of 50 feet and side slopes $1\frac{1}{2}$ to 1; its fall is 1 in 100, and this with a 4 feet depth of water moving down the Bye-wash will accelerate the velocity to 12.6 feet per second, and the Bye-wash will be able to send away 2822 cubic feet per second.

The area of the water-surface is in height with the of the Reservoir when water-level is in height with the Bye-wash is 35 ac 1 rd 6 per and the capacity is 12,588,300 cubic feet. The outlet pipe is laid in depth of r.l.-480.00 and water lying deeper than this, and which amounts to 227,000 cubic ft, cannot be drawn and the available supply is therefore 12,361,300 cubic feet.

What the evaporation amounts to I do not know, but assuming it to amount to say 9 inches for the three driest months, and absorption and leakage to say 3 inches, these together will amount to 1 foot. To obviate this loss, I have arranged to have 12 inches high flashboards placed on the Bye-wash, when out of the season when heavy floods can be expected; but during all other seasons the flashboards must not be used.

The Old Chum Creek is said to be perennial and to forward at least 2 sluice heads during the driest season, and from the Little Mussel Roe River we should also obtain a couple of sluice heads; this in connection with the stored 12 millions cubic feet of water in the Reservoir would avoid any shortage in the supply from the Main Race during even the driest season.

I understand that there is a water-right granted for 4 sluice heads from the Old Chum Creek and which is ⁱⁿ force till 1905. If it is decided to construct the Reservoir, it would perhaps, be best to annul this grant by giving a monetary compensation to the party interested in lieu of water-right.

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Estimated Costs.

Two estimates in chief are attached hereto.

The one called A is for £22,000 and includes the restoration of all 6 syphons (of which, however, Nos 1, 2, and 3 will not require to be renewed till 3 or 4 years hence). The syphons as designed under this estimate are equipped with water measure gauges in 2 places and all the works are designed to be constructed of absolute permanent materials.

The proposed Reservoir on Old Chum Creek (estimated cost about £6,000) is also included, and the construction of this Reservoir would probably put an end to the outcry for water during the dry seasons for the district supplied by the Mount Cameron Water Race.

The estimate called B is for £15,225 and includes also the restoration of all 6 syphons, but only to be constructed of perishable materials as is the case with the present works.

The Reservoir on Old Chum Creek is omitted.

In this case the diameter of Syphon No 4 has been increased from 27 inches to 33 inches because the water-head working this Syphon has necessarily been decreased.

The measurements and estimated costs for the part of the estimate called "substituting" old wooden fluming with permanent works" are for the greatest part Mr M.J.Griffin's, Manager of the Mount Cameron Water Race. I have examined race-embankments that he has constructed of earth and stones in lieu of collapsed wooden flumings, and, in my opinion, the work could not have been done better for the amount of money spent.

I have, therefore, without hesitation used his measurements and estimated cost for these particular works.

I have the honor to be

Sir,

Your obedient Servant,

(SD) K.L.Rahbek
M.Dan Assn.C.E.

To

The Honorable Minister of Mines,

H O B A R T.

Mr Griffin explained to me, that if a Reservoir could be constructed with such a capacity, that he from that could obtain 10 sluice heads for 13 weeks, all complaints about scarcity of water in summer time would cease.

$10 \times 24.2 \times 60 \times 8 \times 7 \times 13 = 10,610,560$
cubic feet - 10 sluice heads for 13 weeks.

The capacity of the Reservoir is 12,361,300 cubic feet and besides this amount we reckon upon getting from 70,000 to 150,000 cubic feet per diem as minimum flow in minimum time from Old Chum Creek and Little Mussel Roe River.

Accordingly the storage capacity of this Reservoir is a good deal more than is immediately wanted.

By raising the embankment say 8 feet the storage capacity of the Reservoir would increase from 12 million to 30 million or perhaps 30 million cubic feet, but this is surely not yet needed for Mount Cameron Water Race.

(SD) K.L.R.
20:12:1900

Old Cham Creek Reservoir

Estimated Cost

Description of works	Quantities	Rate	L	S	D	Amount		
						L	S	D
<u>Embankments</u>								
<u>Earthworks.</u>								
Clearing stumps for site of embankment and filling the cavities with puddle	item		35					
Excavating and stepping site for embankment.	4162 Sq Yds	4d	69	7	4			
To be excavated from Bye Wash	14435 cu yds	2/6	1804	7	6			
Selected material (about 1/3 clay and 2/3 decomposed granite thoroughly mixed) excavated from Bye Wash	4775	3/6	835	12	6			
6" rich soil on top of embankment and part of back slope sowed with grass seed	1675	9d	62	16	3	2807	3	7
<u>Stone Pitching.</u>								
12" Stones set on a 6" layer of broken 1 1/2" stones on front slope, back slope, abutment for foot bridge and in 40 lin feet of outlet Race.	2400 sq Yds	7/-	840					
Hand packed stones in a 15" thick layer at bottom of front slope	212	3/-	31	16		871	16	
<u>Bye Wash</u>								
Excavation 20160 cu yds but as 19210 cu yds has been paid for under the embankment, there remains	950 cu yds	1/6	71	5				
Excavating for concrete and pitching	140 cu yds	1/6	10	10				
Cement Concrete including rendering	33	60/-	99					
Pitching 12" stones set on a layer of 1 1/2" broken stones	200 sq yds	7/-	70					
Board-work 12"-high-flash								
Timber-work 12" high flash								
board 3" thick and 4 pieces	100 Sup ft							
12" X 12" posts 5ft long	4	20/-	4					
Footbridge	12	20/-	12			266	15	
<u>Outlet through embankment.</u>								
15" C.I. faucet and spiget pipes, one inch shell thickness, length 225 ft say	18 tons	£14	252					
3 W.I. Cellars	Item		6					
Excavating for and laying 225 ft 15" C.I. Pipes			9					
One special 4 ways pipe with 4 flange			25					
One banded, special flanged pipe about 12 ft long			30					
3 pieces 15" sluice-valves complete	3	£25	75					
1 Special 15" sluice valves complete	1	£30	30					

Description of works	Quantities	Rate	L s d			Amount		
			L	s	d	L	s	d
3 Strainers	3	£3	9					
Valve tower								
8 old 42 lb rails each 24' long	0.6 tons	£10	6					
W.I. work for finishing tower erection say	2.5	£22	55					
Footbridge		£25	25					
8 old 42 lb rails each 24' long	0.6 tons	£10	6					
W.I. work for finishing 2 trestles	1	£22	22					
Erection say			15					
140 lin ft of light hand-railing	140 lin ft	1/-	7					
Timber work	100 sup ft	20/-	19					
	19							
Cement concrete work for foundation of valve tower and bridge -trestles.								
Retaining wall for abutment for bridge and 3 walls for the outlet pipe and 20 cub ft of outlet race	92 cu ft	60/-	276					
Excavation herefor and puddle			8				875	
<u>Outlet Race</u>								
Length say	0.5 miles	£125	62	10			62	10
<u>Inlet Race from Little Mussel Roe.</u>								
Total length 3.36 miles								
First 29 chains of race including weir and measuring chamber			480					
From 29 chains to 269.23 chains	240.33 chains	35/-	420	11	6			
For 7 chains through rock and boulders reckon extra	7	£10	70					
Extra excavations through two saddles say	900 cu ft	2/-	90					
Embankment and concrete for tapping Harpers Creek say			50					
Crossing 4 small creeks								
Embankments, pitching say			12				1122	11 6
Total estimated cost for Reservoir,							£6,005	16 1

Description of works
 Quantities
 Rate
 L s d
 Amount
 L s d
 3 Strainers
 Valve tower
 8 old 42 lb rails each 24' long
 W.I. work for finishing tower erection say
 Footbridge
 8 old 42 lb rails each 24' long
 W.I. work for finishing 2 trestles
 Erection say
 140 lin ft of light hand-railing
 Timber work
 Cement concrete work for foundation of valve tower and bridge -trestles.
 Retaining wall for abutment for bridge and 3 walls for the outlet pipe and 20 cub ft of outlet race
 Excavation herefor and puddle
Outlet Race
 Length say
Inlet Race from Little Mussel Roe.
 Total length 3.36 miles
 First 29 chains of race including weir and measuring chamber
 From 29 chains to 269.23 chains
 For 7 chains through rock and boulders reckon extra
 Extra excavations through two saddles say
 Embankment and concrete for tapping Harpers Creek say
 Crossing 4 small creeks
 Embankments, pitching say
Total estimated cost for Reservoir,

SYPHON No 6.

Vertical
Description
of
works
done
for
the
purpose
of
the
siphon
No
6.
The
works
done
include
the
excavation
of
the
siphon
and
the
formation
of
the
embankment
on
both
sides
of
the
siphon.
The
siphon
is
made
of
W.I. pipe
27" in
diameter
with
a
shell
thickness
of
1/4" @ £35
per
ton.
The
siphon
is
laid
on
a
bed
of
green
grass
turf
and
is
supported
by
stone
pitching
on
both
sides.
The
siphon
is
provided
with
a
scour
valve
and
an
air
vane
and
1
man
hole
with
cover.
The
total
cost
of
the
works
is
£2895
13
3.

Description of works	Quantities	Rate	Amount		
			£	s	d
W.I. pipe 27" in diameter shell thickness 1/4" @ £35 per ton	2917 lin ft	13/-	1896	1	
Laying and joining the pipes	2917	2/-	291	14	
Excavating for siphon and forming embankment	2917	1/9	255	4	9
1 double 16" E.W. pipe culvert				9	
1 single Do				6	
Drains say	270 cu yds	1/6	20	5	
1 scour valve, 1 air vane and 1 Man hole with cover			55		
					2533 4 9
<u>Intake.</u>					
Earthwork	275 cu yds	1/6	20	12	6
Cement concrete work	45	70/-	157	10	
Timber work	100 sup ft	20/-	4		
9" C.I. Pipe 55 ft long	1.25 tons	£16	20		
W.I. work	650 lbs	6d	16	5	
2 W.I. Collars			2		
Green grass turf	8 sq yds	9d		6	
Stone pitching	12	10/-	6		
					226 13 6
<u>Outlet</u>					
Earthwork	130 cu yds	1/6	9	15	
Cement concrete work	199 sup-ft	70/-	122	10	
Timber work	100 sup ft	20/-	1		
W.I. work	40 lbs	6d	1		
Pitching	3 sq yds	10/-	1	10	
					135 15
Total Cost			£2895	13	3

SYPHON No 5

Description of work	Quantities	Rate	L s d			Amount		
			L	s	d	L	s	d
W.I. Pipe 27" in diameter shell thickness 1/8" at 235 per ton	4120 lin ft	13/-	2678					
Laying and joining the pipes	4120	2/-	412					
Excavating for syphon and forming embankment	4120	1/9	360	10				
Drains	400 cu ft	1/6	30					
1 Double 18" R.W. pipe culvert				9				
3 Single Do	No 3	26	18					
2 Air valves, 2 scour val- ves and 4 Man holes with cover			120			3627	10	
<u>Intake</u>								
Earthwork	55 cu yds	1/6	4	2	6			
Cement concrete work	20	60/-	60					
Timber work	100 sup ft	20/-	3	3				
9" C.I. Pipe 15 feet	3.15 0.3 tons	£16	4	16				
W.I. work (ordinary)	279 lbs	6d	6	19	6			
1 1/2" W.I. bars with thread complete	60	1/-	3					
Stone pitching	5 sq yds	7/-	1	15		83	16	
<u>Outlet.</u>								
Earthwork	250 cu yds	1/6	18	15				
Cement concrete work	35	60/-	105					
Timber work	100 sup ft	20/-	1					
W.I. work	40 lbs	6d	1					
Stone pitching	30 sq yds	7/-	10	10		136	5	
Total Cost,			£3,647 11					

SYPHON No 4.

Description of works	Quantities	Rate	Amount		
			L	s	d
W.I. Pipe 27" in diameter shell thickness 1/8" at £35 per ton	3665 lin ft	13/-	2382	5	
Laying and joining the pipes	3665	2/-	366	10	
Excavating for syphon and forming embankment	3665	1/9	320	13	9
Drains	340 cu ft	1/6	25	10	
2 Double 18" X.W. pipe culvert	No 2	£9	18		
2 Single Do	2	£6	12		
1 air valve, 2 scour valves and 2 Man Holes with cover			75		
					3199 18 9
<u>Intake.</u>					
As per syphon No 6			226	13	6
Add for extra W.I. work	100 lbs	6d	2	10	
W.I. work	75	1/-	3	15	
					232 18 6
<u>Outlet</u>					
As per syphon No 5			136	5	
					136 5
Total Cost,					<u>£3,569 2 3</u>

Estimated cost for substituting 24 old flumings with permanent works.

Description of Works	L s d			L s d		
	L	s	d	L	s	d
1 Intake of Great Mussel Roe River. New inlet and 80 lin yds of old fluming to be substituted with embankments of earth and stones	158	9				
2 Iron fluming on new trestles	62	14				
3 Do	64	13				
4 Conduit bank	98	1				
5 Iron fluming on new trestles	157	1				
6 Earth and stone embankments	109	11	6			
7 Do	84	19				
8 Conduit bank	39	9	6			
9 Do	69	8	6			
10 Earth and stone embankments	68	17				
11 Iron fluming on new trestles	102	8	6			
12 Earth and stone Embankment	122	1				
13 Do	171	11	6			
14 Do	94	15	6			
15 Conduit bank and cutting	48	7	6			
16 Do	111	3				
17 Do	34	18				
18 Earth and stone embankment	81	11	6			
19 Do	66					
20 Do	66	2				
21 Do	78	2				
22 Do	238	5				
23 Appears in Estimate for Old Chum Reservoir To connect Cascade Creek with Main Race	26					
24 Iron Fluming and new trestles, Old Chum Creek	296	17	6	2461	6	6
				<u>22,461</u>	<u>6</u>	<u>6</u>

Estimate in Chief A.

Description of works				Amount		
	L	s	d	L	s	d
Old Chum Creek Reservoir	6005	16	1			
Syphon No 6	2895	13	3			
Syphon No 5	3847	11				
Syphon No 4	3569	2	3			
Substituting 24 old wooden flumings with permanent works	2461	6	6	18779	9	1
In 3 to 4 years time Syphons Nos 1,2 and 3 must be renewed				2200		
Road repairing				250		
Telephone, communication with Old Chum Creek Reservoir				75		
Supervision and overseeing				300		
				<u>£21,604</u>	<u>9</u>	<u>1</u>

Grand Total say £22,000. Stg.

(SD) K.L. Rahbek
20/12/1900

Estimate in Chief B.

The pipes in syphons Nos 6, 5, and 4 to be made to the same size (except Syphon No 4, which will be 33" in diam) same kind and similar material as mentioned under estimate A.

But the syphons are to be placed on sleepers on the surface of the ground, and the inlet and outlet to be made of timber similar to the existing ones, and no arrangements are made for the measurement of water. The cost of the proposed Reservoir is omitted in this estimate.

Description of works	£	s	d	Amount		
				L	s	d
<u>Syphon No 6</u>						
W.I. Pipes 27" in diameter, length 2917 feet laid on sleepers, joined, fitted with all valves etc	2300					
Inlet and outlet of timber and necessary earthworks	150			2450		
<u>Syphon No 5.</u>						
W.I. Pipes 27" in diameter, length 4120 ft laid on sleepers, joined, fitted with all valves etc	3400					
Inlet and outlet of timber and necessary earthworks.	150			3550		
<u>Syphon No 4</u>						
W.I. Pipes 33" in diameter, length 3590 ft, laid on sleepers, joined, fitted with all valves etc	3400					
Inlet and outlet of timber, including 3 "drops" and necessary earthworks	250			3650		
Forward.				£9,650		

Continuation of Estimate in Chief B

Description of works				Amount		
	L	s	d	L	s	d
Brought forward				9650		
Substituting 25 old fluming with permanent works	2900			2900		
In 3 to 4 years time syphons Nos 1,2 and 3 must be renewed				2200		
Road repairing				200		
Telephone connection extended to channel <i>keeper's house at Old Chum Creek</i>				75		
Supervision and overseeing				200		
Grand Total,				<u>£15,225</u>		

K.L.Rahbek

(SD) 20/12/1900