

(1) Number of pages 8

(2) Date of repair 3. 2. 58.

(3) Initials of the Referencer _____

MADRAS RECORD OFFICE

Government of Madras

Revenue DEPARTMENT
(*Hamine*)

G.O. No.
B.P. No.

883

~~Press~~
~~Mis.~~

(S.C.)

Dated

7. 4. 1878

195

Not to be folded or roughly handled

6. Mr. Wilson's design is for a masonry dam, a portion of which is to serve as an escape; the section of neither portion appears to be very good and would require considerable modification.

7. There are a number of other papers connected with the project which I will look through and use their information in the further report which will be submitted when the levels mentioned above are taken.

8. I shall be obliged by your informing me, should you receive this letter in time, whether the above investigations will be sufficient, or whether you consider it necessary to examine the ground in any other direction.

From Major J. PENNYCUICK, R.E., District Engineer, Salem, to Lieutenant-Colonel J. MULLINS, R.E., Chief Engineer for Irrigation, dated Salem, 25th March 1878, No. 91 S.L.

In continuation of my letter, No. 81, of 26th February 1878, I have the honor to forward herewith a copy of the surveys executed by Mr. Wilson in connection with the Kistnagherry reservoir.

6 sheets of surveys.

1 section of valley at site of dam.

2. Several of Mr. Wilson's bench marks have been found and connected; his levels do not appear to be very accurate, and I am inclined to think that they were calculated from theodolite observations and not taken directly with the level. On the plan are marked the lines which have been run in order to ascertain what facilities exist for the discharge of surplus on the left bank, and it will be seen that the conjecture expressed in my letter abovementioned has been verified by the result.

3. In the direction of the Oosoor road there is plainly no possibility of discharging surplus at a lower level than about 150; the Royacotta road on the other hand passes over a saddle, a considerable portion of which is below 130; the line run was unfortunately not taken along the ridge itself, and offsets had to be taken from it to ascertain the level of the ridge; enough has been done to show that an escape of considerable length at any level between 130 and 110 could be obtained with no difficulty and but slight expense.

4. I am the more inclined to believe that Mr. Wilson's levels were taken from theodolite observations that it seems impossible that a man of ordinary intelligence could have levelled up to the 100 feet contour marked on the survey, and yet have stated as he has done in one of his reports that the dividing ridge is fully 70 feet above that contour.

5. It is quite clear that on the right bank no escape is to be looked for except at the head of one of the branches of the nullah which joins the Pooniar close to the village of Putehempetty and passes by Dodagampully; this stream has accordingly been surveyed up to 150 feet, and it may be taken as certain that there is no possibility of an escape at any practicable level on this side of the river.

6. A cross section of the river bed at the site of the dam has also been taken; this section has been connected with the bench mark on the Royacotta road by two independent lines of levels, and shows an error of 6.81 feet in Mr. Wilson's levels, the lowest point of the bed, taking the above bench mark at 101.71, being 6.81, while Mr. Wilson makes it 0.

7. I do not consider that it would be at all desirable to construct an earthen dam at this point; the depth of water (120 feet or so) would be so great as to involve considerable risk; the soil is not good, containing as it does a large proportion of sand, and over a very large part of the area from which the soil must be taken there is a deposit of silt which would have to be removed at considerable expense.

8. A still greater difficulty would be found in the disposal of the water coming down the river during construction; a dam containing, as this would do, some four millions of cubic yards of earth would take a long time to construct, and provision

would have to be made for the disposal of floods reaching to 120,000 cubic feet a second. Excluding the cost of this provision, that of an earthen dam, sluices, &c., would be in round numbers fourteen lakhs of Rupees as against twenty-two for a masonry dam; including it there would be but little difference in cost, certainly not so much as to justify the risk attending the construction of an earthen dam under such circumstances. It will be remembered that it has been shown conclusively that at the Periar, owing to similar causes, an earthen dam, with all the advantages of the silting process (which could not be applied in the case in question), would cost actually more than one of masonry.

9. On the other hand the circumstances are favorable for the construction of a masonry dam; stone is at hand in unlimited quantities; the bed of the river, though the Surveyor who took the section has marked it as "sand," is really of rock overlaid in parts with a small depth of sand, and the hills on the flanks have rock at or close to the surface of the ground. In the absence of trial pits or borings it is not possible to say exactly what is the depth of the alluvial soil overlying the rock between the hills and the river, but the position of the latter will probably not be found to vary greatly from that sketched on the section.

10. It is of course impossible with our present information to form anything like an accurate estimate either of the probable cost or of the returns, as the latter and to a very great extent the former will depend upon the content of the lake, and this at present we do not know.

11. Mr. Wilson estimated the waterspread (it is not quite clear whether at the 80 or 100 feet level) at 21,445 acres; on what data this exact figure is founded does not appear. His survey only covers the ground on the left bank up to the point where the river bed is 34 above datum; at this portion the area at the 100 feet contour is a little over 6 square miles. I have been down the valley over nearly the whole of this portion, and should say that the area on the right bank was fully equal to that on the left, which would give about 12 square miles for the two sides. If we assume that the area of the waterspread varies as the square of the depth, the total area at the 120 feet level which would probably be found the most convenient in practice would be to 12 square miles as $(120)^2$ to $(66)^2$, or would amount in round numbers to 31 square miles; probably, however, the upper part of the valley is narrower and steeper than the lower, and the actual area would be something less than this. It is likely, I think, to lie between 24 and 30 square miles. Each square mile of waterspread, if the mean depth be ten yards (a moderate estimate with a maximum of 40), would give a content of nearly thirty-one millions, sufficient for the irrigation of close on 4,000 acres.

12. As the content even with a maximum area of 30 square miles would only amount to less than 6 inches on the drainage basin of 1,892 square miles, we might safely reckon on its being filled twice over during ordinary years, and so giving two crops off all the ground irrigated; after allowing for maintenance charges the return might be taken at Rs. 6 an acre, making Rs. 5,76,000 and Rs. 7,20,000, the return for the two extreme areas of 24 and 30 square miles.

13. The cost of the dam and escape would be independent of the lake area, the former may be tolerably accurately estimated, its content would be in round numbers twelve and a half millions of cubic feet, and its cost including sluices would not be likely to exceed Rs. 24,00,000.

14. The cost of the escape itself would be but slight, but expensive works would be necessary in order to pass the water down the valley by which it returns to the main river; this valley is very fertile, and it would be necessary to reduce as much as possible the destruction of cultivated land in it. Probably three lakhs of Rupees would cover all expenses connected with the surplus works.

15. The compensation for land would form a heavy item. In the absence of information as to the proportions of various kinds of lands to be submerged only a very rough guess can be made at its amount. Mr. Wilson appears to have taken it at 20 Rs. an acre, or Rs. 12,800 per square mile, but this seems much too low. The average land revenue of the taluq is Rs. 270 per square mile, and taking the

value at seventy years' purchase (twenty for loss of assessment and fifty for compensation) it would amount to Rs. 18,900 per square mile; of course we cannot say that the value of the particular tract we are concerned with would be the same as this, but it will probably not exceed 25,000 Rs. Information sufficient for a very tolerable approximation can probably be obtained from the Revenue Department without much trouble.

16. The distribution will be expensive not only on account of the cross drainage, but because the required amount of land cannot be found within a short distance, and the main channels will have to extend many miles in length; 15 Rs. an acre is a very high allowance, which is not likely to be exceeded.

17. On these data the cost would be:—

	For 24 Square Miles.	For 30 Square Miles.
	Rs.	Rs.
Dam	24,00,000	24,00,000
Surplus	3,00,000	3,00,000
Compensation	6,00,000	7,50,000
Distribution	14,40,000	18,00,000
Total	47,40,000	52,50,000
Return	5,76,000	7,20,000
Percentage	12.15	13.7

18. These percentages are good, and I have probably over estimated the cost of distribution and compensation.

19. As regards the power of the river to fill the reservoir without injury to existing irrigation there need, I think, be no doubt; I have not had time to go into the registers of discharge, but the maximum storage contemplated is only 6 inches on the drainage area.

20. Of course the above figures make no pretension to accuracy, but they do, I think, indicate that the project is one worth taking up in earnest. If it is to be taken up it is useless to waste time in picking up casual scraps of information; the survey will occupy an experienced and energetic officer with a competent staff of Surveyors for fully a year.

21. I would also suggest that before any further expenditure is incurred or time employed in field investigations it should be decided whether there is any prospect of the work being carried out if the result of those investigations be entirely favorable; I speak feelingly on this subject from my experience in connection with the Periar project, and may be pardoned for hoping to avoid a repetition of what has taken place with regard to that work, the investigations for which occupied four years and employed six officers of the Public Works Department alone, and ended in showing conclusively that the work would prove highly remunerative and was perfectly practicable, while as a famine preventive it possessed advantages which as far as I know are possessed by no other work whatever; yet this work has been put aside on grounds which whatever their nature (a point on which I have no information) must have existed before the investigations were commenced as much as after they were completed.

SUBMITTED for information.

The information given by the District Engineer shows that it would be practicable to discharge surplus from a reservoir formed by damming the Pooniar where it passes between rocky hills about $4\frac{1}{2}$ miles south-west of Kistnagherry, and that the level of the saddle which is available for the formation of a surplus weir would admit of F.T.L. being fixed at from 110 to 120 feet above datum. From paragraph 6 of the District Engineer's letter and from the section at the bund site it would appear that with F.T.L. at 120 the maximum depth of water would be $120 - 6.81 = 113.19$ feet in the bed of the river, while out of the river bed the maximum would be about 20 feet less.

It would be necessary to make a detailed examination of the escape saddle by means of trial pits before any decision as to the proper full tank level could be come to.

The area of the drainage basin is said to be 1,892 square miles. The maximum flood discharge may be estimated at 143,800 cubic feet a second, and the length of weir required, assuming a maximum depth of 6 feet of water to pass over it, would be 3,018 feet, say 3,000 feet. The width of the river at the dam site is 1,140 feet.

2. The probable area of the water surface of the reservoir when full would be about 30 square miles, and the contents would be, if the assumed average depth of 10 yards be correct, about 900 millions of cubic yards, or 24,300 millions of cubic feet.

3. Major Pennycuik considers that the construction of an earthen dam would not be advisable because—

- (1.) The depth of water would be great for such a structure.
- (2.) The soil contains a large proportion of sand.
- (3.) The disposal of the discharge of the river would be difficult and, if effectually provided for, expensive.

With regard to these reasons it may be observed that the safety of an earthen dam would depend upon freedom from leakage, and the puddle wall has to be relied on for this. Good puddle clay is therefore essential, and, given this, only a comparatively small part of the bund need be of fairly impervious soil; the rest has no function beyond make weight, and this is a question of section or arrangement. It would be an undertaking of some magnitude to construct such a bund of earth, but it would not be as difficult at the present day to make such a bund stable as it was for the natives to form the larger of the tanks which they built.

The disposal of the discharge of the river is a very material objection to the construction of a tank with an earthen bund, for it would not be safe to leave a gap for the river and to afterwards close it in one season, and such closure would probably not be feasible. Consequently it would be necessary to form a bridgeway across the river, and the bridge would be a very costly work indeed. Major Pennycuik apparently allows eight lakhs for the sluices, and this sum would probably be found inadequate.

The *prima facie* evidence is shown to be in favor of a masonry dam, and if there be solid rock foundations throughout it would be the cheaper and much the safer arrangement, for the river could be discharged over it during construction at no cost beyond the provision of a cushion wall.

The length of the top of a dam with F.T.L. at 120 would probably be about 1,200 yards.

4. Major Pennycuik's approximate estimates, with a masonry dam, for reservoirs covering 24 and 30 square miles respectively are 47,40,000 and 52,50,000 Rs. respectively, and the corresponding areas of irrigation are 96,000 and 120,000 acres respectively. No useful purpose would be served by the discussion of these figures. If 900 millions of cubic yards or 24,300 millions of cubic feet of water can be stored and distributed for $52\frac{1}{2}$ lakhs, the project would be financially feasible, and the revenue from second crop would be a further gain.

It may be noticed that the river itself would be the main distributary, and that in this way probably one-third at least of the cost of distribution direct from the tank would be saved.

5. The further investigation more immediately necessary, if any further inquiry be considered desirable, should include—

- (1.) A detailed examination by trial pits and borings of the bund site, so as to determine whether solid rock is to be met with all across and at what depths.
- (2.) A similar examination of the escape saddle, with also cross sections of the saddle down to a given level which should be the lowest possible F.T.L.

Govt. of (1878) Madras.

REVENUE.

To
THE REVENUE DEPARTMENT,
&c., &c., &c.

Dated, April 9th.

Printed 10th.

Recd.

Encl.

G.O., 9th April 1878, P.E. No. 883.

APRIL.

Nos. 135-136.

Kishinagerry Reservoir in the Salem District.—
Stating with reference to the observations by
the Chief Engineer for Irrigation on the — that
there is no sufficient reason so far as famine is
concerned for proceeding further with the matter,
and that the papers will be forwarded to the
Revenue Department.