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MADRAS RECORD OFFICE.

Government of Madras.

Public works DEPARTMENT.

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Supg Engineer's Office, B.
Camp Moreholum 2nd August 1857

From

Lieut Colonel J. Bean R.E.
As Supg Engineer 4th Division

To

Colonel C. A. Orr R.E.
Secretary to Government M.D.

Sir,

I have the honor to inform
Government that I have lately inspect-
ed the works in progress in connection
with the supply of water to the Spur
Tank & Madras from the large Red Hill
Reservoir, to be fed by the Fort St. John River
in the Madras District, and for pro-
viding increased irrigation from the
Sholavaram and Red Hill Tanks. As
this is one of our largest projects, and
of great importance, on which, also, a
sum of three lacs is sanctioned, this
year for expenditure, a report of the
state of progress made will be interest-
ing to Government, and, as considera-
ble deviations from the sanctioned
plans of the Aicut have been carried

out

out by the Executive Engineer, and further alterations are contemplated in other works by myself, it is necessary that I should submit a report on the subject and obtain formal sanction for my proposals. —

2 The Government are aware that the project consists of an ancient across the Cortellia River, with a head sluice and Channel from the South bank 8 1/2 miles in length, to feed the Pholaveram Tank, which is to have its banks and Calingula raised 18 feet to receive the increased supply. — A further main channel with head sluice from this Tank is to be taken off to supply the Red Hill Lake, which will be raised 15 feet, and the water will be conducted by a smaller supply channel, regulated at the head, to the Spur Tank where filtering beds will be established for the further distribution of the water. —

3 Captain Maguay the Executive Engineer, has been engaged on the Ancient, the two main Channels from the Cortellia to Pholaveram, and from Pholaveram to the Red Hill Lake, and in raising the banks of these

two Tanks. His principal object, before the monsoon, is to complete the Ancient to the bed level to excavate the Channels as far as possible, and more especially to raise the banks of the Reservoirs, for if this is not carried out before the Tanks fill, his operations will be much retarded next year, until the subsidence of the water allows of his raising the permanent and puddle wall of the banks. — It may be possible to allow some of the surplus water from the large streams, the Booyhal and Katakhal, falling into the Pholaveram Channel, to be diverted into the Tan Rau, if the state of the masonry works and channel will admit of it, to augment the supply in the Pholaveram Tank this year. —

4. The foundations of the body and retaining wall of the Ancient have been laid on wells across the river, 500 feet in length, with the exception of about 25 feet which had been left for the passage of summer floods, but which portion, even, will have been nearly completed by this time. The wing wall foundations will be built before the monsoon. — Large quantities

of materials are collected on the spot, and preparations are made to lay a rough stone bed for a flooring and the Apron above.

5. The excavation of the foundations of the head sluice are commenced, and the Executive Engineer expects to complete the work above the reach of fishes by the 15th October next.

6. The Channel 8 1/2 miles in length to Holaveram, has had a large portion of the excavations carried out, with the exception of the first mile from the head, which has been kept in reserve for the Ancient Coolies when they are out of employ. At the summit of the ridge through which the channel is taken, the cutting is of rather a heavy nature, being from 6 to 7 yards deep, and to this point the attention of the work people is diverted. The large brook that surplus has to be led off by a new cutting into the Holaveram channel; for a mile above the latter, and this work is in progress.

7. The Holaveram Tank bank is being raised, and the present

3
ment and puddling is in progress with a view to raising it five feet above high water mark in the monsoon, and so to cause no delay next year as was the case this season. One thousand running feet of face work have been raised from two to four courses of stone. It is hoped that the salingulak will be completed before the monsoon, but care must be taken to protect sufficiently by the banks in the first instance.

8. The excavation of the channel from this Tank to supply the Red Hill reservoir through only 2 3/4 miles in length, is owing to the extreme hardness of the laterite soil, an extremely slow and laborious piece of work, which will require eight months longer to complete. Portions of the work have to be taken through solid rock and at the summit the excavations will be 18 feet in depth. On going over this work I found that progress for a mile in length had been made and the cutting nearly completed at the portion which enters the Lake.

9. The Red Hill Tank bank retirement is in progress and will progress simultaneously with the other Tank, which is in the hands of the same Contractor

Contractors about 5000 piling feet of foundation for the revetment have been dug, and 1000 feet laid in two or three courses of stones. It is anticipated that this Sink bank, also, will be raised to such a height above the level the water stands in the monsoon, as to cause no delay in further progress during the next year.

10. I include a comparative statement of work done and work estimated for to date.

Name of work	Amount done	Value	Work estimated	Value
Ancient Acrop Patellier river	Materials collected and foundation built	Rs 22,000		Rs 30,710
Channel to Ch. Laveram Lake	Earthwork 182,000 Cubic Yards	22,822	Earthwork 6,38,000 Cubic Yards	122,055
Cholaveram Lake	Earthwork 66,120 Cubic Yards besides revetment work	10,322	Earthwork 2,85,000 Cubic Yards revetment work	1,38,752
Channel to Red Hill Lake	Earthwork 107,716 Cubic Yards besides revetment	23,816	Earthwork 2,69,000 Cubic Yards revetment work	65,964
Compensation for land		20,600		53,140
Materials and Contingencies		4,580		25,772
Total Rs.	124,110		Total Rs. 4,65,793 Add other items	1,45,966
			Total Est. Rupees	6,11,759

* Item No. 4.

It will be seen that Rs 1,24,110 represent the value of work done to date, which has been disbursed with the exception of about Rs 14,000 due to contractors, and as the allotment for this year amounts to 3 lacs of Rupees a fair proportion of the authorized outlay for the year 1867/68 has already been incurred. There seems to be a discrepancy as to the amount of work done and its value, in the Red Hill Channel section, concerning which I will call for more information from the Executive Engineer. It may happen that the excessive hardness of the soil here met with, may lead to some increase over the estimated rates, which appear totally inadequate.

11. I would now briefly make a few remarks on the sanctioned plans of the works, and note in detail the alterations which I suggest should be made.

12. The Ancient acrop the Patellier River, as carried out by Captain Magnay, consists of a solid foundation wall 3 or 4 feet high resting on masonry wells filled in concrete. The retaining wall, also, has a foundation on wells, and the intermediate and

advanced

advanced apron will consist of closely packed stone laid in mortar. The body wall of the Dam will also be built of solid squared blocks of laterite stone set in mortar, the upstream face to be sloped off, the downstream face to be perpendicular. The original site chosen has not been exactly adhered to, but this change has been advantageous, as the section of the River at the Anicut, where now built, shows compact clay with a thinner stratum of sand above, than at the spot fixed on by Mr. Fraser. I think Captain Magnay has fixed the level of the top of foundation of Anicut one foot too high, but as he states that all the wells are sunk from $8\frac{1}{2}$ to 11 feet down ^{to} the clay, this is not of so much consequence.

13. The Anicut was 600 feet long, designed with a crest 6' 8" above the bed of the River and of a curved form, the outer casing composed of large blocks of laterite closely set in chumam, and the body or core and foundation of concrete sunk to the clay, the interior being filled in with layers of earth (which I presume meant clay mixed with gravel well rammed, and mixed with water. This concrete wall was

to be sunk, six feet wide, through 12 feet of sand to the clay, the upper five feet being faced with stone, and a pear wall at the toe of the slope was to be sunk in the same way, but below the laterite flooring of the Anicut. It would have been extremely difficult, with the means and time at our disposal, to have carried out a work of this kind. The provision, also, for baling would have been inadequate. The wing, though 19 feet high, average only 3' thick, which I think insufficient, and the wings at the front apron are built on the apron itself without any foundation. The interior core or bed of clay and gravel would have been laid with difficulty, for it was to be sunk 12 feet in front and pear, below the bed of the River.

14. The head piece for the supply channel has abutments $3\frac{1}{2}$ and piers $2\frac{1}{2}$ feet in thickness, which are reduced to $1\frac{1}{2}$ feet by the grooves made in them for the shutters. The wings are 15 feet high, averaging $2\frac{1}{2}$ thickness. The foundations are only three feet deep, and as there will be a great

velocity

velocity through each of the 10 vents, with a head of water of 10 feet, when the River is in flood, I think these dimensions are too slight. The roadway is only 6 feet wide, and as a road will most probably be formed hereafter along the banks of the channel from the Bellare Spunk Road to the Aqueduct, I would suggest that the sluice roadway be widened to 10 feet, the same as in the Cart Bridges provided for in the estimate.

15. At the diversion of the Booythal surplus into this channel, the intermediate drainage from the proposed dam to the channel is to be carried into the Fortellian River by a tunnel of one Arch, 12' wide, springing from the bed. It is doubtful whether this will be sufficient for the drainage of $1\frac{1}{2}$ miles of surplus, but in any case, as this tunnel is 157 feet in length, it will be better, as suggested by yourself when you saw the work, to have a centre pier and 2 Arches, thus saving much expense and trouble in the cost and execution of Centerings.

16. The Caluigulah of the Cholaveram Lake is to be built three feet

60
feet below the natural level of the ground, the soil being excavated for 3 feet in depth in front of the work. It would be better, I think, to place the Caluigulah on the natural and higher level nearer the extremity of the bund, especially as the soil will probably be found to be hard laterite rock.

17. The Cart Bridges are 14.5 feet span of laterite in Chinnam. I do not believe it is safe to build Arches of this size of this material. I have never found this material answer for this purpose after some years experience in its use, and I am aware that the Arches of bridges built of laterite on the South Western Railway have had to be taken down. The design proposed of carrying the segmental Arch 10 feet below the natural level of the ground that is building 12 feet of Arch as a foundation, with a front supporting wall 15 feet in depth or 5 feet below the average bed of Canal, would be a very difficult one to carry out and the cost of bulking and other incidental expenses do not appear to have been sufficiently provided for in the

the Estimate, I would use brick Arches. Wooden truss bridges are proposed, but they are not so durable. They would suit better for the Madras Bridges of this project, where the spans are much less, and a double Queen post truss, with double longitudinal pieces, would be a simpler mode of construction than that shown in the plans.

18. Captain Magnay proposes to build the under tunnels in the old prevailing form, with the foundations laid horizontal to save expense. The sanctioned designs allow of their being built in a curve, the Arches, upper and lower, being 98 and 120 feet long respectively.

19. The head sluice for the Red Hill Supply Channel has, as the other, ten vents of 5' in width, with piers $5\frac{1}{2}$ ' high and $1\frac{1}{2}$ ' thick. These Piers are carried up to 27 feet of a diminished thickness. The wings are 17' 6" high, and average 3' thick. The foundation for this work is 4 feet deep and the flooring is left. Considering that there is a head of water of 18 feet on this sluice when

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the Tank is full, that the vents are 8 by 5', that the rear apron and wings come to a point at 10 feet distance, from 2 to 50 feet, and that the velocity generated when discharging is 27 feet per second, sufficient to fill the Red Hill Tank in 15 hours with a Capacity of 20 millions of Cubic Yards the Pholavaram Lake being kept full, I think the entire work too slight.

20. The new sluice for irrigation, I consider, has the same fault. In the measuring of the wings, averaging 30' high and 5' thick, rests on 3 feet of foundation.

21. The sluices are to be worked by a rack and pinion attached to the shutter handles, at a height of from 18 to 27 feet above the floor of the vents. With 18 feet head of water, it will be very difficult to rise these sluices, but the experiment can be made.

22. The Red Hill Channel has a fall of 3 feet per mile and the bed is 30 feet wide with side slopes of $1\frac{1}{2}$ to 1. With a depth of 6 feet of water in the channel, the velocity

will

will rise $4\frac{1}{2}$ feet per second, and may produce a scour, excepting where the soil is of laterite. Notwithstanding the fall, the water in the Red Hill Lake, when it is full, will stand back 2 feet in height on the slope of the Chelavara and Lake.

23. The Calingula of the Red Hill Lake is to be built with its sill sunk 6 feet below the natural bed, the sub being cut out for 15 feet in breadth in front of the work. - I think this a bad arrangement, and that it would be better to shift the Calingula to higher ground, on the natural level, as the soil is hard laterite rock. There is no advantage gained by having such a fall in front of the Calingula, and as the foundation is composed of hard laterite rock, there is no necessity for introducing concrete as proposed in the designs for the work.

24. - In making the above remarks and suggestions, on the sanctioned designs for the Madras Water project, for the orders of Government, I have not done so in any captious spirit, as I am fully sensible.

sensible of the labour, care, and accuracy, displayed by Mr Fraser in the preparation of this Red Hill Lake water scheme. I have thrown out my suggestions, under the belief that they are worthy of consideration, and with a view, in the adoption of any of the modifications here proposed, of saving Government from any possible loss or unnecessary outlay hereafter. -

I have the honor to be
Sir
Your most obedt Servant
Rear Lieut Col. M.
Agst. Sup. Engineer & Secy.

PROCEEDINGS of the MADRAS GOVERNMENT

Under date the 10th Sept 1867.

Read the following

Supg Engineer L^d to

(Here enter No. 2, dated 2nd Aug 1867.)

From the Acting

In this letter the Acting Supg. Engineer of the Division reports the result of his inspection of the works in progress on the Madras Water Supply Project, and offers some remarks upon the deviations from the original designs which he considers expedient or which have been necessarily made in constructing the Aqueduct across the Corbelliar and some of the minor works.

The Government are

Copy

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10. 4. 1867. Deputy
Commissioner of the
Madras District.

The Deputy Engineer
at Madras.

To
The Deputy Engineer
at Madras.

Dated 2nd August 1867.

C. 2190.

Report of the
Deputy Engineer of the
Madras District, on the
works in progress on the
Madras Water Supply Project,
and offers some remarks upon
the deviations from the
original designs which he
considers expedient or
which have been necessarily
made in constructing the
Aqueduct across the
Corbelliar and some of
the minor works.

10. 4. 1867.

10. 4. 1867.

are much pleased to learn that satisfactory progress is being made, and they consider that the change which is described as having been effected in the position and sectional construction of the Aqueduct is judicious, and that the substitution of two six feet outlets for the drainage near the diversion of the Boosy Kal for the one vent of twelve feet originally planned for the escape of that drainage is an improvement as facilitating construction.

The Govt. agree with Colonel Beau in thinking the depths designed

These seem to me to be important matters. Should the Government be advised to increase the depth of the outlet or of the main drainage? I have no experience of such a work. Would it not be better to divide the line of communication into two? I will leave it to the Engineer.

W.D.

designed to be given to the foundations of the head sluice on the flank of the Aqueduct, and the thickness of its wing walls as well as of those of the Aqueduct are very slight, and they authorize the dimensions to be increased to such an extent as Captain ^{in communication with the Deputy Secy, &c.} Magnay with the experience that he possesses of similar works, ^{as well as} with reference to the nature of the soil may think advisable. The width of the roadway over the sluice may with advantage be increased to ten feet. If like of the very best description for bridge purposes can

not.

not be obtained, it will be advisable to build the large spans of 45 feet of brick, or to substitute timber platforms for the arches, adopting in either case such modification of the form of the abutments as may, in the opinion of the Super. Engineer, be most suitable, and admit of their being constructed without the enormous labor and cost of baling which the construction of abutments built in the manner described by Mr. Fraser would entail.

The proposed alteration in the mode of building the under-tunnels may be carried out, and the remarks above

P. W. 186 . Department.

No.

PROCEEDINGS OF GOVERNMENT.

Dated

110
above made with regard to the head sluice at the aicut will apply to the other two head sluices as well as all the irrigation sluices, the foundations and wing walls of which should be built in the most secure and permanent manner possible without reference to any defects of original design.

The Govt. Trust that the Super. Engineer will take care to have the works pushed on with the utmost possible rapidity, and that he will not allow any more questions of detail to interrupt progress

I would omit this
JF
WY

9th The Super. Engr & Secy
Controller

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23/9/67

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Pub. Works by Report

Proc. of Govt. for September

Ch 2783

Proc. of the Madras Govt.

10th September 1867

Passing orders on a
letter from the Supg. Engr.
of the 4th Division
reporting the result of his
inspection of the works in
progress on the Madras
Water Supply Project.

Ch 213-214