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TAMIL NADU ARCHIVES

GOVERNMENT OF TAMIL NADU

J. W DEPARTMENT

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V. S. M.

Not to be folded or roughly handled

Immediate
856W

From Major J. PENNYQUICK, R.E., District Engineer, Salem, to the Chief Engineer for Irrigation, dated Salem, 16th May 1878, No. 19 S.L.

I HAVE the honor to forward a memorandum on the subject of the Periar Project, which I shall feel much obliged by your submitting to Government with any remarks you may think proper.

2. As I believe you are aware I have been intending to send up this memorandum for some time past, but delayed doing so, partly on account of press of work, and partly to complete some inquiries on the subject of the manufacture of Portland cement.

MEMORANDUM.

At a time when the prevention and mitigation of famines in India is occupying so much attention as at present, it may be considered as not out of place to draw attention to a work which gives promise of being highly remunerative in ordinary years, and of being of immense benefit to a large and important district, while as a protection against famine it may safely be said to be unrivalled by any work constructed or proposed in the Madras Presidency since the execution of the great delta systems of irrigation.

2. I allude of course to the Periar Project.

3. What gives this work its great superiority, as a preventive of famine over ordinary irrigation works, is that its water-supply is drawn from a country under different climatic conditions from that which it is to irrigate, and that the former will be unaffected by the drought of the latter. Ordinary irrigation works which merely store and utilize local supplies are affected by the same causes which affect the tracts which they supply, and consequently may fail at the time they are most needed. The larger the area from which the supply is drawn, the less of course is the latter affected by local conditions; but in all cases, except those of the great rivers, whose number is unfortunately limited, there is risk of failure, partial or total, at the time water is most wanted.

4. No competent judge would allow this one defect, or rather imperfection, to weigh against the numerous benefits derived from irrigation works even of the smallest class, but it does exist, and its absence in the case of any particular work stamps that work as one of a limited class of the very highest excellence.

5. The water-supply of the Periar is drawn from a tract not merely distant from the plains of Madura where it is to be used, but different in its climatic condition; the former may be parched and dry from failure of successive monsoons, but no one has ever heard of the hills of the Western Ghats being deprived of rain, or of the streams which flow through Travancore being dried up. If these works had been in operation during the last two years, they would have produced food to the value of more than two millions of Rupees, and it is difficult to over-estimate the difference they would have made in the condition of the Madura District.

6. How valuable soever a work may be as a protection against famine, it may not be desirable to undertake it unless it is in ordinary years at least sufficiently remunerative to ensure the State against loss from its construction. The particular work in question is estimated to produce a revenue, after providing for the monstrous payment of Rupees 75,000 annually (a capital of fifteen lakhs of Rupees for some twelve square miles of uncultivated jungle) to the Travancore Government, of not less than eight per cent. on its cost, and if this could be ensured, it is hardly conceivable that there should be any hesitation as to carrying it out.

7. The question of revenue has been so carefully and thoroughly examined that there is hardly room for doubt concerning it; indeed I am not aware that any has ever been expressed, and the only point on which any doubt exists is, whether the works can be constructed for the sum at which they are estimated.

8. As regards a considerable portion of the estimated cost, all, that is, which relates to the works of distribution, there is not, nor can be, any doubt; these works are of an ordinary character, their cost is susceptible of accurate calculation, and they have been planned in detail, probably in fuller detail than any previous work of a similar kind, by one of the most careful and experienced officers in the Department, the late Mr. Smith.

5 1/2

9. The only doubt is with reference to the head-works, and with regard to these it will probably be admitted that the only serious doubt has reference to the construction of the main dam; it is with special reference to this point that this memorandum is written.

10. The project was first seriously taken up by the late Major Ryves, and he satisfied himself that the cost of a masonry dam so far exceeded that of an earthen one as to be prohibitory of the former; an opinion, it may be added, which, if the work were carried out as originally proposed by him, would be unquestionably correct.

11. All the officers who have subsequently dealt with the project have worked more or less on Major Ryves' lines, and though the difference between the project in its latest form and that originally drawn up by him is considerable, the deviations have been gradual, and the great earthen dam has always remained part of the scheme.

12. As finally worked out by Mr. Smith and submitted to Government in 1875, the project included a dam a hundred and seventy feet in height, to sustain a maximum depth of water of a hundred and fifty-five feet; this dam was to be constructed by means of the silting process introduced by the late Mr. Melvor, which not only greatly reduces the cost of earthwork, but also improves its quality, to an extent which in the opinion of two successive Chief Engineers for Irrigation as well as of Mr. Smith himself, removed the objection which might otherwise have been felt to the construction of an earthen dam of the unprecedented height above mentioned.

13. The late Chief Engineer, Major-General Walker, took a different view, and while admitting the generally valuable qualities of earthwork executed by the silting process, considered

* Something was also said about the difficulty of closing the tunnel, but General Walker would probably have been the first to acknowledge, if he had had occasion to consider the point practically, that this difficulty had been very much over-estimated, and was in reality a very small matter.

that sufficient experience had not been gained concerning it to justify our trusting to it for a work of such magnitude as the one in question, so that the Periar dam would really be a gigantic experiment carried out under somewhat unfavorable conditions.

14. Holding these views, General Walker declined to recommend the project for execution, and his opinion was adopted by the Madras Government; there has I believe been some slight further correspondence and discussion on the subject, but nothing practical has come of it.

15. It is not proposed here to discuss the question regarding which this difference of opinion has arisen; personally I agree with those officers who think that the dam could be safely constructed in the manner proposed by Mr. Smith (whether his estimate is sufficient is another question), but no one in his senses will deny that there is an element of risk and uncertainty in the matter, and if that element can be entirely removed by the adoption of a different mode of construction without involving any expense above the estimate already made, the only cause which justifies the postponement of the work will be removed at the same time.

16. It has already been stated that Major Ryves' opinion as to the excessive cost of a masonry dam as compared with an earthen one would be perfectly correct if the work had been carried out as originally contemplated by him.

17. Subsequent inquiry showed that this was not possible, and various subsidiary arrangements had to be made, notably as regards provision for the discharge of water during the construction of the work, which added so much to the cost of the earthwork as to render it doubtful whether a masonry dam would not be actually cheaper than of earth.

18. This point was never so far as I know seriously considered until 1875, when I submitted a note on the subject containing a rough estimate of the cost of a dam partly of

† It may be worthwhile to note here that I think both Colonel Mallins and Mr. Smith were mistaken in their expectation that a great reduction in the cost of tunnelling would be made by the use of machinery. The benefit of rock boring machinery is in the saving of time; tunnelling by its use is distinctly more costly than tunnelling by hand even when the cheapest possible motor, water with a great head, is available. I have gone into this subject with some care, and believe that Mr. Smith's rate of ten Rupees per cubic yard, though it was rather a guess, will very fairly represent the actual cost of such work for the large tunnel.

masonry and partly of concrete, a construction which was (rightly) objected to on the score of risk of unequal settlement. Since that time I have studied the subject, and others connected with it, more deeply, and am now prepared to assert positively and with perfect confidence that a dam of rubble masonry with Portland cement (locally made of course) can be constructed at a cost certainly less than that allowed by Mr. Smith for an earthen dam,† all subsidiary works included. With ordinary

surki mortar it could be constructed for a still smaller sum.

19. A dam entirely of concrete, which for many reasons I consider a still better arrangement, will be somewhat cheaper than one of masonry. The objection of unequal settlement, the force of which I quite admit as against a combination of masonry and concrete, does not apply to a structure entirely of concrete, and there is good reason to believe that well-made concrete is actually stronger than rubble masonry of the same materials.

20. To prevent misunderstanding I think it as well to note that I am not now contemplating the execution of the masonry by the process, a rough sketch of which was shown by me to the Chief Engineer for Irrigation in 1875. I believe that a considerable reduction in cost

might be made by the adoption of this process, but the statement in paragraph 18 refers to masonry constructed in the ordinary manner "with stones not too large to be conveniently handled" and with no special reduction in the amount of labor on account of the convenience of working on a large mass, or the careful and incessant supervision that will be available.

21. It is not now proposed to go in detail into the proof of the correctness of the above statement; to do this would involve a careful and minute examination into many distinct questions and would lengthen out this paper and occupy my own time to an extent which would not be desirable unless I knew that there was a prospect of some practical result therefrom. For the present it is enough to say that the conclusion at which I have arrived is the result of a most careful and thorough consideration of the subject from every point of view, and of every detail connected therewith, and that I am confident of being able, if called upon to do so, to establish it to the satisfaction of any competent authority.

(Signed) J. PENNYQUICK, Major, R.E.,
District Engineer, Salem.

SALEM.
16th May 1878.

Print as P. H. D.
(Memorandum by)
For Orders. C. E. - P. H. D.
850 / P. 9
3

As the Department
will soon it is to be
hoped settle down after
its last reorganization
it appears desirable
that steps should be
taken to try and place
such projects as may be
considered to be specially
suited for famine purposes
in such a forward con-
dition that they may
be sanctioned for execu-
tion whenever the
necessity arises.

I approve the proposed
Exp. L. Pl. this
L. B.

1/11 29/3

2. There are several
projects of a more or

less promising character
which if now taken up
with this view could
be completed and passed
within a reasonable
time - well it may
be hoped in advance
of any actual necessity
arising from famine.
Some of these may also
prove to be so remun-
erative or so thoroughly
protective in character
as to admit of them
being taken in hand
even before such a
contingency arises under
the sanction of the Govt.

of

P 10 850^W

of India whose policy in
regard to the Famine
Insurance fund has all
along been so distinctly
proclaimed.

3. Among such works
in this Presidency few
apparently commanded
so much attention as
the Perryour Project
which forms the subject
of the annexed note
by Major Pennycuik
and the history of which
is so well known that
I need not say anything
on the subject here.

4. All that need here

he said about it is,
that notwithstanding
its remunerative character
and its special suit-
-ability as a work for
Famine protection
the project is not
now in a condition
to admit of Government
sanctioning its execu-
-tion were famine to
occur.

1st. The Travaux
Co^{rs} make the extra-
ordinarily heavy demand
of Rs 75,000 per annum
as rent for the reservoir
site and,

2nd

P 11 856

2nd Some of the most
important points con-
-nected with the con-
-structive features
of the design remain
unsettled.

5. The last official
communications on the
subject of this project
left all in a state of

* Despatch to the Secy. of State
No. 1 of 1877 dated 23rd Jan'y.
obeyance. This Govt.
recommended the depu-
-tation of Major Pennington
to obtain special informa-
-tion regarding dams
carried out under
exceptional conditions
in Europe and America,
but

* Despatch from the Secy. of
State No. 4 of 1877, dated
29th March.

P12 856
6
but the proposal was
negatived as "full and
reliable data for the
project" were not then
available and as the
Gov^t was not in a
position to undertake
it.

b. Judging from the
tenor of this corres-
-pondence it may be
inferred that further
investigations connected
with the project were
considered indispensable
but it is doubtful
whether Her Majesty's
Secretary of State

thought the definition
of an officer necessary.

It seems clear also from
a previous reply by the
Gov. of India that they
were averse to any reference
being made to experienced
authorities outside of
India.

7. Major Pennycook
it appears submitted
a memo. to the Chief
Engineer for Irrigation
in connection with
this work on 16th May
1878 but as this was
never disposed of he
has again brought up
the subject in an
office

Letter from Gov. of India
No. 560 A dated 28th March
1876.

Letter from District
Eng. Salem No. 19 S.L.

5
173
office note dated 5th March
1880 (herewith).

8. The reasons for not
taking any action
on the memo. of the
16th May 1878 are not
recorded but whatever
they may have been
these two communica-
tions should I think
now be considered
by Col. Mullins.

9. It is needless for
me at this stage to
enter on any profes-
sional criticism of
the project in its
present condition.

though I may at once
say I entirely share
the adverse views in
regard to an earthen
embankment already
expressed by General
Walker, supported as
they are by the opinion
of Major Tulloch in
his Bombay Water
supply report and by
my own experience in
India and Australia.
Indeed there is nothing
in the correspondence
to show that Colonel
Mullins would not
himself thoroughly

* para 5 of his note printed
with L. O. 30 April 1875
No 1193.

* Chapter III of his report
of 1872.

* The late Mr. Smith's
estimate was. Rs 26,43,000
(for head works)

Major Pennycook's
present rough estimate - 22,00,000 10.
on which Rs 40,000 more
might be saved if water
transport were used from
mouth of cutting to site
of main dam.

856
approve of Major
Pennycook's proposed
substitution of a simple
concrete bund by which
he hopes on the whole
to save some $2\frac{1}{2}$ or 5
lakhs of Rupees.

Should the Govt.
approve of the suggestions
made above I would
therefore urge the
desirability of the
Chief Engineer for Irrigation
being requested to state,

1st What are the prospects &
in his branch now
sufficiently matured for
sanction to allow of
their being at once

put in hand on the
occurrence of famine.

2nd Those which being
now in various stages
of advancement can be
completed for sanction
and the arrangements
he would propose with
this object.

3rd What he would now
propose to do in reference
to Major Penryne's R's
two memor on the subject
of the Penryne Project.

W. H. Stanley

H. R. R.

Leary, to Gov. P. H. D.

P. S. The present time

would

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856W

would appear very
suitable for initiating
and carrying through
such negotiations as
may be required in
regard to the unwarrant-
ably heavy demand
made by Travancore
for the use of the site,
and which might be
pressed greatly to the
disadvantage of this
Govt. if at any time
they were compelled
by the near approach
of famine to enter
hurriedly on the
undertaking.

List from
archives

856 W 45th April 1880.
P. H. D. B. & R. Smith

Proc. of the Madras Raseement

Read the following

Memorandum by the Chief Engr. P. H. D.
dated 26th March 1880.

The above memorandum
with the papers accom-
panying it will be
communicated to the
Chief Engineer for Bri-
gation, who will be
requested to report as
soon as possible upon
the three points, and
especially the third,
mentioned in paragraph

2. The memorandum
will also be communi-
cated to the Political
Department with
reference to the remarks
contained in the
postscript.

Att

4/6/80

Ch. E. J. with 3 enclosures
Political Dept.
Ch. E. J. P. H. D.
Major John Pennington R.E.
S.E. 3rd Div. 7 38

856w
10

Am. W. Middleton
Mrs. Grace the Queen

1000

8560
3

Paint

5/11

Govt. of 1880 *Madras*
PUBLIC WORKS.

To

Dated

Issued

Recd.

Encl.

O. O. 6 April 1880, No. 886 W

Nos. 12-13

Projects specially suited
for famine purposes

Memorandum by the Ch Engr
P. & Dept. recommending
the advisability of placing
such ~~in~~ in such a form
condition as will admit of
them being sanctioned for
execution whenever the
necessity arises, ~~and~~ to
the Ch Engr for Engr for
report.

$\frac{49}{4}$