

(1) Number of pages_____

(2) Date of repair_____

(3) Initials of the Referencer_____

MADRAS RECORD OFFICE

Government of Madras

Public works DEPARTMENT.

G.O. No.	123-(9)	Press
B.P. No.		Mis.
243-244		
Dated	19-1-1874	195.

Not to be folded or roughly handled

No. 243. Read the following endorsement of the Chief Engineer for Irrigation,
dated Pudukottai, 20th November 1873, No. 816:—

From Captain J. W. PENNYCHICK, R.E., District Engineer, North Arcot, to
Lieutenant-Colonel J. MULLINS, R.E., Chief Engineer for Irrigation,
dated Vellore, 11th October 1873, No. 2,242.

In reference to G. O., No. 1,275, of 6th May last, I have the honour to submit
the following report on the work done to
Cauverypauk Tank up to the 1st instant.

- 1 Longitudinal section.
- 1 Plan of large slip at the north of Lion sluice.
- 1 Do. do. showing work executed.
- 1 Book containing sections of the bund.

2. There were four points at which
the bund had slipped more or less, and
all these have been attended to.

3. The most important slip was the southernmost, close to the "Lion" sluice.
4. At this point there was considerable leakage, and the whole of the rear
slope of the bund had slipped outwards to such an extent as to force up the sur-
face of the road, which runs along the foot of the bund.

5. Some attempt was first made to stop this action by adding more earth to
the rear slope of the bund, but this earth sunk down as soon as it was deposited,
and the only effect of the addition was to increase the weight of the bund and
consequently the slipping.

6. The whole of the rear slope of the bund was cut away, and the surface on
which the slipping took place was
exposed. It was found that there was
in the bund a hollow nearly rectangular
in plan* with its longer side running
parallel with the line of the bund and its bottom about 46 feet below the top of
the bund.

7. A plan and section of this hollow are given on drawing No. 3.
8. At first the slipping was all towards the road, which had to bear, as a revet-
ment, the whole pressure of the bank above it, and whose surface was constantly
forced upwards by this pressure; but when, by the removal in horizontal layers of
the earth forming the rear slope of the bund, this pressure was diminished, the
slipping took place on both slopes of the hollow and towards its centre, so that the
movement was either towards or from the road, according as during the progress
of the work the weight of earth was slightly greater on one side than on the other.

9. This action was very remarkable as the excavation approached the bottom
of the hollow and showed the absolute want of cohesion between the surface of
the hollow and the earth with which it had been filled.

10. The surface was quite smooth and polished, and for a depth of 3 inches
was almost as hard as rock.

11. There is a good deal of room for doubt as to the cause of this hollow; I
was disposed at first to think that there must have been an old well or "goonta"
at the foot of the bund, which had not been properly filled in, and that this had
caused the subsidence, but no trace of anything of the kind is to be found, and the
true explanation is probably that suggested in your memorandum, No. 534, of 21st
August, namely, that the hollow was produced by the scour due to an old sluice,
and this supposition is strengthened by the fact that a quantity of loose stone which
apparently formed part of a sluice was found in the bund while the excavation was
in progress; about 60 cubic yards of stone were thus removed from the bund.

12. As soon as the whole area of the hollow had been exposed, the surface was cut away and the bank reformed with the new earth slipped carefully over the old work and laid in layers 6 inches thick with a slope towards the bund. The greatest care was taken in this work, and I have little doubt it has been thoroughly and securely done.

13. Only a single section of the hollow was taken, as it was important that the bund should be reformed without delay; but this section, with the plan, shows clearly enough the nature of the slip. Simultaneously with the removal of the earth at the back of the bund a shaft was sunk along the centre, and a puddle core 8 feet thick inserted. This puddle core was carried down to 29 feet below the top of the bund into a stratum of good solid clay.

14. Planking was used to protect the sides of about half the length of the excavation, which were made vertical; for the remainder, the soil being firm, the sides were given a slope of one half to one, and no planking was used, except for a few feet at the bottom.

15. There was at first some little difficulty in getting labourers to work in the shafts, owing to the novelty of the work, but this difficulty was very soon overcome, and no accident, even of the most trifling kind, has occurred from first to last. In working immediately in front of the slip, great care was necessary, owing to the constant movement that was taking place in the earth at the back of the trench.

16. The clay for the puddle was at first obtained from the fields close at hand, but only a small supply was then obtainable and afterwards it was taken from the tankbed, laid bare by the fall of the water, about a mile from the work to which it was brought by rafts.

17. A longitudinal drain of loose stone, 2 feet square, was built along the bottom of the puddle wall, and six transverse drains carried from it to the further side of the road, to carry off any leakage that might take place.

18. On the occasion of my last inspection (on the 27th September) the water was only about 8 feet above the lowest level reached during the season, and there had not been time for any defects in the work to declare themselves; since then we have had constant rain, and by a report from the Range Officer received yesterday, I learn that the water has now risen to within 6 inches of full tank level, but that there is no sign of slipping or leakage, and that the new earth has merely settled 6 inches in the centre.

19. A plan and sections of the work done in connection with this slip are given on drawing No. 2.

20. The remaining slips were of a much slighter nature and were caused merely by leakage.

21. The second was a little to the north of the first slip and has been included in the work done for the correction of the latter.

22. The third and fourth slips have been treated by cutting into the rear slope of the bund, and inserting longitudinal and cross drains similar to those put in behind the puddle wall of the first slip; at No. 3 the length of the longitudinal drain is 84 feet, and at No. 4 eighty feet, with two cross drains to each.

23. The soil with which the rear slope of No. 3 slip was made up not being very good, this slope was gravelled, but the gravel does not stand well, and is a good deal gullied by rain; it will therefore be removed and the slopes turfed.

24. The top of the bund throughout is full of cracks and is formed of a somewhat porous soil, which admits a good deal of water during heavy rain. This has been removed over nearly the whole length of the bund to a depth of about a yard, and the cracks as far as possible filled in and well rammed with good soil. It is hoped that this and the gravelling of the top of the bund which is to be done will prevent surface percolation, and that it will not be found necessary to undertake the serious work of inserting a puddle core or facing to any considerable portion of the bund; on this point, however, I cannot at present express any decided opinion.

25. The upper portion of the bund down to the level of the top of the revetment has been levelled and sectioned where necessary, so as to bring it to an uniform level of 8 feet above full tank level. The total length of bund so treated is 3,770 yards.

26. The rear slope, which is now visible, the surface having been cleared, has a somewhat ragged appearance, but the mass of earth is amply sufficient for stability, and I do not therefore propose to incur any expense in sectioning this portion of the bund.

27. The revetment has been pulled down and re-constructed where necessary; in some few places this has had to be done from top to bottom, but in many others it has been found that there has been a slight sinking of the earth at the back of the revetment, and that the latter has fallen in for a greater or less height, and the injured portion only has been touched. In all cases the reconstructed revetment has been given a good backing of small stones and gravel. It has never been found necessary to remove so great a length of revetment as to render it worthwhile to insert a puddle facing behind it, as suggested in your memorandum, No. 534, of 21st August. The total length of revetment that has been treated already is 567 yards, and the quantity of stonework done is 4,089 cubic yards, a little more remaining to be done.

28. All the new slopes formed by the sectioning of the bund, filling up slips, etc., will have to be turfed; 13,820 square yards have already been done, but a good deal more remains.

29. The total quantity of earthwork done is 59,501 cubic yards, of which 26,000 belong to the principal slip. The earth here had to be carried across the road to the fields 70 yards off and brought back again.

30. The total quantity of puddle done is 4,768 cubic yards.

31. The two calingulahs have been thoroughly repaired; these repairs however were not of a very important description.

32. The clearing of the bund has been very nearly completed; this work is being done under the orders of the Head Assistant Collector, by whom it was begun, and whom I requested, on receipt of G. O., No. 1,671, of 26th June 1873, to continue it; it has been very well and thoroughly done, and, as far as I can judge at present, very cheaply.

33. The total expenditure up to the end of September was Rupees 19,832, to this must be added Rupees 2,529 advanced to the Head Assistant for the clearing of the bund, and about Rupees 2,500 due to coolies, etc., but not paid.

*Proceedings of the Madras Government, Public Works Department,
19th January 1874.*

34. I regret that I cannot at present give any opinion as to the ultimate cost of the work to be done. This will depend entirely upon whether it is found necessary to do any more puddling or not, and upon this point it is not possible to form an opinion until it has been seen what is the behaviour of the bund during the present monsoon.

35. If no more puddling is required, the additional work to be done will be the gravelling of the top of the bund, the turfing of the slopes where necessary, a small quantity of earthwork and revetment, and improvements to the heads of the sluices.

36. As far as I can judge at present, about Rupees 50,000 will in this case cover the whole cost.

37. If more puddling is wanted, the expense will be increased by something like Rupees 30 to Rupees 35 per running yard.

38. I desire, in conclusion, to bring to notice the excellent manner in which this work has been superintended by Mr. Supervisor Stephens, who was in charge of it up to the 10th ultimo, when he had to be removed to take charge of the Vellore Range.

39. There were at one time nearly 2,000 people employed, and notwithstanding the novel and to some extent dangerous nature of part of the work, no accident of any kind has happened, and I have heard of no disputes with either work-people or ryots.

40. Mr. Stephen's pay and allowances during the five months that he was on the work amount to something like Rupees 1,100, and I have not the slightest doubt that ten times that sum has been saved by his constant presence. If the economy of sufficient supervision were a matter that admitted of argument, this work would be an useful example in its favour.

41. I request that the plans and sections may be returned when no longer required.

SUBMITTED for the information of Government, with reference to Government Order of the 6th May 1873, No. 1,275.

2. The work done at this important tank* to place it in a safe state appears to

have been well carried out; and though, as the District Engineer mentions, it

was too early when his report was written to speak confidently of the result of the large expenditure, amounting to nearly Rupees 25,000, which has been incurred, it is satisfactory to find that the tank water had risen to 6 inches below full level without any sign of weakness being shown.

3. It will be observed that Captain Pennycuick speaks highly of Mr. Supervisor Stephen's management of the work.

(Signed) J. MULLINS, Lieut.-Colonel, R.E.,
Chief Engineer for Irrigation.

No. 244. ORDER THEREON, 19th January 1874, No. 123.

IRRIGATION, No. 24.

His Excellency the Governor in Council has read with interest Captain Pennycuick's clear report of the exten-

*Proceedings of the Madras Government, Public Works Department,
19th January 1874.*

sive, and in some respects difficult, work which has been carried out at the Cauverypauk Tank to stop the leakage and restore the portions of the bund which slipped during the heavy monsoon of 1872, and the satisfactory manner in which Mr. Stephens, the Supervisor in immediate charge, has superintended the work is noticed with satisfaction.

The Government will be glad to receive a further report after the close of the monsoon, by which time the result of the work done will be more fully appreciable.

(True Extract.)

Colonel, R.E.,
Secretary to Government.

To the Chief Engineer for Irrigation.
,, District Engineer, North Arcot.

J. P. C. Clerk.
Spare Copies

North Arcot.
District Engineer's Office
Vellore 11th October 1873.

From
The District Engineer
North Arcot.

To
The Chief Engineer
for Irrigation.

Encls = 4.

1 Longitudinal
section 3

1 Plan of large slip
to the south of
Lion Sluice

1 Do. showing
such & associated

1 Book containing
section of
the bund

With reference to G.O. No 1275 of

6th May last, I have the honor to submit the
following Report on the work done to Causing
further work up to the 1st instant.

2. There were four points at which
the bund had slipped more or less, and all
these have been attended to.

3. The most important slip was the
southernmost, close to the "Lion" Sluice.

4. At this point there was considerable
leakage, and the whole of the rear slope of the
bund had slipped outwards, to such an extent
as to force up the surface of the road, which
runs along the foot of the bund.

5. Some attempt was first made to stop
this

this action by adding more earth to the rear slope of the bund, but this earth sunk down as soon as it was deposited, and the only effect of the addition was to increase the weight of the bund and consequently the slipping.

6. The whole of the rear slope of the bund was cut away, and the surface on which the slipping took place was exposed. It was found that there was in the bund a hollow, ^{* I called this hollow elliptical in a former report, but it is really a rectangle with the corners rounded off} nearly rectangular in plan with its longer side running parallel with the line of the bund, and its bottom about 46 feet below the top of the bund.

7. A plan and section of this hollow are given on drawing No. 3.

8. At first the slipping was all towards the road, which had to bear, as a pivot point, the whole pressure of the bank above it, and whose surface was constantly forced upwards by this pressure; but when, by the removal of horizontal layers of the earth forming the rear slope of the bund, this pressure was diminished, the slipping took place on both slopes of the hollow, and towards its centre, so that the movement

movement was either forwards or from the road, according as during the progress of the work, the weight of earth was slightly greater on one side than on the other.

9. This action was very remarkable, as the excavation approached the bottom of the hollow, and showed the absolute point of cohesion between the surface of the hollow, and the earth with which it had been filled.

10. The surface was quite smooth and polished, and for a depth of 3 inches was as hard as rock.

11. There is a good deal of room for doubt as to the cause of this hollow; I was disposed at first to think, that there must have been an old well or "goonda" at the foot of the bund, which had not been properly filled in, and that this had caused the subsidence, but no trace of any thing of the kind is to be found and the true explanation is probably that suggested in your Memo No. 534 of 21st August, namely, that the hollow was produced by the scour due to an old sluice, and this supposition is strengthened by the fact that a quantity

quantity of loose stone, which apparently formed part of a sluice, was found in the bank while the excavation was in progress, about sixty cubic yards of stone were thus removed from the bank.

12. As soon as the whole area of the hollow had been exposed, the hard surface was cut away and the bank reformed with new earth, stepped carefully into the old work, and laid ⁱⁿ layers of six inches thick with a slope towards the front of the bank. The greatest care was taken in this work and I have little doubt that it has been thoroughly and securely done.

13. Only a single section of the hollow was taken, as it was important that the bank should be reformed without delay; but this section, with the plan, shows clearly enough the nature of the slip. Simultaneously with the removal of the earth at the back of the bank a shaft was sunk along the centre and a puddle cone eight feet thick inserted. This puddle cone was carried down to twenty nine feet below the top of the bank into a stratum

stratum of good solid clay.

14. Planking was used to protect the sides of about half the length of the excavation, which were made vertical; for the remainder, the soil being firm, the sides were given a slope of one half to one, and no planking was used, except for a few feet at the bottom.

15. There was at first some little difficulty in getting labourers to work in the shaft, owing to the novelty of the work, but this difficulty was very soon overcome, and no accident even of the most trifling kind has occurred from first to last. In working immediately in front of the slip, great care was necessary, owing to the constant movement that was taking place in the earth at the back of the trench.

16. The clay for the puddle was at first obtained from the fields close at hand, but only a small supply was then obtainable and afterwards it was taken from the bank bed, laid bare by the fall of the water, about a mile from the works to which it was brought by rafts.

17. A longitudinal drain of loose stone,

given two feet square, was built along the bottom
fore of the puddle wall, and six transverse drains
were carried from it to the further side of the pond,
six to carry off any leakage that might take place -
from 18.

12. On the occasion of my last inspection,
(on the 27th September) the water ~~was~~ ^{was} only about
eight feet above the lowest level reached during
the season, and there had not been time for any
defects in the work to declare themselves; since
then we have had constant rain, and by a
report from the Range Officer received yesterday
I learn that the water has now risen to
within six inches of full bank level, but that
there is no sign of slipping or leakage, and that
the new earth has merely settled six inches in
the centre -

13. A plan and sections of the work done
in connection with this slip are given on draw-
ing No 2.

14. The remaining slips were of a
much slighter nature and were caused
and merely by leakage -

15. The second was a little to the north
of the first slip and has been included in the
work

work done for the correction of the latter -

22. The third and fourth slips have been
treated by cutting into the rear slope of the
bank, and inserting a longitudinal and cross
drains similar to those put in behind the
puddle wall of the first slip. At No 3 the
length of the longitudinal drain is eighty four
feet; and at No 4 eighty feet; with two cross drains
to each -

23. The soil with which the rear slope of
No 3 slip was made up, not being very good, this
slope was gravelled, but the gravel does not stand
well, and is a good deal gullied by rain; it will
therefore be removed and the slopes turfed -

24. The top of the bank throughout is full of cracks
and is formed of a somewhat porous soil, which
admits a good deal of water during heavy rain;
this has been removed, over nearly the whole
length of the bank, to a depth of about a yard,
and the cracks as far as possible filled in and
well rammed with good soil. It is hoped that
this and the gravelling of the top of the bank,
which is to be done, will prevent surface per-
colation and that it will not be found necessary
to

to undertake the serious work of inserting
a puddle core on facing to any considerable
portion of the bank; on this point however
I cannot at present express any decided
opinion. -

25. The upper portion of the bank down
to the level of the top of the pavement has been
levelled and sectioned where necessary, so as to
bring it to an uniform level of eight feet above
full tank level. The total length of bank so
treated is 3770 yards.

26. The rear slope, which is now visible,
the surface having been cleared, has a some-
what ragged appearance, but the mass of
earth is amply sufficient for stability and I
do not therefore propose to incur any expense
in sectioning this portion of the bank.

27. The pavement has been pulled
down and reconstructed where necessary; in
some few places, this has had to be done from
top to bottom, but in many others it has been
found that there has been a slight sinking of the
earth at the back of the pavement, and that
the gutter has fallen in for a greater or less height.

and

75 5
and the injured portion only has been touch-
ed. In all cases the reconstructed pavement
has been given a good backing of small stone
and gravel. It has never been found necessary
to remove so great a length of pavement as to
render it worth while to insert a puddle facing
behind it, as suggested in your Memo No 534 of
21st August. The total length of pavement that
has been treated already is 587 yards and the
quantity of stonework done is 4089 Cubic Yards,
a little more remaining to be done.

28. All the new slopes formed by the sec-
tioning of the bank, filling up slips & will have
to be turfed, 13,820 Square Yards have already
been done, but a good deal more remains.

29. The total quantity of earthwork done
is 59,501 Cubic Yards, of which 26,000 belong to the
principal slip. The earth here had to be carried
across the road to the fields seventy yards off
and brought back again.

30. The total quantity of puddle done is 4,768
Cubic Yards.

31. The two Calingulaks have been thoroughly
repaired; these repairs however were not of a very
important

important description -

32. The clearing of the bund has been very nearly completed; this work is being done under the orders of the Head Assistant Collector by whom it was begun, and whom I requested, on receipt of G.O. No 1671 of 26 June/73 to continue it; it has been very well and thoroughly done and as far I can judge at present very cheaply.

33. The total expenditure up to the end of September was Rs 19832 to this must be added Rs 2529 advanced to the Head Assistant for the clearing of the bund, and about Rs 2500 due to Coolies but not paid.

34. I regret that I cannot at present give any opinion as to the ultimate cost of the work to be done. This will depend entirely upon whether it is found necessary to do any more puddling or not; and upon this point it is impossible to form an opinion until it has been seen what is the behaviour of the bund during the present monsoon.

35. If no more puddling is required, the additional work to be done will be the gravelling of the top of the bund, the turping of the slopes where necessary, a small quantity of earthwork and permanent, and improvements to the heads of

of the sluices -

36. As far as I can judge at present, about Rs 5000 will in this case cover the whole cost -

37. If more puddling is wanted, the expense will be increased by something like Rs 30 to Rs 35 per running yard -

38. I desire in conclusion to bring to notice the excellent manner in which this work has been superintended by Mr. Supervisor Stephens, who was in charge of it up to the 10th of June, when he had to be removed to take charge of the Villone Range -

39. There were at one time nearly two thousand men and people employed, and notwithstanding the novel and to some extent dangerous nature of part of the work, no accident of any kind has happened, and I have heard of no disputes with either work people or ryots.

40. Mr. Stephens's pay and allowances during the five months that he was on the work amount to something like Rs 1100 and I have not the slightest doubt that his time has been saved by his constant presence. If the work

= my

economy of sufficient supervision were a great
- tin that admitted of argument, this work would
be an useful example in its favour -

44. I request that the plans and sections
may be returned when no longer required -

I have the honor to be

Sir

Your Most Obedient Servant

John Benjamin Capt. R.E.

District Engineer &c.

21/10/1893
Dated 11/10/1893
Recd 13/10/1893
Que. 4 No. 2243

Submitting Report
on the work done to the
Cannery bank taken up
to the 1st instant with
reference to C.O. No 1275 of
11 May last.

P.W. 6545/1/3
5
L.O. 123-19-1-74

Encls 5-

Lawrence Park

Submitted for the information of Government with re-
ference to Government Order of the 6th May 1873 No. 1275.

The work done at this important tank to place it in a safe state appears to have been well carried out, and though, as the District Engineer mentions, it was too early when his report was written to speak confidently of the result of the large expenditure, amounting to nearly Rupees 25,000, which has been incurred, it is satisfactory to find that the tank water had risen to 6 inches below cull level without any sign of weakness being shown.

2. It will be observed that Captain Pomyechnik speaks highly of Mr. Supervisor Stephen's management of the work.

Office of the Chief Eng^r
for Irrigation.
Albore 20th November 1873.

Columbiana Acad. Cal. P. E.
Chief Engineer for Irrigation

To The Secretary of the War

62

Read two following

From the Chief Justice
Justice

H.E. No 87/87 20 Nov/73)

His Excellency the Governor
in Council has read with interest
Captain Pennycook's clear report,
the extensive, and in some respects
difficult, work which has been
carried out at the Cranbury Bank
Bank to stop the leakage and
restore the portions of the bund
which slipped during the heavy
monsoon of 1872, and the satis-
sfactory manner in which Mr.
Stephens, the Supervisor in imme-
diate charge, has superintended
the

[Handwritten signature]

•
 600
 600

P. H. - 1893 Newark
Cambridgeport Mass
June 6th 1894.

The Chief Clerk
For Proclamation
to the Secretary
Oct 20 1877

1816.

dated 20.
Nov. 27.
Nov. 30.
Nov. 5.

~~Subscribes for~~
~~from action~~ ~~highest~~
~~from~~ ~~but~~ ~~in~~ ~~part~~
~~providing~~ ~~work~~
~~done~~ ~~to~~ ~~the~~ ~~con-~~
~~veyance~~ ~~and~~
~~bound~~ ~~up~~ ~~to~~ ~~1~~
~~other~~ ~~last~~

Johns

8/11/23-19

the work is noticed with satisfaction.

2. The Government will be glad to receive a further report after the close of the monsoon, by which time the results of the work done will be more fully appreciable.

W.M. May. 21/11/13

To The Secy for Irrigation
" Bt. Secy, Contact Street

Despatched - 20/11/14

CP 6545
Govt. of 1873 Madras.
PUBLIC WORKS.

1. The Chief Secy for Irrigation

Dated

Recd.

Encl. 1/123

G.O. 19 "Levy" 4 No. 123.

Nov 24 1874

Canveybank Tank.

Paying orders on the ^{report} ~~order~~ ~~from~~ the Secy, North Arcot, on the work carried out to the bank.

75

123
19-1-74

6.