M.R.O. 1—10,006—28-2-50.

(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. 1427 (2) Press
~~B.P. No.~~ Mis.
563-66

Dated 29th May 1924 195 .

Not to be folded or roughly handled

No. 563. Read the following papers :—

From Captain J. PENNYCUICK, R.E., District Engineer, North Arcot, to Lieutenant-Colonel J. MULLINS, R.E., Chief Engineer for Irrigation, dated Vellore, 17th October 1873, No. 2,274.

I HAVE the honour to forward, with reference to your memorandum, No. 203, of 1st April 1873, the papers noted in the margin, concerning the works required for the disposal of the surface drainage of the ground above the Town of Vellore.

8 Plans.
6 Estimates.
6 Abstracts.
6 Specification Reports.
1 Railway Receipt.

2. The total area, the drainage of which has to be disposed of, is eighteen square miles, of which five form the drainage basin of the Verupatchy tank, and eight that of the Thorapady tank ; of the remainder, two square miles are brought down by the Adavanunthal channel, which receives the surplus of the Otarry tank, and three by the Sooriagoonta nullah, which reaches the cusbah nullah by a somewhat circuitous and inconvenient route, about 800 yards from the point where the latter crosses the Bangalore road.

3. The Thorapady tank surplus joins the cusbah nullah just at this point, and for the present the natural catchment basin of this tank (eight square miles) may be neglected, as it does not affect that portion of the cusbah nullah to the south of the Bangalore road, from which alone any injury to the cusbah itself can arise.

4. By O. G., No. 1,612, of 20th June 1873, it has been decided that the Verupatchy and Allapooram tanks (the latter of which is a small tank fed from the surplus of the Verupatchy and Otarry tanks) shall not be restored, and we have therefore to deal with the drainage basins of these tanks under natural conditions.

5. The natural outlet of the Verupatchy tank is by the breach towards the west end of the bund, and thence by the channels marked as "Agravaram breach channel" and "Allapooram surplus channel" to the Adavanunthal channel.

6. If the drainage were allowed to take this course, the cusbah nullah would have to carry the discharge of seven square miles down to the junction of the Sooriagoonta, and of ten square miles below that point.

7. As this would necessitate a very considerable enlargement of the cusbah nullah, I propose to direct the whole of the supply of the Verupatchy tank into the Thorapady tank by means of the channel now existing, which will be enlarged for the purpose.

8. Before the Verupatchy tank breached, its surplus escaped by a calingulah at the east end of the bund into the Adavanunthal channel, across which a dam was constructed to supply the Allapooram tank. The surplus of the latter was partially diverted by another dam into the Thorapady supply channel, which is the one to be enlarged as mentioned above.

9. The work to be done, as regards the protection of the town from floods, thus resolves itself into two parts : the diversion of the Verupatchy drainage into the Thorapady tank, and the provision by the cusbah nullah of sufficient means of carrying off the water brought down by the Adavanunthal and Sooriagoonta nullahs.

10. The first portion includes the closing of the outlet of the Allapooram surplus channel into the Adavanunthal, and the enlargement of the Thorapady diversion channel so as to enable it to carry the drainage of the whole of the five square miles which feed the Verupatchy tank.

11. Drawing No. 2 gives longitudinal and cross sections of this channel.

12. The fall available is 27½ feet per mile, and the required discharge of one inch per hour over five square miles, or 3,227 cubic feet per second, can be given by a channel with a bottom width of 40 feet and a depth of 5 feet, with side slopes of 2 to 1. The channel bank will be made nowhere less than 8 feet above the bed of the channel, or 3 feet above the maximum water-level.

13. The estimate for this portion of the work amounts to Rupees 3,800, including a small provision for stone revetment, removing rock, which is met with in one or two places, and compensation for land.

14. The cusbah nullah may be divided into two sections, the upper section has to carry only the drainage of the Adavanunthal channel, or as a maximum one inch per hour over two square miles, or 1,291 cubic feet a second.

15. The fall is 25 feet per mile, and it is calculated that a channel with a bottom width of 22 feet and side slopes of 2 to 1 will give the required discharge with a depth of 4 feet; the tops of the banks will accordingly be made 7 feet above the bed of the channel.

16. Provision is made for a short cut across the somewhat awkward angle formed by the present junction of the Adavanunthal and cusbah nullahs.

17. For the lower portion of the nullah the fall available is only 18½ feet per mile, and allowance is made for a maximum depth of 6 feet; the discharge to be provided for being that of 5 square miles, or 3,227* cubic feet per second.

* The actual discharge of the channel at 6′ depth will be 3,600 cubic feet per second, but it is as well to allow a slight excess here.

18. Provision is also made for superseding the present circuitous junction of the cusbah and Thorapady surplus channels by a direct cut as shown at C. D. on the plan.

19. This estimate provides further for closing the present Allapooram supply channel, and demolishing the dam which feeds it, for reconstructing the injured portions of the bridge at the southern end of the channel, and for constructing a tunnel for the irrigation of the lands cut off from their source of supply by the direct cut mentioned in the last paragraph.

20. The total amount of this estimate is Rupees 5,720; a detailed survey and section of the cusbah nullah and its continuation the Nickal Calva are given in the drawing marked No. 3; it will be noticed that this survey has taken up the nullah from the Palar, and that it is only the upper portion shown on the last two pages with which we are now concerned.

21. Nothing need be done to the Adavanunthal channel, and the small amount of clearing required by the Sooriagoonta nullah has already been executed by the Municipality.

22. The measures described in the foregoing paragraphs dispose of the drainage as far as the Bangalore road to the north of the fort of Vellore beyond

this road the water may be left to find its own way to the Palar; the channels which carry it will, as they always have done, overflow during heavy floods, but the only effect of such overflow is to submerge a small area of cultivated land, and to prevent this would involve an expense out of all proportion to the end to be attained.

23. Practically we may consider the floods as disposed of when they have been safely carried past the Bangalore road.

24. It will be seen that the whole of the drainage of the eighteen square miles with which we are dealing has to cross the Bangalore and Railway roads on its way to the Palar. The bridge on the former is altogether insufficient to pass this large quantity of water, and has been supplemented by a road dam of eighty yards in length; the bridge on the latter road is also insufficient, though to a less degree, and a road dam of sixty yards has been constructed in aid of it. These road dams have been built out of road funds and need not be further alluded to here.

25. We may now return to the Thorapady tank. As already stated the natural drainage area of this tank is eight square miles, to which five more have been added by the diversion of the Verupatchy tank supply.

26. Provision is made for thoroughly repairing the bund and bringing it to an uniform height of 5 feet above the maximum water-level, or 9 feet above the crest of the escape, and for a total length of 300 feet of escape, which will discharge the drainage of thirteen square miles at one inch per hour, or 8,370 cubic feet per second, with a depth of not quite 4 feet.

27. Plans and sections of the tank bund and escapes are given in drawings 4A, 4B, and 4C.

28. The estimate for the repairs of the tank bund is Rupees 6,730, and that for the construction and alteration of the escapes is Rupees 2,650.

29. An estimate, amounting to Rupees 5,700, for the repair of this tank was sanctioned in O. G., No. 2,695, of 16th November 1872, but this estimate was incomplete from the want of sections of the bund, and has accordingly been held in abeyance.

30. It may possibly be questioned whether it would not have been better to enlarge the cusbah nullah so as to enable it to carry the supply now diverted to the Thorapady tank, but as far as I can calculate the expense would have been very much the same as that of the arrangements now proposed, while every addition to the quantity of water to be carried by the cusbah nullah would have added to the sense of insecurity now felt (I do not say rightly) by the people living in its neighbourhood.

31. The other two estimates now forwarded are for reconstructing a bridge over the Allapooram surplus channel on the Arnee road, and for providing additional water-way to the bridge on the Jail road over the Thorapady diversion channel. These estimates amount to Rupees 2,640 and Rupees 2,000, respectively, and the plans, etc., are given in drawings Nos. 5 and 6; no detailed explanation is necessary regarding them.

32. The first of these was destroyed in May last, and an estimate, amounting to Rupees 1,800, was lately sanctioned by the Local Funds Board for its reconstruction on its former plan, but the water-way of the old bridge was manifestly insufficient and a new plan has accordingly been prepared.

33. Of the estimates now forwarded those for the improvements to the Thorapady tank can alone, in my opinion, be considered as Irrigation works; the enlargement of the Thorapady supply channel and of the cusbah nullah are "public improvements," while the bridges on the Arnee and Jail roads are works of communication; but I have thought it best to send the whole of the estimates up together, so that Government can determine in what proportion the cost of the works proposed shall be charged to the various heads of service.

34. At the special request of the Vellore Municipality, I have ordered the banks of the more dangerous portions of the cusbah nullah to be repaired in anticipation of the sanction of Government; the work so done has been very slight, and care has been taken that it shall form part of that provided in the estimates.

35. In a former letter (No. 1,288, of 15th July 1873,) I mentioned that it was possible that the sum sanctioned in O. G., No. 1,652, of 25th June 1873, for the surveys in connection with these works might be exceeded. The amount sanctioned was Rupees 288 for a Surveyor at Rupees 60 and six lascars at Rupees 6 for three months. The actual expenditure has been Rupees 194-8-3 for the Surveyor and Rupees 129-3-0, making a total excess on the sanctioned amount of Rupees 35-11-3, for which I request sanction. This amount can, if necessary, be transferred from the sum of Rupees 384 sanctioned in O. G., No. 1,652, of 25th June 1873, for the surveys of the works on the south bank of the Palar river, which it is not likely that I shall be able to take up this year.

No. 564. From Captain J. PENNYCUICK, R.E., District Engineer, North Arcot, to Colonel G. W. WALKER, R.E., Secretary to Government, Public Works Department, dated Vellore, 4th November 1873, No. 2,472.

WITH reference to O. G., No. 2,648, of 30th ultimo, I have the honour to report that all the estimates connected with the drainage of the town of Vellore were forwarded to the Chief Engineer for Irrigation on the 17th October 1873.

2. With regard to the share of the cost that should be borne by the Government, the total of the estimates is Rupees 23,540, which is made up as follows:—

	Rs.
Repairs to the Thorapady tank	6,730
Improvements to the calingulahs of do.	2,650
Improving and enlarging the supply channel of do.	3,800
Improving and enlarging the cusbah nullah	5,720
Rebuilding bridges on the Arnee and Jail roads	4,640
Total...	23,540

3. Of these the two first are entirely works of irrigation; the third may be considered so, but by rather a stretch of language. The main object of this portion of the work is to diminish the drainage to be carried by the cusbah nullah; it will incidentally increase the supply of the Thorapady tank, but as the average revenue of the latter is already very nearly equal to the full ayacut assessment, no great benefit will be gained by it. Still it will probably render the tank supply more certain, and some additional revenue may be obtained by extra crops. I am of opinion therefore that half of this estimate, or Rupees 1,000, may be considered as coming under the head of Irrigation.

4. The cost of rebuilding the bridges ought, in my opinion, to be borne by Government, as their destruction was caused by the breaching of the Verupatchy and Allapooram tanks.

5. There remain the improvements to the cusbah nullah which, with the half of the third estimate (for the Thorapady supply channel) must be considered as "public improvements." I do not think that the Municipality can ask, as a matter of right, that the Government should bear any portion of the cost of these works, the necessity for which arises entirely from the geographical position of the town; but the Government may reasonably contribute a certain share, in consideration of the destruction caused by the floods last year and of the fact that Vellore is a Military Station. What the amount of this contribution should be is a matter on which I do not consider myself competent to express an opinion.

6. I may add that in my letter forwarding the estimates I did not express any opinion as to this question, not having been called upon to do so.

7. As reported in the above-mentioned letter, I have already, at the special request of the Municipality, ordered the most dangerous portions of the cusbah nullah to be attended to, and there is not any present risk from anything but a very extraordinary fall of rain. It was necessary that this work should be done in anticipation of sanction, as orders could not have been obtained in time, and we had heavy rain at an unusually early period. The expenditure incurred has been about Rupees 300.

8. I do not think the abandonment of the Verupatchy and Allapooram tanks will increase the risk of floods in the way supposed by the Municipality. No doubt the number of occasions when the cusbah nullah will have to carry a moderately large quantity of water will be increased, but the *maximum* discharge will remain unaltered, as it was always possible that a heavy fall of rain might occur when the tanks were already full, in which case the measure of the surplus would be just what it is now, the fall over the whole catchment basin. Moreover the grand danger was of the tanks breaching, and that is now removed.

No. 4.

MEMORANDUM.

THE undersigned has the honour to offer the following remarks on the arrangements proposed by the District Engineer, North Arcot, in connection with the drainage through and in the neighbourhood of Vellore, and to request that the estimates may be modified accordingly.

8 Plans.
6 Estimates.
6 Abstracts.
6 Specification Reports.

2. In this Office Memorandum, No. 203, of the 1st April last, paragraph 2, it was proposed to provide an escape to the Verupatchy Agraharam tank of sufficient capacity to pass a flood of one inch per hour draining from the whole area of the catchment basin, and it was likewise contemplated to make the top of the bund 4½ feet above the maximum water-level. These very great precautions were deemed advisable in view of the serious loss of life which occurred from the breaching of the tank during the cyclone, and to the desire to remove all possible cause of apprehension. It is not, however, necessary where there is to be no accumulation of water or where the stored water if let loose would not occasion loss of life and much damage to property to provide against very improbable contingencies, and the undersigned is therefore of opinion that the drainage channels, etc., as designed are needlessly large, and that if the maximum discharge of the several drainage basins be calculated by Ryves' formula,* and if the channels be made of corresponding dimensions, not only will the pro-

* $D = 562{\cdot}5\ M.^{\frac{3}{4}}$ per cubic foot per second, M = Square miles.

vision for passing flood waters be ample, but this will have been made on a scale almost unprecedented in this country, so that probably not once in fifty years will even a temporary inconvenience be experienced.

3. The diversion channel and the improvement of the Thorapady tank may both be considered as Agricultural works, while everything that may be done below the dam across the Allapooram surplus channel at the head of the surplus channel as also the bridge above that point within Arnee road would appear to appertain to other services.

4. The diversion channel provided for in the estimate* was to have a bottom width of 40 feet and a maximum depth of water of 5 feet, the calculated discharge to be allowed for being 3,227 cubic feet per second. Ryves' formula would give 1,642·5 cubic feet, and as a channel 20 feet wide at bottom will discharge 2,160 cubic feet, the dimensions can be reduced to this.

* No. 39, Rupees 3,800.

5. The Thorapady tank is to have escape weirs of 255 and 45 feet, respectively, and the maximum flood discharge from a drainage area of thirteen square miles may be taken as 3,110 cubic feet instead of 8,370. It may be better, the overfall being considerable, to make the present 45 feet escape somewhat higher than the larger one, and to leave its discharging capacity out of consideration. It may then have its crest 1 foot above full supply level. The other escape will discharge a maximum flood with 28 to 29 inches on the crest, and 30 inches have been assumed as maximum water-level. A margin of 3 feet above this is, it is thought, sufficient for safety when once the bund has been placed and then maintained in good order. These alterations will reduce the top level of the bund 3½ feet, and will make a material difference in the estimate† for the tank. At the deep part of the tank a top width of 9 feet may be allowed, but elsewhere 6 feet will be enough. For revetment there is only a small item which may be allowed to stand, but otherwise it would have sufficed to have made the revetment stop at 2½ feet above escape crest or full tank level, or at the reduced maximum water-level. In raising tank bunds it is better as regards their stability to place the new earth of the lower part inside rather than outside the old bund, and this should as far as may be practicable be attended to. The old bund must in any case be cut into steps before new soil is added. This is essential to stability.

† No. 42, Rupees 6,730.

6. The alteration of the dimensions of the bund will make some difference in the east escape weir, and on the plan drawing No. 6 a revised section has been sketched in pencil.

Estimate No. 41, Rupees 2,650.

7. Turning now to the part of the works proposed for improving the drainage of the town, the cusbah nullah in its upper part will drain two square miles, and the maximum discharge may properly be taken at 900 cubic feet a second instead of 1,291 cubic feet; but as a channel 4 feet deep with a bottom width of 15 feet will discharge 1,104 cubic feet a second, these reasonable dimensions may be allowed instead of 22 feet bottom width; of course no diminution of the existing width is advisable. Similarly for the lower part a width of 21 feet instead of 38 feet will suffice, and the diminished channel will carry 2,254 cubic feet a second which will be more than ample.

Estimate No. 40, Rupees 5,720.

8. For the bridge on the road to Arnee a water-way of 36 feet will be enough, but two spans of either 18 feet or 20 feet each may be allowed as may be most suitable to the site. The design submitted is capable of improvement as indicated in pencil.

Estimate No. 44, Rupees 2,640.

9. The bridge on the Jail road has to be enlarged, and perhaps as this is on account of the increased dimensions to be given to the supply channel of the Thorapady tank, it may be as well to consider it a part of the irrigation work. This bridge is very low, 4 feet 6 inches to the soffit of the arch, and as the channel is to carry 5 feet of water as a maximum, it will be best to raise the springing line 2½ feet or to 4 feet above the floor, and to make the arch segmental with a rise of 3 feet as before, one additional arch of the same span as the present one will then be sufficient. One estimate may be prepared for the tank and its escapes, the diversion

Estimate No. 43, Rupees 2,000.

1·6 to springing.
3·0 rise of arch.

channel and the enlargement of the Thorapady bridge, and the work as indicated in this memorandum may be gone on with at once on the sanction, Rupees 5,700, given in G. O., No. 2,695, of the 16th November 1872, which will be superseded by the revised estimate.

10. All the rest of the works may be included in a second estimate.

11. The large survey has been retained in this office that a copy on a reduced scale may be made after which it will be sent back; all the rest of the papers are returned.

12. The calculations of discharge have been made by DuBunt's formula as given in Stoddard's tables. The formula $V = 9166 \sqrt{2f \times H}{M D}$ gives a higher velocity for small inclinations of bed and a lower velocity for high inclinations than does DuBunt's, but the latter is from its component factors likely to be the more correct. It is, of course, not very material in a matter of this kind in which only rough approximations are needed.

3rd January 1874.

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

No. 245.

No. 565. *Note by the Chief Engineer for Irrigation.*

In G. O. of the 20th June 1873, No. 1,612, it was decided that the breached tanks above Vellore should not be restored, and the District Engineer in October 1873 submitted the following estimates for making use of as much of the water-supply of the breached tanks as could be diverted, and for improving the means of passing the rest down the natural drainages to the west of the town of Vellore. I was at that time on tour, and was unable, while travelling, to dispose of the papers; but on my return, finding that the District Engineer had proposed to provide for a larger amount of drainage water than was likely to be met with, even in very exceptional seasons, certain revisions were called for, and the estimates, as revised, were reforwarded by Captain Pennycuick on the 21st February, and are now laid before Government.

2. These estimates may be considered to consist of three classes of work:—

1*st*.—That which provides for the improvement of the Thorapady tank and its means of supply, and may be met from Agricultural funds:—

	Rs.
Repair and improvement of Thorapady tank	5,750
Constructing an additional surplus weir...	1,900
Improving the diversion channel	2,800
Enlargement of the bridge across this channel...	1,380
Total ...	11,830

2*nd*.—That which is required for the rebuilding of a bridge which was washed away by the floods; this bridge, though within the Municipal limits, it would seem proper to build from other than Municipal funds, and perhaps Provincial funds can be made available for the purpose. The item is:—

	Rs.
Reconstructing a bridge of two arches of 18 feet span on the Arnee Road. Estimate No. 44	2,360

3*rd*.—That which is necessary for improving the drainage to the south-west and south of the town, a strictly Municipal work:—

	Rs.
Deepening and improving the cusbah nullah with subsidiary works.	4,670

3. The estimates, as revised, amount altogether to Rupees 18,860 instead of Rupees 23,540, their former amount, and they will do all that is necessary to meet the circumstances of the irrigation works and drainage.

4. Captain Pennycuick has pointed out in paragraph 3 of his No. 2,472 that the enlarging of the diversion channel which supplies the Thorapady tank

is to be carried out rather in the interests of the Municipality than because the tank needs more water, or can make use of a larger supply, but it has been thought best to treat this as a part of the irrigation expenditure. Similarly, of course, part of the increased discharging capacity given by the new surplus weir is on account of the enlarged drainage basin of the tank, an enlargement not strictly required in the interests of irrigation.

5. The District Engineer reports that of the Thorapady tank estimates Rupees 5,750 are for repairs, and Rupees 6,080 for improvements. In G. O., No. 2,695, of the 16th November 1872, a repair estimate, amounting to Rupees 5,700, was sanctioned, and the difference being but 50 Rupees, this sanction may be allowed to stand, and it is recommended that sanction be now given for Rupees 6,130 for improvements considered as new works. The raised crest of the old Pullum calingulah should be made a little wider than the 18 inches shown, and the rear slope of the new work should be curved to fit into the slope of the old work; the upright stones should be removed.

6. In the design for the Arnee bridge the arch is shown as 3 feet thick at the springing and 2 feet at the crown, 18 inches will be very ample for 18 feet arches, and the difference may be thrown into the water-way by raising the springing line.

CAMP AT TANJORE,
26th March 1874.

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

No. 566.

ORDER THEREON, 29th May 1874, No. 1,427.

IRRIGATION, No. 53.

HIS Excellency the Governor in Council is pleased to sanction the following estimate for the Thorapady tank as a new work, in addition to the sanction of the repair estimate of Rupees 5,700 given in G. O. of the 16th November 1872, No. 2,695 :—

	Rs.
Improving Thorapady tank and its supply channel, and constructing an additional surplus weir	6,130

Application for funds under Agricultural should be included in the demand statement.

2. The estimate of Rupees 2,360 for reconstructing a bridge on the Arnee road, which was carried away by the floods of May 1872, will be transferred to the Financial Department, with a view to funds being provided under Provincial.

3. And the estimate of Rupees 4,670 for improving the drainage of the town of Vellore will be remitted to the Municipality of that town through the Public Department.

(True Extract.)

Lieut.-Colonel, R.E.,
Joint Secretary to Government.

To the Chief Engineer for Irrigation.
,, Financial Department.
,, ~~Public~~ do.
,, Officiating Controller of Public Works Accounts.
,, District Engineer, North Arcot.

Exd. E. C. Shunker.

Spare Copies

North Arcot
District Engineer's Office
Vellore 17 October 1873.

No. A°. 2274

From, The District Engineer
North Arcot

To, The Chief Engineer
for Irrigation

Sir,

Enclos 27
8 Plans
6 Estimates
6 Abstracts
6 Specifications
Reports.
1 Raily. Receipt.

I have the honor to forward with reference to your Memo No. 203 of 1st April 1873 the papers noted in the margin, Concerning the works required for the disposal of the surface drainage of the ground above the town of Vellore.

2. The total area, the drainage of which has to be disposed of, is eighteen square miles, of which five form the drainage basin of the Veerapatchy tanks, and eight that of the Thorapady tanks; of the remainder, two square miles are brought down by the Adavanemuttah Channel, which receives the surplus of the Otarry tanks, and three by the Sooriagoonta mullah, which reaches the Cumbah mullah by a somewhat circuitous and inconvenient route, about 800 yards from the point where the latter crosses the Bangalore road.

3. The Thoraipady tank's surplus joins the Cuchak nullah just at this point, and for the present the natural Catchment basin of this tank (eight Square Miles) may be neglected, as it does not affect that portion of the Cuchak nullah to the South of the Bangalore road, from which alone any injury to the Cuchak itself can arise

4. By G. J. No 1612 of 20th June 1871 it has been decided that the Verupatchi and Allapooram tanks (the latter of which is a small tank fed from the Surplus of the Verupatchi & Otarry tanks) shall not be restored, and we have therefore to deal with the drainage basins of these tanks under natural Conditions

5. The natural outlet of the Verupatchy tank is by the breach towards the west end of the bund, and thence by the channels marked as "Agoraram breach channel" and "Allapooram Surplus channel" to the Adavanuttah Channel.

6. If the drainage were allowed to take this Course, the Cuchak nullah would have to Carry the discharge of seven Square miles down to the Junction of the Sooriagoontah, and of seven Square miles below that point.

7. As this would necessitate a very Considerable enlargement of the Cuchak nullah, I propose to direct the whole of the Supply of the Verupatchi tank into the Thoraipady tank, by means of the Channel now existing, which will be enlarged for the purpose.

8. Before the Verupatchi tank is reached, its surplus escapes by a Calingulah at the east end of the bund, into the Adavanuttah Channel, across which a dam was Constructed to supply the Allapooram tank. The Surplus of the latter was partially diverted by another dam into the Thoraipady Supply Channel, which is the one to be enlarged as mentioned above.

9. The work to be done, as regards the protection of the town from floods, thus resolves itself into two parts, the diversion of the Verupatchi drainage into the Thoraipady tank, and the provision by the Cuchak nullah of sufficient means of Carrying off the water brought down by the Adavanuttah & Sooriagoontah nullahs.

10. The first portion includes the closing of the outlet of the Allapooram Surplus Channel into the Adavanuttah, and the enlargement of the Thoraipady diversion Channel so as to enable it to Carry the drainage of the whole of the five Square miles which feed the Verupatchi tank.

11. Drawing No 2 gives longitudinal and cross sections of this Channel.

12. The fall available is 27½ feet per mile and the required discharge of one inch per hour over five Square miles, or 3227 Cubic feet per second, can be given by a Channel with a bottom width of forty feet and a depth of five feet, with side slopes of two to one.

The Channel banks will be made nowhere less than eight feet above the bed of the Channel, or three feet above the maximum water level.

13. The estimate for this portion of the work amounts to Rupees 3,800 including a small provision for stone revetment, removing rock, which is met with in one or two places, and Compensation for land.

14. The Cuthak nullah may be divided into two sections, the upper section has to carry only the drainage of the Adavanantham Channel, or at a maximum one inch per hour over two Square miles, or 1291 Cubic feet a second.

15. The fall is twenty five feet per mile and it is Calculated that a Channel with a bottom width of twenty two feet and side Slopes of two to one will give the required discharge with a depth of four feet; the tops of the banks will accordingly be made seven feet above the bed of the Channel.

16. Provision is made for a short Cut across the somewhat awkward angle formed by the present junction of the Adavanantham and Cuthak nullahs.

17. For the lower portion of the nullah the fall available is only 18½ feet per mile, and allowance is made for a maximum depth of nine feet; the discharge to be provided for being that of five Square miles or 3,227 * Cubic feet per second superseding

18. Provision is also made for the present circuitous junction of the Cuthak and Shiyali Supplies Channels by a direct Cut as shown at C. D on the plan.

19. This estimate provides further for closing the present Allapooram Supply Channel, and demolishing the dam which feeds it, for reconstructing the injured portions of the bridge at the Southern end of the channel, and for constructing a tunnel for the irrigation of the lands Cut off from their Source of Supply by the direct Cut mentioned in the last paragraph.

20. The total amount of this estimate is Rs 5720; a detailed survey and section of the Cuthak nullah and its Continuation the Nichal Calva are given in the drawing marked No 3; It will be noticed that this Survey is taken up the nullah from the Sea, and that it is only the

* The actual discharge of the Channel at 6' depth will be 3600 Cubic feet per second, but it is as well to allow a slight excess here.

the upper portions, shown on the last two pages, with which we are now concerned.

21. Nothing need be done to the Adavanenthal Channel, and the small amount of clearing required by the Sooriagoontah mullah, has already been executed by the Municipality.

22. The measures described in the foregoing paragraphs dispose of the drainage as far as the Bangalore road, to the north of the Fort of Vellore; beyond this road the water may be left to find its own way to the Palar; the Channels which carry it will, as they always have done, overflow during heavy floods, but the only effect of such overflow is to submerge a small area of Cultivated land, and to prevent this would involve an expense out of all proportion to the end to be attained.

23. Practically we may Consider the floods as disposed of when they have been safely Carried past the Bangalore road.

24. It will be seen that the whole of the drainage of the eighteen square miles with which we are dealing has to cross the Bangalore and Railway roads on its way to the Palar. The bridge on the former is altogether insufficient to pass this large quantity of water; and has been supplemented by a road dam of eighty yards in length; the bridge on the latter road is also insuffi-

insufficient, though to a less degree, and a road dam of sixty yards has been Constructed in aid of it. These road dams have been built out of road funds, and need not be further alluded to here.

25. We may now return to the Sherapady tank. As already stated the natural drainage area of this tank is eight square miles, to which five more have been added by the diversion of the Veerapatchi tank supply.

26. Provision is made for thoroughly repairing the bund, and bringing it to an uniform height of five feet above the maximum water level, or nine feet above the crest of the escape and for a total length of three hundred feet of escape, which will discharge the drainage of thirteen square miles, at one inch per hour, or 8,370 Cubic feet per second, with a depth of not quite four feet.

27. Plans & sections of the tank bund and escapes are given in drawings 4 a, 4 b & 4 C

28. The estimate for the repairs of the tank bund is Rs. 6730 and that for the Construction and alteration of the escapes is Rs 2650

29. The estimate amounting to Rs 5700 for the repair of this tank was sanctioned in P.G. No 2695 of 16th Nov/92 but this estimate was incomplete from

from the mouth of sections of the bund, and has accordingly been checked in three areas.

30. It may possibly be questioned whether it would not have been better to enlarge the Cuchab nullah so as to enable it to carry the Supply now diverted to the Shoraporay tank, but as far as I can calculate the expenses would have been very much the same as that of the arrangements now proposed, while every addition to the quantity of water to be carried by the Cuchab Nullah would have added to the sense of insecurity now felt (I do not say rightly) by the people living in its neighbourhood.

31. The other two estimates now forwarded, are for reconstructing a bridge over the Alla-poor an Surplus Channel on the Arnee Road, and for providing additional waterway to the bridge on the Jail road over the Shoraporay diversion Channel. These estimates amount to Rs 2.640 and Rs 2.000 respectively, and the plans &c are given in drawings Nos 5 & 6; no detailed explanation is necessary regarding them.

32. The first of these was destroyed in May last, and an estimate amounting to Rs 1,800 was lately sanctioned by the Local Fund Board for its reconstruction on its former plan, but the waterway of the old bridge was manifestly insufficient

insufficient and a new plan has accordingly been prepared.

33. Of the estimates now forwarded the one for the improvements to the Shoraporay tank Canal is in my opinion to be considered as Irrigation work, the enlargement of the Shoraporay Supply Channel & of the Cuchab nullah are "public improvements" while the bridges on the Arnee & Jail roads are works of Communication; but I have thought it best to send the whole of the estimates up together, so that Government can determine in what proportion the cost of the works proposed shall be charged to the various heads of Service.

34. At the special request of the Vellore Municipality, I have ordered the breaches of the more dangerous portions of the Cuchab nullah to be repaired in anticipation of the Sanction of Government; the work so done has been very slight, and Care has been taken that it should form part of that provided in the estimates.

35. In a former letter (No 1288 of 15 July) I mentioned that it was possible that the sum sanctioned in G.O. No 1652 of 26th June 1873 for Surveys in Connection with these works might be exceeded. The amount sanctioned was Rs 288 -

for a Surveyor at Rs 60 and Six Lascars at Rs 6 for three months. The actual expenditure has been Rs 194-8-3 for the Surveyor, and Rs 17-9-3 making a total excess on the Sanctioned amount of Rs 35-11-3, for which I request Sanction. This amount can if necessary be transferred from the Sum of Rs 384 Sanctioned in G.G.S.N=1652 of 25th June/73 for the Survey of the works on the Sandy banks of the Palar River, which it is not likely that I shall be able to take up this year.

I have the honor to be,
Sir
Your most Obdt Servant
[signature] Capt. R.E.
Dy to Engr North Arcot

No 2472

From, The District Engineer
North Arcot

To, The Secretary to Government
Public Works Department

Madras

Sir,

With reference to G.O. No 2618 of 30th ultimo, I have the honor to forward, that all Miscellaneous connected with the drainage of the Town of Vellore (queried forwarded to the Chief Engineer for Irrigation on the 14th October 1873.

2. With regard to the scheme of the Cart Track alongside the Canal by the Fort ends of the estimated at Rs 23,570-0 which is considered unnecessary.

Relative to the Perambadur tank Rs 6,730-0

Improvements to the Collingulam Rs 2650-0

Improving and enlarging the supply Channels of Rs 3800-0

Enlarging and enlarging the Canal Bridges Rs 5720-0

Relaid enlarging and the Arms and Rs 46440-0

Said roads Rs 3540

3. Of these two first are entirely works of Irrigation, the third may be considered, but the Road & streets of Vellore, the main object of this petition

Dated Vellore the 1st November 1873.

13-8-95

From Date 1873.
The District Engineer
North Arcot

To
The Chief Engineer for
Irrigation

Dated 17th October 1873
Received 28th October 1873

No 3274

Enclosures 26

Forwards for disposal
Plans estimates &c. of the surface drainage of the ground around the town of Vellore.

No 2068/24/74

No 63

frontiers of the works is to diminish the drainage to be Carried by the Cuchak Nullah; it will increase the supply of the Therapady Lower. but as the average revenue of the latter is already nearly equal to the full ayacut assessment, no great benefit will be gained by it. Still it will produce under the latter supply more certain, and some additional revenue may be obtained by extra Crops. I am of opinion therefore that half of this estimate or Rs 1900-0-0 may be Considered as Coming under the head of Irrigation.

4. The cost of the Rebuilding the bridges ought in my opinion, to be borne by Government, as their destruction was Caused by the widening of the Verupatchy and Allapooram tanks.

5. There remain the improvements to the Cuchak nullah, which with the help of the third estimate (for the Therapady Supply Channel) must be Considered as "Public Improvements". I do not think that the Municipality Can ask, as a matter of right, that the Government should bear any portion of the Cost of these works, the necessity for which arises entirely from the geographical position of the town: but the Government may Reasonably Contribute a certain share, in Consideration of the destruction Caused by the floods last year, and, of the fact that Vellore is a Military Station. What the amount of this Contribution should be is a matter on which I do not Consider myself Competent to express an opinion.

6. I may add that in my letter forwarding the estimates I did not express any opinion as to their questions, not having been called upon to do so.

7. As reported in the above mentioned letter I have already, at the special request of the municipality, ordered the most dangerous portions of the Cuchak Nullah to be attended to, and there is not any present risk from any thing but a very extraordinary fall of rain. It was necessary that the works should be done in anticipation of sanction, as orders Could not have been obtained in time, and we had heavy rains at an unusually early period. The expenditure incurred has been about Rs 300-0-0.

8. I do not think the abandonment of the Verupatchy & Allapooram tanks will increase the risk of floods in the way supposed by the Municipality. No doubt the number of occasions when the Cuchak Nullah will have to Carry a moderately large quantity of water will be increased, but the maximum discharge will remain unaltered as it was always possible that a heavy fall of rain might occur when the tanks were already full, in which Case the measure of the Surplus would be just what it is now, the fall over the whole Catchment Basin. Moreover the ground

danger

danger was of the banks breaching, and that is now removed.

I have the honor to be,
Sir,
Your most Obedient Servant
John Perry Capt. U.S.A.
Dist. Engineer North Ark.

No 15

A-245.

Note by the Chief Engineer for Irrigation

Enclosures 33 22

In G.O. of the 20th June 1873, No. 1612, it was decided that the breached Tanks above Vellore should not be restored, and the District Engineer in October 1873 submitted the following estimates for making use of as much of the water supply of the breached Tanks as could be diverted, and for improving the means of passing the rest down the natural drainages to the west of the Town of Vellore. I was at that time on tour and was unable, while travelling to dispose of the papers, but on my return finding that the District Engineer had proposed to provide for a larger amount of drainage water than was likely

P.D. 78873 Pethard
Encl. Mr. S. Hobby
The District Engineer
North Arcot

Letter from
Secretary to Govt.
Public Works Department.

Letter from
Secretary to Govt.
P.W. 2068 Pet
23 Oct 1874

Secretary writes
Estimate connected with the
drainage of the town of Vellore,
forwarded to the Chief Engr
for Irrigation and requests
to be informed whether
should be carried out
Engr in reply states that
funds not available this year
on the Anicut & Irrigation
Works

Noted 1874

to be met with even in very ex-
=ceptional seasons, certain revisions
were called for, and the estimates
as revised were reforwarded by
Captain Pennycuick on the 21st
February and are now laid before
Government.-

2 These estimates may be
considered to consist of 3 classes
of work.-

1st that which provides for the
improvement of the Thorapady
Tank and its means of supply
and may be met from Agricul-
=tural funds.

Repair and improvement of
Thorapady Tank — Rupees 5,750
Constructing an additional
Surplus weir — " 1,700
Improving the diversion
Channel — " 2,500
Enlargement of the bridge
across this channel — " 1,380
Total Rupees 11,330

2nd that which is required for the
rebuilding of a bridge which was
washed away by the floods, this
bridge though within the Municipal
limits, it would seem proper to
build from other than Municipal
Funds, and perhaps Provincial funds
can be made available for the pur-
=pose- The item is

Reconstructing a bridge of 2 arches
of 18 feet Span on the Arnee
Road ——— Estimate No 46 Rupees 2,360.

3rd that which is necessary for impro-
=ving the drainage to the South West
and South of the town, a strictly
Municipal work.-

Deepening and improving the Kuobah
Nullah with subsidiary works Rupees 4,670.

3 The estimates, as revised, amount
altogether to Rupees 18,860, instead of
Rupees 23,540, their former amount,
and they will do all that is necessary
to meet the circumstances of the irriga-
=tion works and drainage.-

4 Captain Pennycuick has pointed
out in para 3 of his No. 2472 that the
enlarging of the diversion channel which
supplies the Thorapady Tank is to be

carried

carried out rather in the interests of the Municipality than because the Tank needs more water or can make use of a larger supply, but it has been thought best to treat this as a part of the irrigation expenditure. Similarly of course part of the increased discharging capacity given by the new surplus weir is on account of the enlarged drainage basin of the Tank, an enlargement not strictly required in the interests of irrigation.-

5. The District Engineer reports that of the Thorapudy Tank estimates Rupees 5,750 are for Repairs and Rupees 6080 for Improvements. In G.O. No. 2695 of the 16th November 1872 a repair estimate, amounting to Rupees 5700, was sanctioned, and the difference being but 50 Rupees, this sanction may be allowed to stand, and it is recommended that sanction be now given for Rupees 6,130 for Improvements considered as new works.

The raised crest of the old Pullum Calingulah should be made a little wider than the 18 inches shown, and the rear slope of the new work should be curved to fit in to the slope of the old work: the upright stones should be removed.-

6 In the design for the Arnee bridge the arch is shown as 3 feet thick at the springing and 2 feet at the crown - 18 inches will be very ample for 18 feet arches and the difference may be thrown into the water-way by raising the springing line.-

Camp at Tanjore - 26th March 1874.

Lieut Col RE
Chief Engineer for Irrigation

To,
The Secretary to Government
Public Works Deptt

P.W. 1874 Dept.
Irrigation for Mango

From No. 2068
The Chief Engineer
for Irrigation
To The Secretary
to Govt. P.W.D.

No. 245

Dated 26th March 1874.
Rec'd 7 April.

Encls 32 Rs

Ell. No: 1427. 29-5-74.
Note on the estimates for the restoration of the Thoraipandy tank for the drainage of the town of Vellore.

No 866
Copy to Collector 8/4/74

P.W. Dept. 16

1427

Proceedings of the Madras Government
Under date the April 1874.
Read the following

From the Chief Engineer
for Irrigation (Forwarded No 245 of 26 March 1874)

His Excellency the Governor in Council is pleased to sanction the following estimate for the Thoraipandy tank as a new work, in addition to the sanction of the repair estimate of Rupees 5700 given in G.O. of the 16th November 1872 No 2695.

Improving Thoraipady Tank and its supply Channel, and constructing an additional Surplus weir — Rupees 6,130

Application for funds under Agricultural should be included in the demand Statement.—

2 The estimate of

Rupees

Rupees 2,360 for reconstruct-
-ing a bridge on the Arnee
road, which was carried
away by the floods of
May 1872, will be trans-
-ferred to the Financial
Department, with a view
to funds being provided
under Provincial.-

3. And the estimate of
Rupees 4,670 for improving
the drainage of the Town
of Vellore will be re-
-mitted to the Municip
-pality of that town
through the Public Dept.

My. 27/3/74.

To The Chief Engr. for Irrigation
— Financial Dept. with 2 Queries
— Controller of Accounts
— Do Engr. North Arcot
S. Canara Dept. dtd 12/6/74.

F63-566

Cer 14/4/74. RD 21/4/74

13-8-95 Pub.

3-12-84

1-2-02 Pub

2068

Dept. of 1874 Madras

PUBLIC WORKS.

Pub Chief Engr.
for Irrigation

Dated

Rec'd.

Desp. 3

G. O. 29 May 1874, No. 1427

Nos. 563-566.

Thoraipady Tank
North Arcot Dr.

Estimate of Rs. 6130 for
repairs to the Thoraipady
the construction of an
surplus weir, sanctioned
for reconstructing
the Amur road,
the Trichinopoly Dept.
on Famine Relief