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MADRAS RECORD OFFICE.

Government of Madras.

Public Works DEPARTMENT.

G.O. No. 557 (2) Press ~~Mis.~~

Dated 21 2 1877.

Not to be folded or roughly handled

Proceedings of the Madras Government, Public Works Department,
21st February 1877. *No.* 577.

No. 496. Read the following papers:—

No. 3 S.A.

MEMORANDUM.

IRRIGATION.

THE survey and levels which have been taken of the Pooniar give a good deal of information, and serve to indicate the general characteristics of the river and the necessity for endeavouring to improve its condition. Much additional information, especially with regard to the levels of the country north and south, will be necessary to a fairly complete understanding of the distribution of those portions of the flood waters, which the river is at present incapable of conveying within its bed proper, and to the determination of the extent to which embanking will probably be desirable and advantageous.

2. There are, however, some points of considerable importance on which a fairly reliable general opinion may be formed, and the scope of the improvements required indicated. The information needed in connection with these will probably not take very long to collect.

Section 1, Survey Sheet No. 1.

3. Commencing with the river above the anicut.

(*a.*)—There appears to be no need for any embankments in this section except that it may probably be desirable to lengthen the flood bank from the Paumbay channel head sluice carrying it across the Annabelay channel to the bund of the Amapor tank.

(*b.*)—The river-bed on the other hand will be much the better for regulation by means of nanel plantations, and arrangements should be made for commencing plantations at the commencement of the next favorable season. The anicut establishment affords the means of looking after the two miles above the anicut which alone need conserving and about the same distance below the weir. The width of the bed above the anicut is altogether excessive at present, and a very much better channel of approach to the weir may be secured in time. An alignment has been marked in pencil allowing a width of 1,800 feet, which appears to be sufficient;* the right side of the channel will be at one point some 1,500 feet from the present bank, and this shows the extent of the departure of the bed from the proper alignment on this side. It will necessarily take a long time to get the stream back to the desired position.

* Area drained 4,500 square miles.
Estimated discharge 180,000 cubic feet a second.
Estimated discharge per square mile 40 cubic feet a second, or very nearly 1¾ inches from whole area in 24 hours.
C in Ryves' formula 660.
C in Dickens' do. 330.
Mean velocity about 10 feet a second.
Mean depth about 10 feet.

Section 2, Survey Sheets Nos. 2 and 3.

4. This section may be taken as extending from the anicut to a little below the rejunction of the Korayaur and Pooniar.

(*a.*)—Only in the lower part of this section, if anywhere, will embanking on the north or left side be required.

(*b.*)—On the right or south side it will probably be best to construct a flood bank parallel to the river, and as soon as the space between the Malataur and the revised alignment will allow at about 450 feet from the latter, down to the Korayaur head. Thence to Arasur the Trikalore road will be the best line it is thought for a flood bank, and it is understood that the level of this road is not far from correct, and possibly a small bank on the north edge of the road will be the cheapest method of providing additional margin where found necessary.

(*c.*)—It may, it is thought, be taken for granted that the attempt to exclude all Pooniar water from the Korayaur by bunding the head of the latter as was done in 1874 is a mistake. It is not at all probable that such exclusion would be practicable except at a great expense for subsidiary flood banks. It is clear that the channel of the Pooniar for some distance in the 10th and 11th miles is altogether inadequate for the convenient discharge of heavy floods, and it is evident that what is really wanted is regulation of discharge down the Korayaur and the subsequent division of this discharge into two parts, the greater returning to the Pooniar in the 15th mile, and the lesser going by the Malataur to the Guddelum. It is thought that about 60 feet width of waterway may be allowed for the Korayaur, and that at about the position shown in pencil, it would be desirable to construct a curved regulating dam (something like a road dam) with a length of about 600 feet between the wings; with the lowest part about 3 feet above the bed of the Pooniar at a corresponding distance from the bifurcation and with the crest at the wings some $2\frac{1}{2}$ feet higher. Somewhat more than a mile lower down there appears to be a convenient place for a distribution to the lower Korayaur and Malataur, and the widths of the channels below the bifurcation are shown as 500 and 300 feet respectively in the pencil arrangements sketched. It may be necessary to construct regulating dams at this second bifurcation.

(*d.*)—The Pooniar much needs widening in the 10th and 11th miles. Alignments which would afford a reasonable addition of waterway have been sketched, and as the current with the present contracted waterway must be rapid probably the cutting away of the parts which it is desirable to remove would be practicable at a small cost, but the arrangement would involve the reconstruction of a considerable length of the first irrigation channel on the north side of the island along what is probably high ground.

(*e.*)—The additional levels required for this section will be—

(1.)—Along the Trikalore road from Arasur to the anicut with the ground levels alongside.

(2.)—Levels from the anicut to the Korayaur bund.

(3.)—The prolongation of the cross sections east of Korayaur head to the Trikalore road.

(4.) A longitudinal section of the Korayaur down to its rejunction with the Pooniar.

(5.) A longitudinal section of the channel to connect with Malataur and Guddelum.

(6.) Local levels in connection with detail of works and local flood banks.

(7.) A sufficient number of cross sections of the several channels to illustrate their circumstances.

In the interests of the Guddelum the improvement of the arrangements for the distribution of flood discharge of the Pooniar is of immediate importance. It may be admitted that a demonstration of what would be perfectly suitable arrangements, is impracticable; but it is believed that improvements, which will certainly be of great advantage, may be determined upon as soon as the additional information indicated above with regard to levels has been obtained.

5. The third section may be considered to extend from the 15th to the 25th mile, or just below the railway crossing. The head of the North Malataur is in the 21st

Section 3, Survey Sheets Nos. 3, 4, and 5.

mile, and one very necessary point to be determined in connection with this section is the proportion of flood discharge which should be allowed to leave the Pooniar by the North Malataur. The information bearing on this point at present available is extremely limited, and a great deal of levelling will have to be done as a preliminary to a clear apprehension of the circumstances.

(*a.*)—Whatever water does leave the Pooniar at and near the North Malataur head probably crosses the Cuddalore and Pondicherry road between the Pooniar and Ariankup rivers. What is needed therefore appears to be as follows:—

(1.) Levels along the Pondicherry road and of the ground alongside, with particulars of the waterways available, and the levels of the floors of the several masonry works or of the beds of the channels and streams.

(2.) Levels along right bank of the Ariankup river to the Pondicherry and Villapuram road, and along that road to Villapuram and down the Trichinopoly road to Arasur. If water crosses the Pondicherry and Villapuram road, the direction of outfall and the source of the drainage to be noted.

(3.) Levels between the Pooniar and the Pondicherry and Villapuram road which may be run along north and south roads as far as these may afford facilities, the intervals being filled in by diagonal lines. The railway levels will afford some of the information required.

(4.) Surveys of the Alungal channel and North Malataur with longitudinal and cross sections. Possibly there may be levels for these channels available already, as the Alungal channel at any rate has been improved within a few years.

(*b.*) For the south side of the river, the levels required will be—

(1.) From Munjakupam to Arasur with cross lines to the Pooniar, and such particulars of the actual flood levels of 1874 as may be obtainable. These will afford all the supplemental information needed to a correct understanding of what it may be practicable to do to prevent injury to the railway from spill from the Pooniar.

(2.) Special local levels for ascertaining what ground above flood level is to be found near the Pooniar. This may influence the alignment of such flood banks as may be deemed necessary, and it will enable it to be decided whether cross banks for preventing a breach at any particular part of the main line leading to extensive damage can be made.

(*c.*)—The existing flood banks appear from the survey to commence in the 21st mile, and their alignment is more or less defective. On the north side, to the east of the head of the North Malataur, the first two miles are regular, but they are closer to the river than is desirable, for the river here is abnormally narrow, and what would have been a proper alignment has been shown in dotted pencil lines. This bank is practically of little value without one running from its west end along the right bank of the North Malataur to the railway. It will, it is considered, be desirable to construct this latter bank at an early date, so as to exclude flood water from this triangular area, to prevent the Pooniar left flood bank being taken in rear and to obviate possible cause of damage to the railway. The Pooniar embankment here should not be closed upon the railway until the North Malataur flood bank can be carried out. The proper alignment has been marked; with a slight modification near the 24th mile bench mark, it agrees with the apparently intended line or with a survey line.

(*d.*)—On the south side of the Pooniar the channel marked "Yahemungalum" on the survey appears to be that called by Mr. Wiffen, the Wallajah channel, and similarly the Iyenoor channel of the survey is Mr. Wiffen's Yendaramungalum channel. It appears to be necessary to revise the alignment of the embankment here as from the Iyenoor head sluice it runs too close to the river, and is also at too small a distance from the north flood bank. The Iyenoor head sluice is not an efficient work, and need not therefore stand in the way of an improved alignment, which has been marked by a pencil dotted line joining the present line near the 23rd mile cross section. The rest of this bank down to near the railway will do though it is not as regular as it should have been, and near the railway it is doubtful whether the survey is correct. West of the Yahemungalum or Wallajah head sluice a temporary terminus to the flood bank on ground not liable to be turned should, if possible, be found.

6. This section may be for convenience taken to extend from the 25th to the 36th miles. In the upper part some embanking has been done after an irregular fashion, but fortunately the distance so treated is not very great. What appears to be the best available line on either side down to the 28th mile has been marked. Below this point it will be well to postpone even the laying down of a line until more is known about the levels of the country. In the 28th mile, some considerable widening of the bed of the river appears to be desirable to obviate abrupt changes of width, and throughout this section there are here and there places where the river is narrower than is desirable. What appears to be a reasonable alignment has been laid down; it will probably need adjustment, in order to avoid cutting away valuable land, but a good deal of improvement may be effected by means of plantations alone.

4th Section, Sheets 5, 6, and 7.

7. This section is the last and extends from the 36th mile to the mouth of the river. In the 37th mile there is a much needed widening which apparently presents no special difficulties, the cuttings on both sides being short. From 39½ to just below 40 miles there is another very narrow place, the widening of which is manifestly

5th Section, Sheets 7 and 8.

Proceedings of the Madras Government, Public Works Department,
21st February 1877. *No.* 577.

essential to securing a permanent regime. The principal difficulties however of this section arise from the exceptional narrowness of the river-bed in the 42nd, 43rd and 44th miles. What would be a fairly good alignment has been laid down in continuous pencil lines, giving a width of 1,200 feet, which is not only none too much, but as little as will suffice, down to the bridge on the Pondicherry road. Much of the land which would have to be taken up is, it is believed, of small value, but the modification of the river, though evidently very desirable, is a very extensive one. It will however be altogether better if any attempt at improvement is to be made here, to take care that they are carried out on such a scale as to ensure good results and afford adequate relief. It is not of course at all surprising, with the information now made available, that the river water should, on each occurrence of a heavy flood, seek other out-falls, for it is clear that its channel is altogether incapable of carrying the quantity of water coming down. The bridge, with its 945 feet of waterway, is somewhat short, but it is of far greater capacity than the river-bed above.

a.—The importance of determining upon the proper ultimate alignment will be seen on referring to the survey at the head of the Oopalavady channel (called on the survey Oochemadoo channel). It is evident that the erosion which has there taken place, and which has left the end of the right front wing of the head sluice exposed, is a natural result of the want of sufficient waterway in the river, and that an endeavour to restore the line of the bank, as it existed when the head sluice was built, would be to work in the wrong direction. A much better line and one which will it is hoped not further endanger the head sluice, can be laid down, and has been indicated by the pencil alignment. It may further be noticed that any reclamation on the left bank of the river just above the bridge is undesirable; that so long as the river remains as it is, near Aracheecoopum the groynes above bridge may be useful in directing the current into a line more at right angles to the bridge than it would otherwise have, but that the correction of the direction at 43½ miles by radical improvements is what is really wanted, and that the spill which occurred at about 43½ miles was due to the great contraction of the waterway close by.

b.—The waterway of the bridge may, it is thought, be found to be sufficient if a straight and sufficiently wide approach to it be secured, and it would apparently be more profitable to spend money upon the river than upon the enlargement of the bridge, for then all the archways would be made to take their fair share of the discharge, while the addition of arches on the south side would, under existing circumstances, do very little of any good.

c.—The waterway of the river below bridge appears from the survey to be generally about sufficient, but there are some islands or what appear from the bridge to be islands, which are not shown. Some improvement of the alignment is readily practicable. Some particulars appear to be forthcoming regarding the flood of 1864, in which the water overspread the plain at Munjacoopum, and is said to have risen to some 18 inches above the floor of the racquet court. Whether or not this flood was higher than that of 1874 Trikalore the undersigned has not heard, but if not, at the state of the bar at the mouth of the river would probably have caused the increased height of water in the lower miles. It will be desirable

to show on the survey more clearly the circumstances of the mouth of the river and to arrange for changes being recorded.

8. The levels of all masonry works on or near lines of level should be ascertained and noted, and those which are required should be completely ascertained once for all. Thus if a bridge or road tunnel or culvert be the work, the level of the flooring or of the bed of the waterway if there be no flooring, of the roadway and of the parapets are all required, and at every such work a bench mark should be made then and there a small pot of tar being carried about for the purpose, and on this bench mark the exact position of the levelling staff should be shown thus, and it will usually save time and trouble if the value be at the same time noted; this latter can be done in the first instance with a coarse black lead pencil, and after the levels have been checked the correct figures can be shown in tar for the minor bench marks, and by incised figures filled up with black chunam for the permanent bench marks. Plastered masonry works are, of course, here supposed, and standard bench marks cut in stones firmly bedded in masonry will be needed at intervals on all long lines of levels which will be of value for the general work of the department.

Levels of masonry works and bench marks.

9. On the survey itself principal levels should be noted in blue figures which should be written in a plain distinct manner, thus 1, 2, 3, 4, 5, 6, &c., and not, as is very generally the case, in figures which are legible with difficulty. It is not however desirable that the survey should be made confused by the notation of all levels, and the most convenient way of exhibiting these is on skeleton tracings of the survey from which all trees, fields, and other similar details should be omitted, but on which roads and streams may with advantage be shown. Each sheet of the survey should have a separate tracing.

Exhibition of levels.

10. The embankment work recently executed has not been done in that regular manner which is desirable. For all such work sections should be put up, and the earthworks should be thrown up from the first to the full width of the section foot by foot. In very sandy soil the evil effects of irregular formation are less serious than is the case with other descriptions of soil, but all earthworks should be carried out in a thoroughly good way, which with a little trouble at first will save much trouble in the end. Moreover, at any rate, in the case of new embankments or material enlargement of old ones, the quantity of earth required is known for each short tak from the estimate, and the pits should be marked out accordingly of an appropriate size, and then the subsequent measurements will be easy in themselves and have no room for dispute with the work-people. When the pits are to be cut on the river side of embankments, they should be in lengths of about 50 yards with bars of 5 yards left between successive pits, so that there may not be a continuous channel, and it will generally be desirable to plant nanel in the pits after the completion of the embankments to aid in the prevention of the establishment of a channel along them.

Way of throwing up embankments.

11. The Pooniar embankments are for the most part composed of very sandy soil, and the country near them is very frequently bare of grass. In order to get

Protection of embankments.

grass to grow upon them, and in order also to prevent this attracting cattle and leading to perhaps an increase of damage, it is essential that some protective fencing to keep cattle away should be introduced, and there is nothing better for this purpose than the common aloe which grows well in sandy soils. The best position will be at about 3 yards from the foot of the banks. If a commencement be made of a couple of hundred yards here and there, a supply of young aloes will soon become available for extending the fencing. Ramps should be formed wherever crossings are required, and the gradients* should be suited to the traffic.

* 1 in 6, foot-passengers.
1 in 9, cattle.
1 in 16, cart.

12. Whether land for embankments and for the pits be made over with or without payment, it is necessary that the whole of it should be recorded in land registers, so that hereafter there may be no doubt as to the extent belonging to the flood banks, and that it may be at once ascertained that no compensation rightly can be claimed. There have in several districts been claims made for land which has been in the occupation of the department for 15 to 25 years. The boundaries of the land taken up should in all cases be permanently demarcated, either by stones, tree planting, or in any other convenient manner.

Land for embankments.

13. Of the survey, several copies will be required, and for planting operations an enlargement will perhaps be convenient, so that all plantations with the changes they may produce may be duly recorded.

14. The Pooniar anicut on the survey scales 1,800 feet, while the actual length is stated to be 1,200* + 389† = 1,589 feet.

* Old length.
† Extension.

15. Where dependence can be placed on the flood level of 1874, and should it be found that at Trikalore or the Pooniar anicut this was the highest on record—higher, for instance, than that of 1864, a margin of 4 feet above the maximum will suffice. It will be necessary to adjust the surface fall of the river probably in some cases, as that will be more regular hereafter when improvements have been carried out, *e.g.*, at the head of the Korayaur it was exceptionally high, owing to the effect of the narrows; elsewhere the effect of improvements will be to raise the surface somewhat.

Margin of embankments above flood level.

(Signed) JOHN MULLINS, Lt.-Col., R.E.,
Chief Engineer for Irrigation.

7th March 1876.

No. 32 S.A.

IRRIGATION.—MEMORANDUM.

WITH reference to G.O., No. 2,532, of the 21st September 1876, the undersigned has the honor to request the District Engineer, South Arcot, to be good enough to report the present state of the investigations in connection with the embankment and regulation of the Pooniar. It may be desirable to show on a sketch map the surveys and levels completed and those still needed to enable the works required to be designed and estimated for.

(Signed) JOHN MULLINS, Lt.-Col., R.E.,
Chief Engineer for Irrigation.

16th November 1876.

No. 496-B. From Major H. R. MEAD, R.E., District Engineer, South Arcot, to Lieutenant-Colonel J. MULLINS, R.E., Chief Engineer for Irrigation, dated Cuddalore, 9th January 1877, No. 184.

With reference to your memorandum, No. 32 S.A, dated 17th November 1876, which I regret much was mislaid and hence the great delay in answering it, I have the honor to inform you that I have been able to do nothing towards the further investigation of the Pooniar embankments. I am unable to obtain the services of a competent Surveyor; it is useless for me to attempt the work with a young man who has only passed through the College and who has had no experience with field-work, and I can get no other, and these men are of course only willing to enter on this description of work until they can obtain Sub-Overseer or Overseer situations. One of them whom I engaged to do some petty work that would, I hoped, have taught and fitted him for more important work, obtained a Taluq Overseer's place and of course left me, and now I have in the district three men who have not passed out of the College a year as Taluq Overseers.

2. As soon as ever I can obtain the services of a competent man I will put the work in hand; but I must point out that your memorandum, No. 3 SA, dated 7th March 1876, calls for very extensive information, and for it to be done as you wish satisfactorily the services of a special officer and staff of surveyors, if not absolutely necessary, are I consider advisable.

3. The work done since you left the district is Mr. Bird's levels from Cuddalore to Punrootti up the trunk road across to Villapuram, and then down the Trichinopoly road to Arasoor and across to Punrootti. I regret the levels do not check, there being a mistake of 1 foot in them.

No. 496-C. No. 69-W.

MEMORANDUM.

With reference to G.O., No. 2,532, of the 21st September 1876, the Chief Engineer for Irrigation submits for the information of Government the accompanying papers, from which it will be seen that, in March 1876, the survey of the Pooniar had been completed; that the undersigned inspected the river throughout and issued instructions for the preparation of the information needed to deal effectively with this river and its affluents, and that since that time but little has been done. The reason of this is that the establishment then available for continuing the investigations had to be diverted to more pressing work, and was then transferred from the district, and the District Engineer has not been able to supply its place.

No. 3 S.A., dated 7th March 1876.

From District Engr., No. 40, 30th May 1876.
From Chief Engineer for Irrigation, to Chief Engineer, Department Public Works, No. 2 EW, dated 8th July 1876.
To District Engineer, No. 1,095, dated 19th July 1876.
From District Engineer, No. 78, dated 24th July 1876.
To District Engineer, No. 17 S.A, dated 2nd August 1876.

Fort St. George,
24th January 1877.

(Signed) JOHN MULLINS, Lt.-Col., R.E.,
Chief Engineer for Irrigation.

Proceedings of the Madras Government, Public Works Department,
21st February 1877. *No.* 577.

No. 497. Order thereon, 21st February 1877, No. 577.

IRRIGATION, No. 49.

The information contained in the foregoing papers will be communicated to the Consulting Engineer for Railways, with an intimation that it will not be practicable for some time to come to detail an officer for the resumption of the investigations of the Pooniar.

2. It is observed that the District Engineer is on the look out for a Surveyor capable of carrying on the work under instructions.

(True Extract.)

(Signed) JOHN MULLINS, Lieut.-Colonel, R.E.,
Secretary to Government.

Govt. of [1877] Madras.

PUBLIC WORKS.

To

THE DISTRICT ENGINEER,
SOUTH ARCOT,
&c., &c., &c.

Dated February 21st.

Issued

Recd. *Encl.*

G. O., 21st February 1877, No. 577.

FEBRUARY.

Nos. 496-497.

Pooniar Embankment, South Arcot District.—The information contained in the paper relating to the surveys and levels of the—, communicated to the Consulting Engineer for Railways with observations.

No 69 W.

11

Memorandum

Encls 3.

With reference to G.O. No. 2532 of the 21st September 1876, the Chief Engineer for Irrigation submits for the information of Government the accompanying papers from which it will be seen that in March 1876 the survey of the Pooniar had been completed, that the undersigned inspected the river throughout and issued instructions for the preparation of the information needed to deal effectively with this river and its affluents, and that since that time but little has been done. The reason of this is that the establishment then available for continuing the investigations had to be diverted to more pressing work and was then

No. 3. S.A dated 7th March 1876.

From District Engr. No. 40. 30th May 1876
— Chief Engineer for Irrigation to Chief Engineer P.W. No. 2. S. W dated 8th July 1876.
To Dist. Engr. No. 1095 - 19th July 1876.
From —do:— No. 98 - dated 24th —"— —"—
To —do— No. 175. A. 2nd Augt. —"—

then transferred from the District, and the District Engineer has not been able to supply its place.—

Fort St. George
24 January 1877

H. Hunt Collins
Lieut. Col. R.E.
Chief Engineer for Irrigation.

To

The Secretary to Government
P.W.D.

1877. P.W.D.
31 JAN 77
No. 985

From
The Chief Engr. for Irrgn.

31-1-77

Dated 24 Jany. 1877.
Despt. do —do—

Encls 2

No. 69-W.

Poonias Embankments.
South East District. — Forwarding for information, papers regarding the state of the investigations connected with the —.

Public Works Department.

No 577

PROCEEDINGS of the MADRAS GOVERNMENT.

UNDER date the 21 Feb 77

Read the following :—

From the Chief Engr for Irrgn
Letter No 69 W 24 Jany 77

The information contained in the foregoing papers will be communicated to the Consulting Engineer for Railways with an intimation that it will not be practicable for some time to come to detail an officer for the resumption of the investigations of the Pooniar.

2. It is observed that the District Engineer is on the look out for a Surveyor capable

capable of carrying on
the work under instruc-
-tions.-

44.3d/1

21st Sept 1876 No 2832
13 Nov: 1875 " 3248
23 Jan " " 190

Dr South West. r
Ch. Insp. Irrig. r
Cons. Engr Sandy Ps.

Rec'd 8-3-77

Ellis

Ltr 17.2.77 Or. 20-217

Govt. of {1877} Madras.

PUBLIC WORKS.

To The H. S. South Arcot

Dated

Issued

Recd. Encl.

G. O. 21st Feb. 1877, No. 577

Nos. 496-497

Poonian Embankment

South Arcot Dt. — Re information contained in the letters relating to the survey level of the —, asked to be communicated to the consulting Engineer for his observations.