

(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.	430	Press
		<u>Mis.</u>
Dated	12-2-	18

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17

*Proceedings of the Madras Government, Public Works Department,
12th February 1864.*

No. 249. Read the following Proceedings of the Board of Revenue, dated 9th December 1863.

Read the following :—

Read the following letter from E. B. FOORD, Esq., Acting Collector of Kistna Division, to W. HUDLESTON, Esq., Secretary to the Board of Revenue, Madras, dated Masulipatam, 19th November 1863, No. 255.

Sir,

1. With reference to the Board's Proceedings* of 13th July last communicating Order of Government dated 8th idem

* Enclosures returned viz. :—
1 Report from District Engineer to the Deputy Chief Engineer Northern Circle, dated 6th January 1863, No. 143, with three enclosures.
* 1 General Plan of Delta.
* 2 Sections, Masulipatam and Guntoor Deltas.
* 1 Sketch showing probable area of irrigable land.
1 Report from do. to do. dated 5th February 1863, No. 160, with enclosures.
7 Estimates.
3 Specification Reports.
* 3 Plans.

NOTE.—The Plans, &c., 7 marked thus * forwarded in a separate case by Banghy.

No. 1,801, I have the honor to report that on receipt of the Board's orders, the details of the Plans proposed by Colonel Anderson for completing the system of canals in the Kistna Delta were communicated to the Tahsildars of the Delta Taluqs, and they were called upon to give their opinions, and to prepare Statements showing the probable increase of cultivation that might be expected.

2. Replies have been received from all, with the exception of the Tahsildar of Reipilly, who has been for some time very unwell.

3. For that Taluq therefore a Statement has been prepared in this Office.

4. The result of the information received is that about 2,00,000 Acres both Government and Zemindary, yielding an annual income of ten lacs of Rupees, would be rendered capable of being brought under cultivation if the proposed works were carried out.

Names of Taluqs.		Probable increase of wet cultivation under the proposed new Channels.	
		Acres.	Rs.
Masulipatam portion.	Gudivada Taluq ...	34,000	1,20,000
	Bander do. ...	13,000	38,000
	Nuzid Division ...	5,000	12,000
	Total...	52,000	1,70,000
Guntoor portion.	Bapatla Taluq... ..	60,000	3,30,000
	Reipilly do. ..	88,000	5,00,000
	Total...	1,48,000	8,30,000
Grand Total...		2,00,000	10,00,000

5. The figures entered in Columns 2 and 3 are of course only approximate, but I am of opinion that they are much within the mark. Supposing the extent of land entered, be brought under cultivation, the estimated cost of the proposed works, viz., Rupees 30,92,205, would be recovered in three years.

6. The completion of the works as well as the increase of cultivation will of course be gradual; but I have no apprehension that the population of the District will be insufficient to take up for cultivation all the available lands in the Delta Taluqs.

7. Colonel Anderson proposes to dig side channels along the main canals, using the former for irrigation purposes and the latter for navigation. A good deal of the silt which now collects largely in the main canals would then be carried off by the side channels, and the great difficulty and expense now experienced owing to the canal being used for both purposes, would be obviated.

8. Judging from the large increase in wet cultivation and the security of the revenue derivable from that source, owing to the irrigation channels *already excavated*, there can be no reasonable doubt that the *completion of the system* will be attended with highly remunerative results.

1. Ordered to be submitted to Government with reference to Government Order dated 8th July 1863, No. 1,801, Public Works Department, *Public*.

2. The Board are not in a position to test nicely the Acting Collector's Estimate of probable results from the further extension of the Kistna system of irrigation, nor indeed is such an attempt called for. But they have no hesitation in stating their opinion that the works contemplated in the papers communicated to them will prove amply remunerative to Government, and will be highly beneficial to the people.

(A true Copy and Extract.)

(Signed) W. HUDLESTON, *Secretary*.

Read the following letter from Major J. C. ANDERSON, R. E., District Engineer Kistna, to Lieutenant-Colonel S. O. E. LUDLOW, R. E., Deputy Chief Engineer, Northern Circle, dated Bezoarah, 6th January 1863, No. 143:—

SIR,

1. In compliance with the request conveyed in your Memorandum, No. 275, dated 8th August 1862,* I have the honor to furnish you with my general views as to the best mode of completing the system of Canals in the Kistna Delta.

* Statements.
And to paragraphs 4 and 5 of Secretary to Government of India's letter, No. 2708 dated 16th July 1861, Government Order No. 1861, dated 6th August 1862.

2. I have endeavoured to place you in possession of all the information that you can require, to enable you to form an unbiased opinion for yourself, by displaying in a general view for each of the sections of the Delta, the whole of the principal channels, whether sanctioned or in contemplation both in plan and section;† and showing the present size of each channel, and the extension which will be required to irrigate the whole Delta.

† 1 General Plan of Delta.
2 Sections, Masulipatam Delta.
3 Do. Guntur Delta.
4 Sketch showing probable area of irrigable land.
(Forwarded in separate case by Banghy.)

3. As any calculations regarding the ultimate dimensions of the channels must be based on the assumption that a certain proportion of the whole area capable of being commanded by the Anicut channels, will be taken up for wet cultivation, I may remark, that in the absence of any correct data—which can only be obtained when the Revenue Survey of the District is completed—I have assumed that about half the actual area will be taken up, leaving out of the question, a large tract of country which is covered by the tidal inundation, and also allowing a liberal deduction for tracts of sandy soil on a high level; which though capable of being reclaimed in the one case, and fertile in the other, if irrigated by the Kistna water, can only be brought within the influence of the channels partially at the best, and then at a much greater proportional expense than the rest of the Delta. The limit to which the irrigation of such lands should be taken into consideration at present, can only be judged approximately; and it may be sufficient to note, that my calculations will be open to correction and revision by the Revenue authorities, who will have better means than myself for arriving at accurate results.

4. For the present, taking half the actual area of the Delta, after excluding some of the larger swamps and sandy ridges near the sea, I make out that about 2,70,000 Acres of land may be irrigated in the Masulipatam Delta, and 2,30,000 in the Guntur Delta, in all 5,00,000 Acres, or about four times the area at present under wet cultivation.

5. The main Channel from Bezoarah breaks into two branches, at the distance of 900 yards from the head sluice, one branch runs towards Ellore and the other to Masulipatam, and from thence all the other branches and channels required for the irrigation of the Delta to the east of the Kistna are opened.

6. The irrigation of the Delta may be equally divided between the Ellore and Masulipatam Canals. Allowing two cubic yards per hour per Acre, each will require a width at head of 120 feet, which will have to be increased up the point from which branches are thrown off, as the depth of water at the latter will be less than that at the head.

7. The first branch, "Ryves' Channel," of the Ellore Canal opens at the eighth mile. The width* of the Canal will there have to be 150 feet.

* The widths mentioned in this and subsequent paragraphs, are the widths of bed or sole of the channels.

Ryves' Channel will require to be enclosed to a width of 100 feet for the first 7½ miles, fall 7 inches per mile. A branch 19 miles long which runs to Gudevada will require a width of 32 feet at head, gradually reduced to 18 feet at the terminus, fall one foot per mile, with a drop at the fifth mile of 4 feet. Below the head of the branch there will be a Calingulah with a drop of 4 feet and the width from thence to the Pullairu will be 75 feet, fall 7 inches per mile.

8. The head of the Pullairu at the 12th-13th mile on the Masulipatam Canal will have to be enlarged to a width of 60 feet, fall rectified to 7 inches a mile. A Calingulah will have to be constructed at Wezoor with a drop of 5 feet, and the width of the Channel where it is joined by Ryves' Channel will be 50 feet. Beyond this, the united supply of the two Channels will require a width of 110 feet reduced to 90 feet at Pamurru, and to 75 feet at the point where the proposed Channels to the Oopputair and to Buntumilly branch from it. The fall throughout will be 7 inches a mile, with an additional drop at Pamurru of 2½ feet.

9. The Pullairu, as explained in former reports† is admirably suited to act as a main irrigation channel. It runs, as it were, on a ridge, the country falling to the north and east on one side as far as the Colair Lake and Budemair, and on the other, to the swamps bordering on the sand ridges along the coast.

10. But it is too deep at present to allow of its irrigating the land near it, and the fall is so great, as to impede the entry of the water into the minor channels, which ought to have the same velocity, and consequently from their offering a greater proportional resistance to the flow of the water, a higher rate of fall than the main channel. The rectification of the slope of the bed now proposed, will I conceive, render the Pullairu perfect as an irrigation channel. Though the enlargement required is very considerable, it will be accomplished at a moderate expense, considering its length, and the quantity of water it will carry.

11. The following are the principal subsidiary channels which have been carried out or are proposed from the Pullairu.

Sanctioned in G. O. No. 3,028, 17th December 1862.	Channel from Pamurru to Gudevada 6½ miles 9' 6" wide, fall 8 inches per mile.
Do. do.	Do. from Chitrum parallel to the above, 4½ miles, 9' wide.

* 17½ miles sanctioned. Do. do.	Channel to the Oopputair 28 miles width 30', fall 5 inches per mile for 17½ miles, 3 inches per mile for 10½ miles.
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Sanctioned in do. do. 10th June 1863. J. C. A.	Channel to Buntumilly 14½ miles, 32 feet wide, fall 6 inches per mile with a drop of 4 feet at head.
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Old Channel of the Pallairu and Tadecherla cut 11½ miles long.

Old Channel of the Pallairu at the point where it is intersected by the Bantumilly channel to the Oopputair 18 miles.

Butlerkodu at Pamurru 6 miles, fall 8" per mile, width 20'.

Proposed channel from Pamurru to Masulipatam, 20' wide fall 7 inches per mile.

12. The probable acreage of wet cultivation under each channel is shown in a separate Memorandum and sketch.

13. Returning to the Ellore Canal, which as above explained will require a width of 150 feet at the head of Ryves' Channel, I should mention that Captain Ryves, instead of widening

the Ellore Canal, intended that a new channel should have been excavated from the bifurcation of the Ellore and Masulipatam Canals at Bezoarah, and that the existing head of his channel should be used as an escape to the Ellore Canal. There are two important advantages which would be gained by excavating a new channel. It could be carried on without interruption throughout the year, whereas the Ellore Canal can only be enlarged below the water level during two or three months in the year, when the Canal is closed; and there would be facilities in regulating the supply of water, which would not exist, when the head sluice is at a distance from the river. But as regards expense, I have found by a detailed Estimate that the earthwork alone of a new channel would cost about half a lac of Rupees more than the proposed enlargement of the Ellore Canal, and as considerable additional expense would have to be incurred in compensation for land, destruction of No. 6 Trunk Road for several miles, and on masonry works, I have no hesitation in recommending the enlargement of the Ellore Canal in preference to a new head to Ryves' Channel.

14. The width of the Ellore Canal from the 8th to the 11th mile will have to be 60 feet, and from the 11th mile to Ellore, it is proposed to allow a width of 54 feet.

15. At the 11th mile at Caserapilly there is a lock to connect the Canal with the Budemair and a supply Calingulah. From Bezoarah to this point a surface fall of from 5 to 6 inches a mile, will be generated, but along the remainder of the Channel to Ellore, a distance of about 30 miles, the fall of bed is only $\frac{1}{2}$ an inch per mile, and the surface fall cannot be much more.

16. This portion of the Canal should I think be retained for Navigation, as far as possible. Irrigation cannot be prohibited entirely, or at least without great loss, as the supplies of various important tanks have been interfered with, and an equal quantity of water must be given from the Canal. But the greater part of the land between the Canal and the Budemair, may be irrigated advantageously by a branch from Caserapilly. With a fall of 7 inches per mile, it will command an extensive tract of country, and will form a most favorable line of Channel, in all respects but one, and on that it must be allowed it is quite the reverse. It crosses the drainage of the country to the northward, and the expense of the masonry works which will in consequence be necessary, will be very considerable. The land which this Channel would irrigate is mostly Zemindary, and the principal Zemindar (Noozied)* has up to this time flatly refused to enter into any agreement to pay water cess for the lands taken up for wet cultivation, but I believe his objection will be over-ruled after a time; at least some of his Ryots have expressed a strong desire to enter into an agreement on their own behalf.

17. The Calingulah at Caserapilly supplies the Badenair, which again throws a supply into several Channels near the Colair Lake, some improvement to which is now being carried forward, and which will require little more to enable them to irrigate all the land between them and the Lake.

18. Before quitting the subject of the Ellore Canal, I would beg to point out that the above works would not, in my opinion, be all that are required to render it perfect. What I have described is an enlargement to 120-150 feet for 8 miles, to 60 feet for 3 miles further, and to 54 feet for 30 miles. If a heavy fall of rain were to occur to the southward, the stoppage of the supply to Ryves' Channel might be required, before a corresponding quantity could be shut off from the river at Bezoarah. A large body of water would then have to pass into the contracted Channel, and it would evidently be liable to rise to a dangerous height if measures were not taken to prevent it by constructing a powerful escape either in the south bank of the Ellore Canal, or in the east bank of Ryves' Channel. The latter would probably be the preferable of the two plans as the labor of closing the Head sluice would be saved.

19. The Masulipatam Canal will require a width at Head of 120 feet, and if no branch were opened for the first 13 miles it would require a width of 150 feet at the 13th mile. I estimated for this in the first instance, and for a Channel in continuation to the 18th mile along the west

bank of the Canal which I then proposed to break into two branches, one to run to the east bank of the river and the other to run parallel to the Canal to Masulipatam; but finding that the cost would be very great, I had a line surveyed from the 4th mile† to Wullurpallum on the Kistna, and ascertained that a saving of about 90,000 Rupees would be effected by drawing all the water required for the country to the west of the Canal from this point, and by confining the enlargement of the Canal itself from the 4th to the 13th mile to the width required for the supply of the Pullairu only, viz., 60'. Captain Ryves had already proposed a new Channel to the west of the Canal from the neighbourhood of the Bezoarah Head sluice, but the river is too near the Canal to allow of a new head being opened nearer Bezoarah than the 4th mile. The project now recommended may however be considered only a modification of that proposed by Captain Ryves.

20. As regards the Masulipatam Canal from the 13th mile at Kankipad to its terminus at Masulipatam Fort, a distance of 35 miles, I would propose to retain it exclusively for navigation. As the fall from Lock to Lock is only about 3 inches per mile while that of the proposed Channel is 7 inches, it could easily be shown that the expense of enlarging the main Channel to a width sufficient to enable it to carry the supply required for the irrigation of the whole of the country between the Canal and the river, would be very much greater than that of the proposed Channel. Other reasons might be adduced against the former such as silting owing to insufficient velocity when the water is held up at the Locks, or inconvenience and delay to upstream navigation when the velocity is maintained to the full amount due to the fall. I am prepared to enter at length into the subject should it be considered necessary, but I am induced to hope that the importance of facilitating the navigation of this valuable line of communication, both as regards the convenience of troops and passengers as well as that of general traffic, will be thought conclusive as to the advantage of the course now recommended.

21. One side Channel would run along the west bank of the Canal from the 5th mile below Kankipad to Masulipatam, and another along the east bank from the Pullairu at Pamurru also to Masulipatam.

22. It will be observed that I propose to use the existing Calingulahs adjoining the Locks for regulating the fall along the proposed west side Channel. I should also remark that the Channels will be chiefly within embankments, that only one embankment will be required for each, that of the Canal forming the other, and also that the clearance of the silt now accumulated in the Canal will go a great way to form the embankment, without any extra expense beyond that caused by the conveyance of the earth to an additional distance of 15 to 20 yards.

23. I have not thought it necessary to make any special provision for the irrigation of Divi. The project for conveying a supply to it by means of an aqueduct across the eastern arm of the Kistna has not been matured, and some years must elapse before it can be required to be put into execution. In any case, I would propose to confine the irrigation of Divi to the land under the numerous existing tanks, the supply to which is now very precarious, and as they could be filled during the freshes it would only seem necessary that the eastern bank Channel should have depth sufficient to carry on whatever extra supply might be required for the purpose. I have besides allowed a somewhat greater width to the eastern bank Channel than would probably be required for the irrigation of the land to the north of Divi.

24. It has been explained that the Ellore and Masulipatam Canals branch off from the main Channel at the distance of 900 yards from the Bezoarah Head sluice; and as each branch is designed to have a width of 120 feet it would be supposed that the main Channel would require a width of about twice as much; but there would be serious difficulties in the way of effecting such an enlargement; and after careful consideration, and a minute survey of the ground, I have come to the conclusion that it would be best to limit the width to 180 feet. Supposing the depth of water at the Head sluice to be 8 $\frac{1}{2}$ feet, it would be reduced at the distance of 900 yards to 8 feet, and though a loss of 3 inches is not unimportant, it is preferable to in-

* The Zemindar has since expressed his willingness to be responsible for the payment of the water rate from all Channels excavated on the application of the Ryots.—J. C. A. 10th June 1863.

curring the expense of enlarging the Canal further. The depth of cutting is upwards of 20 feet and as the village lies within a few yards of the east margin of the Channel, all the earth excavated on that side must be carried across the Channel and over the western embankment. On the west side again, the space between the Canal and the river is so limited that the enlargement cannot be carried on wholly from that side. Even with the proposed width of 180 feet, a portion of the Masulipatam and Hyderabad road will be encroached upon, and also a considerable number of houses and although the expense of altering the road and compensation will probably not exceed 5,000 Rupees it will be necessary torevet the banks of the Channel with rough stone to an angle of 45°, otherwise a considerable additional space would have to be taken up.

25. The Head sluice ought properly to be enlarged also, but peculiarity of site will prevent this being done, unless to a very moderate extent. The present water way is only 90 feet in 15 vents of 6 feet each, and if no enlargement were effected a loss of about 9 inches of head would be occasioned. But several additional vents may be opened eventually, though even these will not be required for some years, and as the expense will not be considerable it would seem unnecessary to take them into account at present. I may remark that however inconvenient it may be to sustain any loss of supply when the river is low, it is absolutely necessary to keep the dimensions of the Head sluices opening from the river within moderate limits; as during a high fresh, there is an enormous pressure against the shutters, and entangled as they are liable to be, with brushwood, it is found impossible to close them, and of course the greater the number of vents, the greater the quantity of water that will enter when not wanted. As a remedy to this, I propose to have a double set of shutters, which would not be expensive; but even with them, it would not be safe to shut out the water during a high fresh beyond a certain amount, as the pressure of the water in the rear of the head sluice, would be liable to breach the bank between it and the Canal. The river in an extraordinary flood will rise to a height of 23 or 24 feet above the sole of the channel, and though the thickness of the embankment between them is upwards of 100 feet the water oozes through it. It is probable that this might be put a stop to, by the substitution of concrete for the natural soil.

23. As regards the Anicut, I think some additions are necessary. In calculating the supply of water available for the channels during the irrigation season, my predecessors and myself have assumed that the river does not fall below 3 feet on the crest of the Anicut, during that period, or at least for any considerable time. It has been assumed that if it falls below that height occasionally, it also rises above it, and that on the whole this may be taken as the supply available on the average, and that it may therefore be taken as the standard on which all calculations should be based. But in fact, the river is liable to fall to 2½ feet or even less on the Anicut* and to retain that height for a number of days together in the latter half of October, and beginning of November, when in the event of a failure of the periodical rains, the demand for water for irrigation is perhaps higher than at any other time. If there is a good fall of rain at that season, a fall in the river is of no consequence; but if there were to be an entire failure of the North-east monsoon, and such a contingency is far from improbable, the crops would be in the greatest danger, though a splendid body of water might be flowing over the Anicut. The floors of the head sluices at Bezoarah and Seetanagram are 5½' and 6' below the crest of the Anicut and the standard of 3' on the latter would give depths of 8½' and 9' respectively; but if the river falls below this, the District Engineer is powerless to raise it a single inch. The Anicut could not, with safety, be raised; and the only way of effectually guarding against such a catastrophe as the loss of a great part of the wet crops, is to establish a control over the river when it falls below the required level, by fitting up piers and planks along the crest of the Anicut. It would be a more expensive operation than a similar arrangement on the Godavery Anicut, as the current in the Kistna is more powerful. Still I would strongly recommend it the more so as the subsidiary works that it would entail, would add materially to the strength and general efficiency of the Anicut. The cost of the piers and planks, of cut-stone facing along

* See copy of Register of the Kistna river forwarded with District Engineer's letter No. 189, dated 14th January 1862.

the crest of the Anicut 21' wide, of an addition of 30 feet to the width of the rough-stone apron, and of an enlargement of the Seetanagram under-sluice would amount to Rupees 1,50,000, the expenditure of which would have to extend over a period of several years.

27. I proceed to describe what remains to be done in the Guntur Delta, or the portion of the Delta to the west-ward of the Kistna. 2,30,000 Acres, as I have already mentioned, is the probable maximum area to which water will have to be supplied,

28. The Main channel from Seetanagram will have to be enlarged to a width of 200 to 235 feet for the first 8 miles. It is now being enlarged to a width of 96 feet, and it will be several years' before any thing further is required, and instead of enlarging the channel to the enormous width above mentioned it will probably be found advantageous to open a new channel from the flank of the Anicut, to run round the east side of Seetanagram hill and to rejoin the main channel at the 8th mile. At present there is no room for a channel to the east of the hill, but if stone required for the Anicut and other works is quarried at this point, in the course of a few years, sufficient space would be obtained. Whether it is carried out or not, no existing work would be interfered with, and the comparative advantages of the two lines can be best determined when the execution of one or the other is decided on, at present I have confined myself to drawing up an Estimate of the probable cost of enlarging the existing channel to the width specified.

29. At the 8th mile of the main channel, the western bank channel opens out. It will eventually have to be enlarged to a width of 75 feet as far as Kollur a distance of 21 miles, where a calingulah is proposed for construction with a drop of 4 feet. From thence to Vellatur the channel should have a width of 60 feet, from Vellatur to the 31st mile a width of 45 feet afterwards gradually reduced to the terminus at the 47th mile. A calingulah is proposed at Vellatur with a drop of 2 feet and another below the head of the Yeskapilly channel. The fall of the bed of west bank channel is designed at 7 inches per mile throughout, excepting for 7 miles from the head where it will be 6 inches. The fall allowed in the original design is very irregular, varying from 6½ to 14 inches a mile, and no calingulahs are provided. I think these works essential for the proper regulation of the supply, but they will interrupt the navigation, and it has to be decided, whether locks should be added. I would not recommend their construction, in the first instance, either on the west bank channel or on the corresponding channel to the east of the Kistna excepting at the heads, where as there is no fall the expense is inconsiderable. This would furnish a navigable channel for 21 miles on western bank channel and 20 miles on the eastern bank channel. The original design provides for locks into the river at the extremities of the channels, but owing to the distance to which material would have to be conveyed for building them, they would be very expensive, and I would recommend the amount of the Estimates being appropriated for the construction of the proposed calingulahs. There is at present very little traffic on the Kistna, and though the navigation by the channels would be superior to that of the river, still it is practicable enough on the latter. If it were not, there would be no object in tailing the eastern and western bank channel into it at a considerable distance from the mouth.

30. The principal branches of the western bank channel are the Vellatur channel and Yeskapilly channel. Both admit of being much improved. The former is a natural channel which formerly carried off the flood water from the river, and it has still to receive the drainage of the country to the northward. The bed is too deep, but it cannot be raised until arrangements are made for carrying the principal part of the drainage water under, instead of into, the channel. The Yeskapilly channel should be enlarged to a width of 30 feet and extended to Nizampatam. Notwithstanding the present imperfect condition of the western bank channel and its branches, it has proved the most remunerative work in the District. Up to the end of 1860-61, 36,702 Rupees had been expended on the channel and 15,975 Rupees on minor works, while the net increase of revenue derived from the wet cultivation up to the same year amounted to Rupees 95,123, and the increase in 1860-61 alone to Rupees 36,987, and in 1861-62 it was much more. Some improvements are now being carried forward, and a rapid extension of the cultivation may be anticipated. I hold in my hands a copy of a letter from the Tahsildar of Reipilly guaranteeing

an increase of 25,000 Rupees annually, for an expenditure of 10,000 Rupees, which I mention as an indication of the anxiety displayed by the Ryots to extend their cultivation. There are vast tracts of ground near the sea, which, from the soil being either pure sand or impregnated with salt, are useless in their natural condition, but with the alluvium from the Kistna water they become more fertile than any other.

31. To return to the main channel; an enlargement to a width of 180 feet will be required from the 8th to the 13th mile, from which point the Commamoor channel is opened, while the main channel proceeds in nearly a straight line towards Nizampatam. I would propose to adopt the same course with it as that recommended for the Masulipatam canal, that is, I would retain the main channel for navigation only, and carry on the irrigation by means of separate channels parallel to the canal on the east and west sides. Such channels have already been excavated, but eventually a considerable enlargement will be necessary, and the embankments should be much higher than they are at present, in order that a greater depth of water may be admitted; and several Calingulahs are required for regulating the fall. It is proposed to give the east side channel, a width of 42 feet at the head, and of 30 feet and 18 feet at Kútchipúdy and Yintur locks. The west side channel would require a width of 24, 18, 12, at the same points.

32. The canal is completed as yet only as far as Yintur, or about 10 miles from Nizampatam. It will be some time before it is opened throughout as the tidal lock is not yet commenced, and I believe that an additional lock half way between it and Yintur will be necessary.*

33. The Commamoor Channel will eventually have to be much enlarged. I compute that about 100,000 acres may be irrigated by it. It will have to be enlarged to a width of 120 feet for 8 miles from its head, to 100 feet from the 8th to the 23rd mile, and to 75 feet from the 23rd to 28th mile.

34. At present the channel extends to a length of 28 miles; but a further extension of 9 miles (up to the village of Kunkalamurrú) is in progress, and it is proposed to carry it eventually as far as the salt creek at China Ganjam at the distance of 51 miles from the head. The fall of the bed will be 6 inches per mile throughout its whole length interrupted by only one break a drop of 2 feet at the 8th mile. There is also a fall of 4½ feet at the head; and to render the channel navigable a lock would be necessary to connect it with the main Canal. There are 3 slight platform Bridges across the channel, which would also have to be removed, before it can be thrown open for navigation. As explained on a former occasion,† I would propose to abandon the high level canal which was designed to run from the 7th mile of the main channel, past Guntur to Inkole and China Ganjam, and to use the Commamoor Canal instead as a main line of communication, to be connected eventually with the East Coast Canal, should that work be continued into this District.

35. In the first instance, it would suffice to make the Commamoor channel navigable during the irrigation season, that is from June till December, but eventually, locks might be added if necessary to adapt it for still water navigation, for a longer period. From the experience that has been gained from the high level canal to the east of the Kistna, it may be concluded that the expense of constructing a similar canal to Inkole and China Ganjam, would be very much greater, than was anticipated when the design was prepared. The Commamoor channel will also have to cross the drainage of the country to the north and west, but several of the most important drainages have already been disposed of; and as it will in any case be continued to China Ganjam, it may be made to answer every purpose that could be served by the high level canal.

36. The principal drainages which cross the Commamoor channel are the Guntur Nulla, the Nucka Vagu, the Nullamudda and the Purchur Vagu. The first is disposed of by an escape at the 8th mile near the village of Jaggurulamudy, the second by an aqueduct (now under construction) near Kollemula, and a channel from it into the Tungabudra; the Nullamada by means of a Calingulah of 150' water way. The last named stream discharges into the Bapetla

tank, the largest in the District, and the surplus from it is disposed of by two Calingulahs of 120' and 90' water way in the east and west flanks of the tank. The water from the first passes by a circuitous route into another tank, and that from the other into the large swamp called the Romparu which runs along the foot of the sand ridge extending from China Ganjam to the Tungabudra. The Purchur Vagu after supplying the Kinkalamurru tank also passes into this swamp, and several other minor drainages have the same termination. The fall of the bed† of the swamp is insufficient to allow of the free exit of the water to the salt creek on the west, and it is impeded on the east side by artificial works.

† About 3 inches per mile.

37. The soil in the swamp is as fertile as any in the District, and without exaggeration, it may be said that almost every acre of it would be taken up for wet cultivation as soon as the drainage water should have been cleared off. The Commamoor channel if continued to China Ganjam will intercept the minor drainages, and thus free the swamp from a considerable quantity of water. What is chiefly wanted is some other outlet for the Nullamudda and Purchur Vagu. It is proposed to turn the former wholly over the eastern Calingulah of the Bapetla tank, which would be enlarged for the purpose, to close the western Calingulah, and to carry the surplus water by an embanked channel to the sand ridge, end across it to a low tract of land, or Vada near Parali, from which it would find a vent into the Nizampatam creek. The Purchur Vagu might be carried across the sand ridge to the west of Bapetla in a similar manner; and a longitudinal drain of considerable capacity would then suffice to carry off the remainder of the water in the swamp.

38. These measures may be carried out gradually. The first, that relating to the Nullamudda is of the most immediate importance, and if executed in conjunction with the extension of the Commamoor channel, will produce an increase in the area of wet cultivation of 18,300 acres. This is no approximation. The Tahsildar has furnished a detailed statement aggregating that amount; and the Ryots are prepared to enter into an agreement for their several shares, and to make up a sist amounting on the whole to Rupees 91,500. This, though a very satisfactory proof of the confidence of the people in the Delta Irrigation system, is but a fraction of the returns that may be anticipated from the complete drainage of the Romparu.

39. Should the high level canal be abandoned, the portion already partly executed (about 7 miles) may be utilized as an irrigation channel.

40. The above description will, I trust give you a tolerably good idea of what remains to be done to the Delta. I propose to have two main lines of navigation in the Masulipatam Delta, namely, from Bezoarah to Ellore and from Bezoarah to Masulipatam and one secondary line from the Masulipatam canal, to the Oopputair, with a branch to Buntumilly; and two main lines in the Guntur Delta, from Seetanagram to Nizampatam and from the 13th mile on that line to China Ganjam. The eastern and western bank channels will also be navigable for a distance of 20 miles from their heads. I think that a navigable channel from Nizampatam to the Kistna on the east and to China Ganjam on the west may also be found feasible at a moderate outlay, but I am unable to enter into this project at present. With regard to the whole of other works recommended, however, they have been designed after a careful examination of the levels of the country, and I shall shortly be prepared to furnish you with detailed Estimates of their probable cost. The Estimates for the principal works have already been drawn up, and I would beg to annex a list of them, from which you will learn that I compute the probable required expenditure on all works in the Masulipatam Delta at Rupees 16,17,000 and that in the Guntur Delta at Rupees 14,75,000. The expenditure on minor works can only be judged approximately, as they cannot be designed until the Ryots come forward to take up land for wet cultivation.

41. The works may be classed into three sections, viz:—

- No. 1. Ellore Canal Ryves' channel and branches. Pu'lairu and branches.
- No. 2. Masulipatam canal, eastern bank channel, channel to west of Masulipatam channel.
- No. 3. Channels in Guntur Delta.

42. Should it be considered that the scheme of irrigating 5,00,000 acres is on too large a scale, it could be cut down by reducing the size of the channels comprised in section 2; and in any case, as the greater portion of the land which will be influenced by them is Zemindari, it would seem desirable that the other two sections should be pushed on with fast, though I would not recommend the entire postponement of the other.

43. I would urge that in the first instance the Estimates be submitted for the channels enumerated in the several sections, and that on their being approved of, sanction should be granted for their being carried out as a rule to half the extent contemplated eventually. However liberal the allotment provided by Government may be, I do not anticipate that the District Engineer will be able to expend much above 2½ lacs of Rupees per annum on new works, so that about 8 years would be occupied in expending the 20 lacs which I estimate is the amount required to build the necessary masonry works and to enlarge the main channels along one bank only. By adopting this procedure the Government would not commit themselves to carry out more work than would be certain to prove highly remunerative.

44. By the expiration of the period in question, and on a completion of the works to the extent proposed, it could be judged from their effect in increasing the revenue, whether the channels should or should not be enlarged to the extent required to enable them to irrigate half a million of acres.

45. Owing to the present incomplete state of the various works, and to the use of the Ellore, Masulipatam and Nizampatam canals for the double purposes of irrigation and navigation, a great portion of silt which enters from the river is deposited in the main channels. It is desirable that every effort should be made to prevent this; and, instead, to throw the silt as much as possible into the minor branches and channels, and, again, by means of them, to the fields, when it would be productive of good rather than harm. It is not only more expensive to clear the main channels than the small cuts; but deposit of silt in the former necessitates their being closed for three months in the year; at a time when water for drinking purposes is liable to be very scarce in most parts of the Delta. It would be impossible to prevent silting entirely in the main channels, owing to the water which enters from the river in high freshes having a higher velocity and carrying a larger proportion of sand and alluvial matter in suspension, than the stream in the canals can carry forward: further the silt due to the amount of water expended at the locks when still-water navigation might be commenced, would be deposited immediately below the locks. But making due allowance for accumulations from the above and other causes, I am sanguine that, with the assistance of a dredging machine in each of the three principal canals, the main lines may eventually be kept in working order for eleven months in the year instead of nine, as at present.

No. 250.

ORDER THEREON, 12th February 1864, No. 430.

1. In his letter No. 143, dated 6th January 1863, submitted with the Proceedings of the Board of Revenue above recorded, the late District Engineer of the Kistna shows the progress that has been made with the Kistnah Anicut irrigation and navigation project, and, in accordance with the requisitions made upon him, describes in the fullest and clearest detail the nature and extent of the works that are still required to perfect certain lines of navigation and to supply water for the thorough irrigation of the Delta.

2. Taking the total area of the Kistna Delta to be one million of Acres, Lieutenant-Colonel Anderson assumes that only one-half consists of cultivable land, fitted by soil and elevation for being brought under wet cultivation by means of the Anicut at Bezoarah, of which half about one-fourth part only is as yet watered. Of these half million irrigable Acres, he assigns 2,70,000 to the Masulipatam side of the river, and 2,30,000 to Guntoor, and allowing 2 cubic yards per Acre per hour as the quantity of water required in those Districts for a rice crop,

he calculates that the bottom width of the upper portions of the channels to deliver the necessary quantity on each side of the river must be 120 feet, and he shows that, as the surface fall in the channels when they are full during the cultivating season is greater than the slope of their beds, their widths must be gradually increased to as much as 150 feet towards the points where the first branches take off, and that all these branches, as well as the main channels, require great enlargement, and to have the fall of their beds rectified. He explains the inadequate capacity of the channels, as they now exist, for the conveyance into the Delta of the quantity of water for which pressing, and yearly increasing demands are made, and suggesting some additions to the Anicut itself to improve the supply, he conclusively shows that to give full effect to that work for the benefit of the people and the augmentation of the revenue, a further outlay on enlarging, improving, and extending channels must be incurred of Rupees 30,92,205, of which Rupees 16,17,166 are required to be spent in Masulipatam, and Rupees 14,75,039 in Guntoor, in addition to the aggregate of Rupees 24,42,550 already expended on the general scheme up to the end of 1862-63.

3. The extent of land brought under irrigation up to that date is stated at 1,90,000 Acres, which, divided into the expenditure give 12-14 nearly as the capital sunk per Acre; adding to the past expenditure the Rupees 30,92,205 which the works still require to be laid out on them to bring the whole 5,00,000 cultivable Acres of the Delta under irrigation, the average cost of watering each Acre will be not more than Rupees 11. If these calculations be at all correct, and there is no reason to believe that they are exaggerated, there can be no doubt that, beneficial and remunerative as the Kistna works are in their present unfinished state, they will be much more so when extended to completion, and that they will return a profit amply sufficient to justify the requisite expenditure upon them. The Government is satisfied that on financial grounds alone, if on no others, any outlay that may be required to extend irrigation from the Bezoarah Anicut to the utmost may be safely incurred, and it will be prepared to take into favorable consideration all such projects as may be submitted by the Superintending Engineer for the progressive development of the entire scheme as rapidly as funds can be made available.

4. As regards the proposed additions to the Anicut of piers between which planks could, when required, be inserted to raise the level of the water and thereby throw a larger quantity into the channels than could otherwise be obtained at those times towards the end of the freshes when the river sometimes falls too low to furnish a full supply with the body of the Anicut at its present elevation, the Government bearing in mind the great height of the work, as well as its peculiarly dangerous situation in a narrow gorge through which the river when in flood rushes with great force, is of opinion that any measures for even temporarily increasing the obstruction now offered by the Anicut ought to be taken with the greatest caution, and it fears that the adoption of the expedient suggested by Lieutenant-Colonel Anderson will not be unattended with risk, even if the work be strengthened as proposed, unless the means of rapidly removing the shutters at a few moments notice, either by day or by night be provided.

5. With a view of avoiding the very heavy expense of enlarging the main channels throughout to a width sufficient to enable them to carry the supply of water required for the irrigation of all the land under their command, and to diminish, as much as possible, the silting that takes place in them in consequence of their very moderate fall, Lieutenant-Colonel Anderson proposes to retain them as almost still water lines of navigation from the sites of the first of the Locks upon them, and from those points downwards to carry water for irrigation in side channels having enough fall to need little capacity, and to create a current strong enough to carry off silt. He further proposes to abandon the channels along the margin of either bank of the river as lines of navigation, except a few miles of the upper portions of each, and to give up the Southern High Level Channel altogether beyond the few miles of it which have been formed, and which he would make use of exclusively for irrigation, substituting, as a line of navigation to the southward, the Cammamour Channel, improved and furnished with Locks, and extended towards Inkole in a direction to meet the Coast Canal, should it ever be constructed. Thus he would have in each division of the Delta two thorough main lines of first class navigation, namely the

12 Proceedings of the Madras Government, Public Works Department,
12th February 1864.

Bezoarah and Ellore Canal and the Bezoarah and Masulipatam Canal to the north of the Anicut, and the Seetanagram and Nizampatam Canal and the Seetanagram and Inkole Canal to the south. 6. By this arrangement even if some of the larger minor channels, such as the Poolauroo, be made accessible to boats during part of the year, the extent to which it was originally intended to provide the means of water carriage throughout the Delta will be considerably circumscribed, but the Government believes that the change is necessary in order to confine, within the smallest practicable limits, the great evil of the excessive deposition of silt which is found to take place in the Kistna Canals, and, moreover, to save the labor and expense of the inordinate enlargement of the channels that is necessary to give them capacity to carry all the water required for irrigation at the low velocity that is indispensable in a navigable canal.

(True Extract.)

(Signed) CHARLES A. ORR, Colonel, R. E.,
Secretary to Government.

To the Board of Revenue.
" Superintending Engineer, 2nd Division.

Exd. T. Dunn.

Revenue Department.

Proceedings of the Board of Revenue
dated 9th December 1863

Read the following

No. 255

From

C. B. Ford Esq.

Acting Collector of District

To

M. Huddleston Esq.

Secretary to the Board of Revenue
Madras

Enclosures returned
with

1 Report from St. Eug.

inver to the Dy. Chief

Engineer M. G. dated

6th Jan'y 1863 No. 143 with

3 Enclosures

1 General Map of Delta.

2 Sections. Masam

and Gunkoor Delta

1 Sketch showing

probable area of irri-

-gable land

1 Report from D. to D.

27th Feb'y 1863 No. 160 with

enclosures

7 Estimates

3 Specification reports

23 Plans

Para 1 With reference to the Board's Pro-
ceedings of 13th July last communicating
order of Government dated 8th Idem 1863,
I have the honor to report that on
receipt of the Board's orders, the de-
tails of the plans proposed by Colonel
Anderson for completing the system
of canals in the Kistna Delta were
communicated to the Tahsildars of
the Delta Talooks, and they were
called

The plans were marked
thus & forwarded in a separate
envelope by Bangalore

called upon to give their opinions, and to prepare statements showing the probable increase of cultivation that might be expected.

2 Replies have been received from all, with the exception of the Tahsil-dar of Reipilly who has been for some time very unwell.

3 For that Taluk therefore a statement has been prepared in this office.

4 The result of the information received is that about 200,000 acres both by government and zemindary yielding an annual income of 10 lacs of rupees, would be rendered capable of being brought under cultivation if the proposed works were carried out.

Names of Taluks		Probable increase of cultivation under the proposed new channels.	
		Acres	Rupees
Sunderbada Taluk		34,000	120,000
Bander De		13,000	38,000
Nuzid Division		5,000	12,000
Total		52,000	170,000
Bapabla Taluk		60,000	330,000
Repalli De		88,000	500,000
Total		148,000	830,000
Grand Total		200,000	10,00,000

5 The figures entered in columns 2 & 3 are of course only approximate, but I am of opinion that they are much within the mark. Supposing the extent of land entered, be brought under cultivation, the estimated cost of the proposed works, Rs. 30,92,205, would be recovered in three years.

6 The completion of the works as well as the increase of cultivation, will of course be gradual, but I have no apprehension that the population of the District will be insufficient to take up for cultivation all the available lands in the Delta Taluks.

7 Colonel Anderson proposes to dig side channels along the main canals, using the former for irrigation purposes and the latter for navigation. A good deal of the silt which now collects & largely in the main canals, would then be carried off by the side channels, and the great difficulty and expense now experienced owing to the canal being used for both purposes, would be obviated.

8 Judging from the large increase in

and will be highly beneficial to the people.

[A True copy extract]

Thos. J. [unclear]
Secretary

To

Colonel G. A. Orr R.E.

Secretary to Government
Public Works Department
with 15 Enclosures & 7 Plans
returned

G. A. Orr

in wet cultivation and the security of
the revenue derivable from that source;
owing to the irrigation channels already
excavated, there can be no reasonable
doubt that the completion of the system
will be attended with highly remun-
erative results.

Hidna District Collector
Kacheriat-Musulipatnam
19th Novr 1863
I have seen
(Signed) C. B. Ford
Ag. Collector.

Ordered to be submitted to Govern-
ment with reference to Government
Order dated 8th July 1863 No. 1801 Public
Works Department Public.

The Board are not in a
position to best nicely the Acting Collec-
tors estimate of probable results from
the further extension of the Hidna system
of irrigation - nor indeed is such an attempt
called for. But they have no hesitation in
stating their opinion that the works con-
templated in the papers com-
municated to them will prove
amply remunerative to Government
and.

2430

Wm
The Clerk Assistant and Register
has been informed that the Excise, unpaid
in his name of this day's date have
been sent to the Court of the District
District.
Geo. D. Allen
Secretary
of the Board
of the
Register

Dec. 8th July 1863 of 155-186
Copy in the letter to England
of 22nd April 1864 of 1864.

Dec 17 1863
No. of your letter of 17th 38
Proceedings of the
Board of Revenue.

Dec 21st 1863
Dec 22nd 1863
Dec 22nd 1863

Submitting
with remittance letter from
the letter of the 18th has
been sent showing that
the completion of the
system of boards, pro-
posed by General Board,
will be attended
with satisfactory remunera-
tion, see file 1863-12

24th January 1864 of 1864 of 1864

1864-12-12

12,430
Circular
Col. Anderson
Public Works Dept
Proceedings of the Madras Government
Under date the 12th July 64.

Read the following
from the Board of Revenue

Submitting with certain
letter from the collector of the
Madras District stating
that the completion of the
system of canals proposed
by Col. Anderson will be
attended with highly re-
sultative results.

Received 9th Dec/63
No.

The works should be pushed on
steadily & as expeditiously as
is necessary to provide water for
cultivation up by Sept.

See remarks *MA*

Pro: of Govt. 1861. of 6th Aug/62.
Memo: - 275. of 8th Aug 1862
Para 4 and 5 of letter from
Govt. of India 2708 of
16th July 1862 - JP
I should wish to see -

In his letter No. 113,
dated 6th January 1863,
submitted with the Proceed-
ings of the Board of
Revenue above recorded,
the late District Engineer
of the District shows the
progress that has been
made with the District
Ancient irrigation and
navigation project, and
in accordance with the
requirements.

Report on

requisitions made upon
him, describes in the
fullest and clearest detail
the nature and extent
of the work that are
still required to perfect
certain lines of navigation
and to supply water
for the thorough irrigation
of the Delta

Taking the
total area of the Mekong
Delta to be one million
of acres, Lieutenant
Colonel Anderson
assumes that only one
half consists of cultivable
land, fitted by soil
and elevation for being
brought under wet cultivation
by

...the ...
...the ...
...the ...
...the ...
...the ...

...the ...
...the ...

by means of the
Anicut at Bozouah,
of which ^{but} about one
fourth part only is
now yet watered. Of
these half million
irrigable acres he
assigns 270,000 to the
Mekong side
of the River and
230,000 to Siamtoor,
and, allowing two cubic
yards per acre per
hour, the quantity
of water required in
those districts for a
rice crop, he calculates
that the bottom width
of the upper portion
of the Channel to
deliver

deliver

deliver the necessary
quantity on each side
of the River must
be 120 feet, and the
shows that, as the
surface fall in the
Channel when the
one full during the
cultivating season is
greater than the slope
of their beds, their
width must be gradually
increased to as much
as 150 feet towards
the points where the
first branches take
off, and that all these
branches, as well as
the main Channel,
require great enlargement,
and

I suppose that a change of slope
would now be impracticable
or very expensive but
6 or 7 inches per mile is a small
fall and in consequence the
channel must be very wide.

and to have the fall
of their beds rectified.
The explanation the inade-
quate capacity of the
Channel, as they now
exist, for the convey-
ance into the Delta
of the quantity of water
for which pressing, and
yearly ~~year~~ increasing
demands are made, and
suggesting some
addition to the outlet
itself to improve the
supply, he conclusively
shows that to give
full effect to that work
for the benefit of the
people and the aug-
mentation of the revenue

of further outlay on
enlarging, improving,
and extending channels
must be incurred of
Rs 30,92,205 of which
Rs 16,17,166 are required
to be spent in Malabar,
and Rs 14,75,039 in
the other parts of the
provinces of Rs 24,42,550
already expended on
the general scheme up
to the year of 1862/63.

The extent of land
brought under irrigation
is that state is stated
at 1,90,000 acres, which,
divided into three por-
tions, give 12 1/2 nearly
as the capital sum
per

It would be desirable that
the Government should ascertain
the correctness of these assumptions
for upon them must depend
the whole of the calculations
as to the section of channels
dimensions of head sluices
in a survey of the
district with proper levels
or contours should be made
with as little delay as possible.

per acre. According to the
present expenditure the
Rs 30,92,205 which the
Government still require to be
laid out for them to
bring the whole 500,000
cultivable acres of the
Delta under irrigation,
the average cost of
watering each acre will
be not more than Rs 11.

If these calculations are
all correct, and
that no more is required
to be done, they are ex-
aggerated, there can be
no doubt that, benefited
and remunerative as
the Kistnah and
are in their present
unfinished state, they
will

will be much more
so when extended to
completion, and that
they will return a profit
amply sufficient to
justify the requisite
expenditure upon them.
The Government is
satisfied that, on
financial grounds
alone, if on no other,
any works that may
be required to extend
irrigation ^{from the beyond limit} to the extent
may be safely incurred,
and it will be prepared
to take into favorable
consideration all such
projects as may be
submitted by the
Superintendent

Superintendent Engineer
for the progressive de-
velopment of the entire
scheme as rapidly as
funds can be made
available.

As regards the
proposed additions to
the Outlet of pier,
between which plank
could, when required, be
inserted to raise the
level of the water and
thereby throw a larger
quantity into the channel
than could otherwise be
obtained at those times
towards the end of the
floods when the river
sometimes falls too low

to

to furnish a full
supply with the body
of the Outlet of its
present elevation, the
Government bearing
in mind the great height
of the work, as well as
its peculiarly dangerous
situation in a gorge thro
which the river when
in flood rushes with
great force. It is of opinion
that any measure
for even temporarily
increasing the obstruc-
tion now offered by
the Outlet ought to be
taken with the greatest
caution, and it seems
that the adoption of
the expedient suggested
by

As a general rule it would
be advisable to separate the
irrigation channels from those
intended for navigation. In
the former a current as
rapid as can be got with
safety is desirable. In the
latter still water is a desider-
atum - and again it
is very desirable that when
the main channel is to be
necessarily very wide, a
second should be made
so that in any accident to
the main supply channel
all the supply to the
irrigation below

by the Government, with
Anderson will not be
unattended with risk,
even if the work be
strengthened as proposed,
unless the means of
rapidly removing the
obstructions be kept in
immediate notice, either

by day or by night,
as provided for in the

With in view of
avoiding the very heavy
expense of enlarging
the main channel
throughout to a width
sufficient to enable
it to carry the
supply of water required
for the irrigation of
all the land under
their

their construction,
and to diminish,
as much as possible,
the silting that takes
place in their junction
sequences of their very
moderate fall, except
Dolly. Under all things
to retain their use almost
still to open up to
navigation from the
fles of the first of the
Dolly upon the river,
and from those points
downwards to carry
water for irrigation
in the channel
having enough fall
to need little capacity,
and to create a current
strong enough to carry
off

off silt. He further
proposed to improve
the channel along the
margin of silted banks
of the river to line
of navigation, except
a few miles of the
upper portions of each,
and to give up the
farther high level
channel altogether
beyond the few miles
of it which have been
formed, and in which he
would make use of
exclusively for navigation,
substituting as a line of
navigation to the south-
ward, the Cameroor
Channel, improved and
furnished

furnished with locks,
and extended toward
the Beldin navigation
to meet the Coast Canal,
should it ever be con-
structed. Thus, he would
have, on each division
of the Delta two through
main lines of first
class navigation, namely
the Bejoarah and Ello
Canal and the Bejoarah
and Marulipatan
Canal to the North of
the "Mud", and the
Satanagran and Mozam-
bican Canal and the
Satanagran and Anhole
Canal to the South -
By

By this arrangement
even if some of the
larger, minor channels,
such as the Poglango,
be made accessible,
to boats during part
of the year, the extent
to which it was originally
intended to provide
the means of water,
carriage throughout,
the Delta will be
considerably improv-
ed, but the Govt
believes that the change
is necessary in order
to confine, within the
smallest practicable
limits, the great evil
of the excessive
deposition

Deposition of silt
 which is found to take
 place in the Krishna
 Canals, and, moreover,
 to cause the labor and
 expense of the inor-
 dinate enlargement of the
 channels that it is
 necessary to give them
 capacity to carry all
 the water required for
 irrigation at the low
 velocity that is indis-
 pensable in a navigable
 canal.

(4) *Deposition of silt in the Krishna Canals*

When the water is
 low the velocity is
 small and the silt
 is deposited in the
 bed of the canal.

To the Board of Rev.
 W. H. & Co. Secy

140
 Dec 13th 1864

Copy in a Letter to England
of 22^d April 1861.

1241-12
9-11-37 III

19/5/74 31
P^r W 1864 Dep^t
P^ro: of Gov^t for July

N^o 430

P^ro: of the Belgoot

D^y 12 July 1864

P^ro 318/65

C^r 1865/66

Further P^ro of 364 D^y 6 Feb^r 1861

Papers on the subject
of the best mode of
Completing the system
of Canals in the Pais-
na District.

N^o 249. 200