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MADRAS RECORD OFFICE.

Government of Madras.

Public works DEPARTMENT.

G.O. No. 590	Press ~~Mis.~~
431-432	
Dated 19-2-	18 66.

Not to be folded or roughly handled

*Proceedings of the Madras Government, Public Works Department,
19th February 1866.*

No. 431. Read the following letter from the Consulting Engineer for Irrigation and Canal Company, to the Secretary to Government, Department Public Works, dated Madras, 3rd February 1866, No. 145:—

2 Letters in original from Agent, Nos. 485 and 550, dated 21st December 1865, and 1st February 1866.
1 Plan (tracing of cross sections).
4 Estimates

* 1 Detailed Estimate for earth-work.
1 Comparative Statement.
1 Abstract Estimate.

1. I have the honor to forward, for the consideration of Government, the revised estimates as per margin,* for the completion of the earthworks of the 8th Section of the main canal, and which were received with a letter No. 485 of the 21st December, from the Agent and

Manager, Madras Irrigation and Canal Company. A letter No. 1,082 of the 13th idem, from the Chief Engineer, and a report of the 14th idem, will be found attached to the Agent's letter.

2. These estimates, as prepared by the Chief Engineer, amount to Rupees 4,86,895, of which Rupees 2,58,675† have been already sanctioned. As in the estimates for the 4th Section, however,‡ in this total amount is included the value, half a lac, of the stores which will remain available for disposal on the completion of the works, and which will not form a part of their ultimate cost, and deducting this, the revised estimate becomes Rupees 4,36,895, and the amount requiring sanction Rupees 1,78,220.

3. From the comparative Statement it will be seen that the quantity of earth-work in the previous estimates was cubic yards 23,11,252 $\frac{1}{4}$, and that in the revised or "total column" cubic yards 29,10,351, which is an increase of 25 per cent. on the former. This extra earthwork is required to increase the slopes of the embankments from 1 $\frac{1}{2}$ to 1, which has hitherto been allowed throughout to 2, or, in some cases, 2 $\frac{1}{2}$ to 1, according to the nature of the soil.

Procs. Madras Govt. 24th August 1864, No. 2,438, report paragraph 146. The alteration is, I think, very necessary, and in my first report on the canal it was mentioned that the soil was of a description, which would certainly not stand at 1 $\frac{1}{2}$ to 1. The increased slopes now proposed account for Rupees 61,361 or, with contingencies, Rupees 67,497 of the extra sanction required.

4. Paragraphs 3, 4, and 5 of the report attached to the Chief Engineer's letter explain the reasons for the increase of rates for earthworks in certain cases, and the revised estimate shows the quantities, at each rate, already done, and remaining to be done. The amount of excess due to this cause is Rupees 49,730 or, with its share of contingencies, Rupees 54,703, and it will be noticed that these amounts are very much above that (Rupees 21,730) which, in March 1865, was supposed to be required, and as I find that the differences between that estimate and the present are not explainable by any further general increase of rate, it may be supposed that the estimates now submitted are

Report paragraph 143, Procs. Madras Govt. No. 1,317, dated 15th May 1865.

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based upon a more careful and detailed examination of the work remaining to be done.

5. The total increase estimated cost of earthworks is	Rupces	1,73,220
Of which that for increase of quantity is	Rupces	67,497
Do. of rates	"	54,703
Allowance for stores, tools, &c.	"	50,000
		1,72,200

and the difference, Rupces 6,020, is an addition to the contingencies on the work already done. The allowance on this latter account, in the estimates already sanctioned, was Rupces 18,044, or $7\frac{1}{2}$ per cent., but the Progress Report for October shows that the expenditure under this head had reached Rupces 28,314-1-4 on an expenditure of Rupces 1,61,063 only for earthworks, or more than 17 per cent. Now as Rupces 3,51,722 are the total value of the earthwork in the revised estimate, there remained to be expended after the close of October Rupces 1,87,659, and for contingencies there remained Rupces 35,173 less Rupces 28,314, or Rupces 6,859, or an allowance of only 3.65 per cent., which, unless the past expenses on this account have been very greatly above what they should have been, will certainly prove insufficient. It would appear moreover that, instead of the increased allowance of 10 per cent. being, as mentioned in paragraph 6 of the Chief Engineer's report, intended to provide for the making up of banks and cuttings during the two years that the works will be in progress, it must be considered as a provision for excess expenditure already incurred.

* Sanctioned May 1863.

† Rupces 1,72,360 or with contingencies Rupces 1,85,649. Length 32 $\frac{1}{2}$ miles.
‡ Do. February 1865.
§ Rupces 2,40,631 or with contingencies Rupces 2,58,675. Length 29 $\frac{1}{2}$ miles.

6. The original estimate* for this section showed the probable cost of the earthworks to be Rupces 5,756† a mile; the revised estimates‡ increased this to Rupces 8,806§ a mile, and the estimates now submitted raise the amount to Rupces 14,873 a mile.

7. As regards the increased rates entered in the estimates now submitted, it is rather a difficult matter to form a reliable opinion of their necessity, without an examination in detail of the several descriptions of soil to which the different rates are allotted. In the last estimates the increases were of two kinds, one a general one for the ordinary black cotton soil, which was raised from the 1 Anna 2 Pice originally allowed, and which may be called 14 cubic yards for the Rupee, to 1 Anna 7 $\frac{1}{2}$ Pice or 10 cubic yards a Rupee; and the other the substitution of special rates for more difficult soil varying from the Rupee for 9 to the same amount for one cubic yard. I find, however, that of the work already done cubic yards 12,27,988, out of cubic yards 13,82,314, have been executed at 1 Anna 5-29 Pice, as the average rate, or a little more than 11 cubic yards for a Rupee. Now of the work remaining to be done there is undoubtedly very much that is not in the least more difficult than the greater part of that already completed, but the estimate provides ten yards the Rupee as the lowest rate for future work, and out of 15.28 lacs of cubic yards, yet to be done, 6.835 lacs are entered at this minimum, and 5.223 lacs at the next higher rate of nine cubic yards the Rupee,

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and it is certainly my impression that, with the comparatively very small demand for labor that now exists on the line of the canal, the easy earthwork should be executed at but very little, if at all a greater cost than that of the same description already done. It may also be noticed that while one-ninth only of the quantity of earthwork already finished has cost more than 1 Anna 7 $\frac{1}{2}$ Pice per cubic yard, of that to be done, cubic yards 15,28,036, or more than 55 per cent. are estimated at below ten cubic yards the Rupee, and 21 per cent. are entered at 8 cubic yards and less the Rupee. It is very possible that the Chief Engineer may, looking to the possible demand for labor on the Railway works, have deemed it necessary to allow a considerable margin, so as to avoid having to apply for further sanction, and I think therefore that the estimates may be passed with the rates entered,* and I hope that care will be taken to keep down the cost of the easy work, for this the greater part of the earthworks is, and it is of comparatively little importance whether the rates for the harder work are a little too high, provided it be remembered that 2 or 3 Pies per cubic yard on lacs of cubic yards are of great moment, while 2 or 3 Annas on work which amounts altogether to a few thousands of cubic yards, come to but a small sum.

8. The cross sections of the canal, which were received only this morning, shew the present state of the canal, and also the increased slopes to be given to the banks. It appears to me that perhaps some expense might have been saved by leaving the exterior slopes of the embankments as they were or at $1\frac{1}{2}$ to 1, for it is only the interior slopes which absolutely require the flatter gradients. It will be noticed that berms between the banks and the canal are very generally dispensed with, and as the tops of the banks are only four feet above full water level, the arrangement seems unobjectionable, and in some respects advantageous.

9. Among the enclosures of this letter is a return shewing the difference between the actual amount of earthwork done in the 8th Section, as found by measurements at end of July last, and the quantity paid for to the same date, and from this return and from the Chief Engineer's remarks* thereupon, it will be seen that the excess of the latter over the

* Paragraph 6.

former is 3.1 per cent., which is very moderate indeed, and that in one mile only did this excess amount to as much as 9 per cent. This result is a remarkable contrast to that ascertained elsewhere, and while it reflects credit on the Executive Engineers who have been in charge of the Division, it shows that the effects of one or two monsoons are not such as to account for wide differences between the work shown in the accounts and that found in existence.

10. Subject to the same conditions, with respect to the sufficiency of the guaranteed capital, as were prescribed by Government in their Order of the 4th December 1865, No. 3,676, passing the revised estimates of the 4th Section, I beg to recommend the sanction of the estimates now submitted.

From the Agent and Manager Madras Irrigation and Canal Company, to the Consulting Engineer Irrigation and Canal Company, dated Madras, 21st December 1865, No. 485.

1 Detailed Estimate of earthwork.
1 Comparative Statement.
1 Abstract Estimate.

1. I have the honor to transmit, for the sanction of Government, revised supplemental estimates for the completion of earthwork and

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revetment in the 8th Section, together with copy of the Provisional Chief Engineer's letter, No. 1,082, dated 13th December 1865, and its accompaniments.

2. Mr. Latham informs me that sections of banks and cuttings will follow as soon as possible.

From the Provisional Chief Engineer, to the Agent and Manager Madras Irrigation and Canal Company, dated Kurnool, 13th December 1865, No. 1,082.

*Revised Estimates for the completion of the earthwork and revetting of the Koondaur Division
(18th Section.)*

1. I have the honor to forward to you for submission to the Board and to Government revised estimates for the completion of the earthwork and revetting of the Koondaur Division (8th section), comprising the 115th to 144th miles inclusive.

2. You are aware, though I may not re-state it in every case, that after the original estimates were submitted, some general alterations in the design of, or protection for, banks were adopted, and it became in time apparent that the average cost of foundations for classes of masonry works, or of excavation where hard soil was unexpectedly found, would be exceeded, it gradually became clear that the saving on such as proved easier than the estimated average would not pay for extra cost in others. It also proved that the estimated rates had to be exceeded in particular cases, and it was soon clear that the average would be exceeded.

3. The rules laid down by Government prescribe that as soon as it is clear that an estimate will be exceeded, a supplemental one shall be prepared. It would be very improbable that if a supplemental one be required at all, the first would be the last. There is no time to wait until the whole extent of the excess is evident. If it be clear that rates will rise before it is clear that revetment will be needed, the first supplemental estimate cannot include both, and so for other excesses.

4. The present estimates for opening the canal for irrigation have been made as final estimates, in accordance with a request of the Board. They are in the main mere estimates, not bills of past work; but all the past experience of our Engineers has been utilized, and conjecture or supposition has given way to it. In order to make them final, some delay has been incurred, and doubtful points have been freely and, if necessary, repeatedly referred to the Resident Engineer.

5. So far as I see, the works now estimated can be carried out for the estimated amount in a thoroughly efficient way. The present estimates include the cost of stores, plant and tools, half of which will, it is supposed, be recoverable.

* Koondaur.

6. The present estimate* will be best understood if first the return of the difference between

actual amount of work done at the end of July last, and the amount paid for up to the same date be glanced at. This is merely an ordinary return to my Office, but I forward it as bearing on the interesting subject of wash of rains. There is no fear that this is so dangerous and excessive as has sometimes been represented. It will be seen that there is no deficiency which is not covered either by a definite estimate of the probable loss by rains or silt, which amounts to above three per cent. in 118th mile, nine per cent. in 121st, five or six in 122nd, five in 125th, and under three per cent. in all the others; or by over-measurements, always within the ten per cent. usually retained as security, and not amounting to three in a hundred except in the 121st, where it is ten per cent., the 122nd, where it is nine, and 125th, where it is six. Supposing no more silt nor washing away by rains than has been thus detected, this per-centage of over-measurement not accounted for, is unusually small. But when it is considered that the banks and pits had stood through one or two monsoons, and that the measuring was therefore rather vague, it will appear that any single mile may be expected to exhibit a difference caused by the ground appearing an inch or two higher, or lower, than it was before the streams of drainage flowed over it. The total deficiency, due to both silt and over-measurement, and all causes is only thirty-one per cent. on the amount now efficiently standing, and is partly balanced by some surplus.

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7. At the date of the estimate the main canal was nearly half finished; out of a total of 2,910,351 cubic yards only 1,528,036 remained to be done.

8. Also out of Rupees 3,51,722 total only Rupees 2,02,261 or under four-sevenths have to be spent.

9. Deducting the lac of Rupees added for purchase by the Agent of stores, tools, &c., chiefly past, I find that a total of Rupees 3,86,895 requires sanction, of which Rupees 2,58,675 has been already sanctioned. This includes an allowance for trimming and restoring slopes which had not been included before.

10. For the mode of forming the estimate I refer to the accompanying report.* It will be seen that the increased quantities required to give increased stability to the banks and slopes is estimated at Rupees 60,000. Increase of rates has

added nearly Rupees 51,000, or under twenty per cent., and the rest of the increase of estimate is due to contingencies and store charges. I have discussed the rates and slopes carefully with Mr. C. Henslowe at Donapaud, while inspecting the ground, and those taken in the estimate seem to me to be satisfactory.

Report to accompany revised supplemental estimates of the Koondaur Division (8th Section).

1. Every piece of work has been carefully measured where to irregular to show in a cross section, and the full quantity of work in cutting or bank, deducting the amount shown as actually done by these measurements, has then been estimated for. Wherever possible accurate cross sections of banks and cuttings have been taken at distances of 1, 2, 3, and where very regular 5 chains, on these sections have been plotted, alteration of slopes where necessary, making the new slopes two and a half to one in bad soil, and estimating for a rammed face to the bank. Where gravel or kunker was to be had a slope of two to one has been allowed for calculating for a face of kunker. Where the cuttings are in good hard soil they have been left at one and a half to one and two to one according to the quality of the soil.

2. The quantities for work now remaining to be done have been taken out carefully through out, and the Divisional Engineer (Mr. C. Henslowe) asserts them to be reliable.

3. The work has been assessed at such rates as the Divisional Engineer believes it can be executed for satisfactorily, but not too extravagant. In the first four miles (115th to 118th) a rather higher rate on small portions of the work has been allowed, than it is believed the work can be got done for, but in these places the degree of hardness in the kunker alters so much, even in one chain of length, that it was not safe to estimate at the exact probable cost, and the Divisional Engineer has therefore allowed a margin. There is however not much of these.

4. In the 132nd, 135th and 136th the same occurs with the same reason. It is hoped the highest rates will not be required, though with the closest inspection it is now impossible to say.

5. The Divisional Engineer believes that in no case has he made the rates unnecessarily high. A small balance may possibly remain on the completion of some of the miles, but it is doubtful that any considerable surplus will be found.

6. The total difference between the former estimates and the revised estimate is cubic yards 5,99,098½ and Rupees 1,23,220 including contingencies, for which 10 per cent. has been allowed. The reason for this large per-centage is, that as this is to be the final estimate and the whole of the work cannot be done for the next two years or probably more, both banks and cuttings will probably alter considerably in that time and when they come to be made up finally it is very likely that some difference will be found. The extra per-centage will then be useful.

7. The difference between the estimates is, therefore, more than half due to the increase in the quantities of earthwork, as 5,99,098½ cubic yards at ten yards per Rupee gives about Rs. 60,000, leaving Rupees 51,000 to be set down to increased rates, Rupees 17,000 being the difference in contingencies.

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8 The detailed estimate has been drawn up in the following form —
The first column shows sanctioned quantities and amounts.
The second column, the quantities and amounts done.
The third column the quantity shown as necessary to complete the works by the amounts now made.
The fourth column, the difference between sanctioned and revised estimates.
And the last column, the total expenditure past and future at the various rates.

KRANGAL,
14th December 1865.

(Signed) W. C. DEAMONT,
Chief Engineer

(True Copy)

(Signed) F. H. HENSLOWE,
Agent and Manager

No. 432.

ORDER THEREON, 19th February 1866, No. 590.

CIVIL WORKS, No. 52.

1. With this letter the Consulting Engineer for the Madras Irrigation and Canal Company submits a second revised estimate, amounting to Rupees 4,86,895, for the completion of the earthwork of the 8th Section (29½ miles in length) of the Company's Main Canal.

2. The original estimate amounted to Rupees 1,83,619, which was supplemented by Rupees 73,026 in the first revised estimate sanctioned in the Proceedings of Government, No. 514, dated 12th February 1865. The total amount of the present estimate is, therefore, Rupees 2,56,645 in excess of the first and Rupees 2,28,220 above the second sanction for the works in question.

3. The Consulting Engineer explains that the excess now reported is attributable —

- | | |
|---|-----------------|
| 1st.—To an increase in the slope of the embankments. | Rs. 67,497 |
| 2nd.—To the insufficiency of the original rates allowed for the work. | 54,704 |
| 3rd.—To the inclusion in the estimate of the cost of stores, &c. | 1,00,000 |
| 4th.—To extra contingencies. | 6,000 |
| | <u>2,28,220</u> |

4. From the third item, it is stated, Rupees 2,000 should be deducted on account of the value of the tools and plant that will be available for disposal on the completion of the works. The net increase therefore that now requires sanction is Rupees 1,73,220, and the entire estimate for the earthworks of the 8th Section will hereafter stand at Rupees 4,30,895, being at the rate of Rupees 14,500 per mile.

5. In passing the second supplemental estimate, the Government desire to call the attention of the Company's Chief Engineer to the Consulting Engineer's remarks in paragraphs 7 and 8, and they rely upon that Officer's best efforts to ensure the utmost economy in carrying out the earthwork which yet remains to be performed.

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6. It will be understood that the sanction now accorded is conditional on funds being available within the guaranteed million.

(True Extract.)

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

To the Consulting Engineer for the Irrigation and Canal Company, with seven Enclosures.
.. Agent and Manager for do. do.

Exd. S. T. Augustin.

requiring sanction Rupees 1,78,220.
3. From the Comparative Statement it will be seen that

$\eta = 14.5$

1. To
From,
J.C.
S.

MADRAS 3rd February 1866

Captain John Mullins M.C.
Consulting Engineer for the P.C.C.
The Secretary to Government.
Department of Public Works.

Report of Public Works.

1. I have the honor to forward for the consideration of Government, the revised Estimates as per margin for the completion of the Earthworks of the 8th Section of the Main Canal, and which were received with a letter No. 485, of the 21st December from the Agent and Manager, Maras Irrigation and Canal Company. A letter No. 1082 of the 13th Idem, from the Chief Engineer, and a report of the 14th Idem, will be found attached to the Agent's letter.

2. These Estimates, as prepared by the Chief Engineer, amount to Rupees 4,86,895 of which Rupees 2,58,675 have been already sanctioned. As in the Estimates for the 4th Section however in this total amount is included the value $\frac{1}{2}$ a lac of the stores which will remain available for disposal on the completion of the works, and which will not form a part of their ultimate cost, and deducting this, the revised Estimate becomes Rupees 4,36,895 and the amount requiring sanction Rupees 1,78,220.

3. From the Comparative Statement, it will be seen that

7. Abstracts & Estimates for
Earthwork.
1. Comparative Statement.
1. Abstract - Estimates.

P.M.C. 22 Feb 1885
 amount sanctioned for
 the section 558,610
 deduct masonry work 299,935
 258,675

P. M. Q. No. 2676 - dated
14th September 1865.

that the quantity of earthwork in the previous estimates was cubic yards 231,252½, and that in the revised or "total column" cubic yards 291,037, which is an increase of 25 per cent on the former. This extra earthwork is required to increase the slopes of the embankments from 1½ to 1, which has hitherto been allowed throughout, to 2, or in some cases 2½ to 1, according to the nature of the soil. The alteration is, I think, very necessary, and in my first report on the Canal it was mentioned that the soil was of a description - which would certainly not stand at 1½ to 1. The increased slopes now proposed account for Rupees 61,361 or, with contingencies, Rupees 67,497 of the extra sanction required.

P.M.C. 24th Aug 1864
D: 2438 Report
para 146.

2. Paras 3, 4 and 5 of the report attached to the Chief Engineer's letter explain the reasons for the increase of rates for earthworks in certain cases, and the revised Estimate shows the quantities at each rate, already done, and remaining to be done. The amount of excess due to this cause is Rupees 49,730 or, with its share of contingencies, Rupees 54,703, and it will be noticed that these amounts are very much above that (Rupees 21,730) which, in March 1865, was supposed to be required, and as I find that the differences between that estimate and the present are not explainable by any further general increase of rate, it may be supposed that the estimates now submitted are based on a more careful and detailed estimate of the work remaining to be done.

Report para 143-
P.M.C. 51: 1317 - dated
15th May 1865.

5. The total increase estimated cost of earthworks is Rupees - - - - - 178,220
of which that for increase of quantity is Rs. 67,497
- - - - - 20% of rates - - - - - 54,703
Allowance for stores, tools, &c. - - - - - 50,000
172,200

and the difference Rupees 6,020 is an addition to the contingencies on the work already done. The allowance on this latter account, in the estimates already sanctioned, was Rupees 18,044, or 7½ per cent, but the Progress Report for October shows that the expenditure under this head had reached Rupees 28,314 - 1-4 on an expenditure of Rupees 164,063 only for earthworks, or more than 17 per cent. Now at Rupees 3,57,722, or the total value of the earthwork in the revised Estimate, there remained to be expended after the close of October Rupees 187,659, and for contingencies there remained Rupees 35,173 less Rupees 28,314, or Rupees 6,859, or an allowance of only 3.65 per cent, which, unless the past expenses on this account have been very greatly above what they should have been, will certainly prove insufficient. It would appear moreover that, instead of the increased allowance of 10 per cent being, as mentioned in para 6 of the Chief Engineer's Report, intended to provide for the making up of banks and cuttings during the

two years that the works will be in progress, it must be considered as a provision for excess expenditure already incurred.

6. The original Estimate for this Section showed the probable cost of the Earthworks to be Rs 5,756 a Mile; the revised Estimates increased this to Rs 18,806 a Mile, and the Estimates now submitted raise the amount to Rs 14,873 a Mile.

* sanctioned May 1863.
* Rs 17,236 6/11 of 155649 with contingencies 32 1/4 miles.
* Rs 24,063 1/2 or with contingencies 259,675 1/2 miles.
* Rs 29 1/2 miles.

7. As regards the increased rates entered in the Estimates now submitted, it is rather a difficult matter to form a reliable opinion of their necessity, without an examination in detail of the several descriptions of soil to which the different rates are allotted. In the last

Estimates the increases were of two kinds one a general one for the ordinary black cotton soil, which was raised from the 1-2 originally allowed, and which may be called 11 Cubic yards for the Rupee, to 1-7 1/2 or 10 Cubic yards a Rupee; and the other the substitution of special rates for more difficult soil varying from the Rupee for 9 to the same amount for one cubic yard. I find however that of the work already done 12,27,988 out of Cubic yards 13,82,314, have been executed at 1-5.29, as the average rate, or a little more than 11 Cubic yards for a

Rupee. Now of the work remaining to be done there is undoubtedly very much that is not in the least more difficult than the greater part of that already completed, but the Estimate provides 10 yards the Rupee as the lowest rate for future work, and out of 15.28 laes of cubic yards yet to be done, 6.835 laes are entered at this minimum, and 5.223 laes at the next higher rate of 9 Cubic yards the Rupee, and it is certainly my impression that, with the comparatively very small demand for labour that now exists on the line of the Canal, the easy earthwork should be executed at but very little, if at all a greater cost than that of the same description already done. It may also be noticed that while 9th only of the quantity of earthwork already finished has cost more than 1-7 1/2 per Cubic yard, of that to be done, Cubic yards 15,28,036, or more than 55 per cent are estimated at below 10 Cubic yards the Rupee, and 20 per cent are entered at 8 Cubic yards and less the Rupee. It is very possible that the Chief Engineer may, looking to the possible demand for labour on the Railway works, have deemed it necessary to allow a considerable margin, so as to avoid having to apply for further sanction, and I think therefore that the Estimates may be raised with

with the rates entered, and I hope that care will be taken to keep down the cost of this easy work, for this the greater part of the earthworks is, and it is of comparatively little importance whether the rates for the harder work are a little too high, provided it be remembered that 2 or 3 pies per cubic yard or less of cubic yards are of great moment, while 2 or 3 annas on work which amounts altogether to a few thousands of cubic yards, come to but a small sum.

8. The cross sections of the Canal, which were received only this morning, shew the present state of the Canal, and also the increased slopes to be given to the banks. It appears to me that perhaps some expense might have been saved by leaving the exterior slopes of the reinforcement as they were or at 12 to 1, for it is only the interior slopes which absolutely require the flatter gradients. It will be noticed that berms between the banks and the Canal are very generally dispensed with, and as the tops of the banks are only 4 feet above full water level, the arrangement seems inobjectionable, and in some respects advantageous.

9. Among the enclosures of this letter is a return shewing the difference between the

no 6

75
actual amount of earthwork done in the 8th Section, as found by measurements at end of July last, and the quantity paid for to the same date, and from this return and from the Chief Engineer's remarks thereupon it will be seen that the excess of the latter over the former is 3.1 per cent, which is very moderate indeed, and that in one mile only did this excess amount to as much as 9 per cent. This result is a remarkable contrast to that ascertained elsewhere, and while it reflects credit on the Executive Engineers who have been in charge of the Division, it shews that the effects of one or two monsoons are not such as to account for wide differences between the work shewn in the accounts and that found in existence.

10. Subject to the same conditions, with respect to the sufficiency of the Guaranteed Capital, as were prescribed by Government, in their Order of the 4th December 1865 No. 3676 passing the revised Estimates of the 4th Section, I beg to recommend the sanction of the Estimates now submitted.

I have the honor to be
Your Most Obedt^{ly} Servant
Wm Mullins Captain R.E.

Cons Eng for S.C.C.

14
Civil Works, Public Works Department
No. 590

Proceedings of the Madras Government
Under date the 19th February 1866
Read the following

From the Consulting Engineer
1 Sand & Co.

Forwards for the consi-
deration of Government the
revised Estimates within
mentioned for the completion
of the earthworks of the 8th Section
of the main Canal with cer-
tain observations.

With this letter the Consulting
Engineer for the Madras Irrigation
and Canal Company submits a
second revised estimate amounting
to Rupees 4,86,895 for the completion
of the earthworks of the 8th Section
(29³/₄ miles in length) of the
Company's main Canal.

The original estimate
amounted to Rupees 1,85,649
which was supplemented by
Rupees 73,026 in the first revised
estimate sanctioned in the Resol-
ution of Government No. 574 dated
22nd February 1865. The total

22nd Feb. 1865-5114
24 Aug. 1864-2438
15 May 1865-1349
15th Dec. 1863-1232
1st Dec. 1865-3676

Copy in a letter to England
of 22nd March 1866.

20 M 1865 5 PM
Copy of Govt. Order No. 503
from Secy to Govt. of Madras

(The Consulting Engineer
J. Sand & Co.
(The Secretary to Government
P. W. D.

(Dated 3rd Feb. 1866
No. 6

67

No. 590-19th Feb. 1866.

Forwards for the
consideration of Govern-
ment the revised Esti-
mate with the following
observations for the
completion of the
8th Section of the
main Canal with
certain observations.

1431

Copy in a letter to England
of 22nd March 1866.

Amount of the present estimate is therefore Rupees 3,07,246 in excess of the first and Rupees 2,28,220 above the second sanction for the works in question.

The Consulting Engineer explains that the excess now reported is attributable

1. To an increase in the slope of the embankments Rs. 67,497
2. To the insufficiency of the original rates allowed for the work 54,703
3. To the inclusion in the estimate of the cost of stores &c. 1,00,000
4. To Extra Contingencies 6,020

2,28,220

From the third item, it is stated, Rupees 50,000 should be deducted in account of the value of the Tools and Plant that will be available for disposal on the completion of the works. The net increase therefore that now requires sanction is Rupees 1,78,220, and the entire estimate for the earthworks of the 8th Section will hereafter stand at Rupees 4,36,895 being at the

15
Rate of Rupees 14,873 per mile

In passing the second supplemental estimate, the Government desire to call the attention of the Companies Chief Engineer to the Consulting Engineer's remarks in paras 7 & 8, and they rely upon that Officer's best efforts to ensure the utmost economy in carrying out the earthwork which yet remains to be performed.

It will be understood that the sanction now accorded is conditional on funds being available within the guaranteed million.

4. By the Consulting Engineer for the M. C. & F. Co. Ltd.
4. As Agent & Manager - to the M. C. & F. Co. Ltd.

Dec 20th February

18

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Copy in a Letter to England.
of 22nd March 1866.

Pr. W. 1866 Department
Pro: of Govt for February

55
No 590

Pro: of the Madras Govt

of 19th February 1866

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Earth-works in the 8th
Section of the Irrigation Company
"viz" Main Canal - after
revised estimate for the
Completion of —, sanctioned
Conditionally.

No 431-432.

2. 9th Feb. 1866 No 135