M.R O. 1—77,006—8-6-37.

(1) Number of pages 72

(2) Date of repair 18-1-44

(3) Initials of the Referencer

MADRAS RECORD OFFICE.

Government of Madras.

Public works **DEPARTMENT.**

G.O. No. 3701-02 Press ~~Mis.~~

406-08

Dated 19 · 11 1869 .

Not to be folded or roughly handled

No. 406. Read the following letter from the Acting Consulting Engineer for the Madras Irrigation and Canal Company, to the Secretary to Government, Public Works Department, dated Madras, 23rd October 1869, No. 87 :—

I HAVE the honour to submit the following General Report on the operations of the Madras Irrigation and Canal Company, as called for in Order of Government, No. 3,193, of 2nd October 1869, in accordance with instructions from the Government of India, No. 319, of 14th September 1869.

1 Sketch Map.
1 Reduced Longitudinal Section.
1 Lock.
1 Sheet of Anicuts.
1 Do. of Aqueducts.

2. The project, as now being carried to completion under the Supplemental Contract of October 1866, consists of a main canal from Soonkasala, 18 miles above Kurnool, to Cuddapah, being a distance of 188 miles, and is shown on the accompanying plan, which is a modified copy of one published by the Company, and will conveniently elucidate the following remarks, both as regards the general design and the position of the more important masonry works referred to; while the reduced longitudinal section will show at a glance the fall of the country which the canal traverses; and here I must notice that a very important omission in the reduced scheme now being carried out is any provision for reservoirs to supplement the supply of water from the Toombudra, without which the canal will never be efficient as an irrigation-work, and its value, as a line of navigation, will be comparatively small; and the extension of the canal below Cuddapah to Somaishweram and thence through the Nellore District to the Coast, which formed part of the original scheme, is not referred to in the Supplemental Agreement. The other drawings which accompany are cross-sections of the anicuts, section of some of the larger aqueducts, and a general plan of a lock; all of which will, it is hoped, convey a sufficiently clear idea of the nature of these works and the method of their construction.

General Design.

3. The project commences with an anicut or bund across the River Toombudra at a point 18 miles above Kurnool, by means of which the water will be raised sufficiently high to flow 8 feet deep in the main canal which commences there. The anicut is founded on rock, and is simply a heavy wall of rubble masonry; the supplementary works are a head-sluice for regulating the admission of water into the main canal to the extent of 400,000 cubic yards an hour, when the river-surface is level with the crown of the anicut; and a series of under or scouring sluices for removing any deposits of silt or sand which may occur above the head-sluice.

1st Section, Main Canal, Soonkasala to Kurnool, 18 miles.

4. The 1st section of the main canal is 18 miles long from Soonkasala to the River Hindry at Kurnool. It is 90 feet wide, depth of water 8 feet; has a fall ranging from 3 inches to 1 foot 8 inches a mile; and will carry 400,000 cubic yards an hour. The first three miles are excavated in rock; thence to the 16th mile the canal is formed by a single bank, the water on the upper side spreading according to the nature of the ground and

forming small tanks; and for a further portion of its length, it runs between two banks until it meets the River Hindry. Any surplus water from drainage that finds its way into the canal by reason of the single bank-formation, will be discharged by masonry works called weirs (termed calingulahs in Madras), which are constructed in the bank of the canal for the purpose. The large masonry works in this section are six accommodation bridges.

5. At Kurnool the canal crosses the River Hindry by an aqueduct 14 arches, each of 40 feet span, the breadth of waterway being 90 feet, and depth 9 feet. After passing the Hindry, the canal, at a fall varying from 1 inch to 1 foot 8 inches a mile, continues for a distance of 24 miles, crossing deep gullies, and cutting through rocky spurs. Some portions are carried over valleys by masonry aqueducts, and in others, as above Kurnool, by means of single banks. Where rock is met with, the cuttings are comparatively narrow. In some parts the canal runs between masonry walls, backed by earth-embankments. The walls are nearly vertical, and in parts 25 feet high. The masonry works are very many: at the 19th mile the Ghooty road is carried over the canal by a bridge 3 arches of 30 feet span; in the 21st mile, a stream is carried under the canal by a culvert 240 feet long; at Kadrabagh the valley is crossed by an aqueduct 3 arches of 25 feet; at Sultanpore the road is taken under the canal by a tunnel 14 feet span; at Ulloor, in the 35th mile, there is an aqueduct similar to that at Kadrabagh. Across many valleys the canal is carried by lofty masonry walls where the soil was scarce or unsuitable for embankments, or labour scarce, and stone abundant. In the 24th mile one of the walls is 48 feet high, and in some places dry rubble walls filled with clay have been substituted for masonry walls. The number of large masonry works in the 2nd section is one aqueduct and three bridges, and in the 3rd section one aqueduct and four bridges.

2nd Section, from Kurnool to Sultanpore, 18th to 32nd mile.
3rd Section, from Sultanpore to Nagatore, 33rd to 43rd mile.

6. At the 45th mile a bridge, 3 arches of 30 feet span, crosses the canal; double banks and favourable cutting continues up to 46½ mile, where a valley is crossed by a single bank, and a tank formed; cutting and double banks re-commence at 47th mile, and some further portion is formed of single banks as before. The fall of the canal in this section is 4 inches per mile, and the chief masonry works are four bridges over the canal for villages.

4th Section, from Nagatore to Jupad, 44th to 60th mile.

7. The principal work in this section is the Metacondal cut at the 72nd mile, by which the canal passes through the water-shed that separates the River Kundar, a tributary of the Pennair, from the valley of the Toombudra, and of the mountain-stream Bowanassy; the cutting is 30 feet deep, and the canal on emerging from it, enters the valley of the Kundar. For 30 miles the canal is partly within double banks, and partly formed of single banks, the water being comparatively shallow but of considerable spread; there are no locks in the canal above the cutting, and if hereafter, by means of

5th Section, from Jupad to Yerragoodoor, 61st to 72nd mile.



reservoirs to supplement the flood of the Toombudra, a constant supply of water becomes available, the navigation will be open throughout the year, except during occasional heavy falls of rain when the current in the narrow cuttings will be too strong for any thing but steamers.

8. At the 72nd mile the canal parts with seven-eighths of its supply of water, which, not being required for irrigation, is carried off from the canal by a cut into the River Caulee, to be again taken up and utilized by means of anicuts lower down. The Terogapila Aqueduct is the chief masonry work in the section; the only other important one being the bridge over the Metacondal Cut. The fall of the canal in this section varies from 4 inches to 1 foot, and the chief masonry works, in addition to those mentioned, are three bridges.

9. With the commencement of this section the canal is of reduced dimensions, the first six miles only of it being required to carry water for irrigation; the remainder of the length being a still-water canal for navigation, and only having sufficient water for lockage passing down it. The quantity to pass down this part of the canal will be 50,000 cubic yards an hour, and the remainder will be carried off by the natural drainage improved to the Caulee, to be again taken up in the first instance by the Jootoor Anicut for the supply of the 7th and 8th Sections. In the first six miles the fall is slight, but in the lower or navigation portion a rapid fall is overcome by locks consisting of twelve lifts of 10 feet each. The other masonry works are two bridges.

6th Section, from Yerragoodoor to Jootoor, 73rd to 91st mile.

10. This section commences with an anicut across the River Caulee at Jootoor from which a canal carrying 100,000 cubic yards an hour is taken. The remainder of the water thrown into this river from the cut at the 72nd mile will pass this anicut, and be taken up again below the junction of the Caulee and Kundar. Part of this section is in deep and hard cutting. The section is a contour line, crosses a great deal of drainage where the country is flat, and water courses shallow; so that the drainage culverts lie deep, and are drowned for some months of the year. The canal here has a surface width of 70 feet, the depth is 6 feet, and the fall 6 inches a mile. The chief masonry works are two aqueducts and eleven bridges.

7th Section, from Jootoor to Jillalah, 92nd to 114th mile.

11. This portion of the canal receives its supply of water from the 7th section. In the first five miles there is a great deal of excavation in rock, and in extremely hard kunkur; that is, nodular limestone. There are in this section seventeen single chamber-locks of from 10 to 17 feet lift, and one bridge.

8th Section, from Jillalah to Rajoly, 115th to 146th mile.

12. This section of the canal is to be supplied by an anicut, called the Rajoly, across the Kunder River into which the Caulee falls; and it will there carry of a part of the Toombudra water not taken up at Jootoor for the 7th and 8th sections, and which will be used to

9th Section, from Rajoly to Adimapully, 144th to 178th mile.

irrigate the district between Rajoly and the Pennair River. The anicut is 1,000 feet long and average height 5 feet; the capacity of the canal here is bottom width 50 feet, surface width 70 and depth 5 feet; the fall is only 3 inches a mile, and the discharge will be 50,000 cubic yards an hour. The chief masonry works are thirteen aqueducts, nine locks of one chamber each, and from 8 feet to 12 feet lift; there are also four bridges.

13. This section will obtain its supply from the River Pennair and the surplus water of the Kundar, by means of a bund called the Adimapully Anicut built across the former at a point below the junction of the Kundar. The length of this bund will be 2,376 feet, for one-third of its length it will be simply a wall built on rock, the remainder will be on deep sand or clay with the usual sloping apron. The dimensions of the canal, which is for irrigation and navigation, are 50 feet width at bottom, 70 feet at surface, depth 5 feet, and discharge 30,000 cubic yards an hour; the fall is only one-tenth of a foot a mile. This section of the canal in its course crosses some important water courses by aqueducts. The principal masonry works are two aqueducts and one bridge.

10th Section, from Adimapully to Cuddapah, 179th to 197th mile.

14. Having briefly described the general plan of the work as being now carried out, I proceed to detail the progress made in each year since the commencement, and here I have to apologize for the incompleteness of the foregoing description. I have only just taken up my present office, and have not had an opportunity of becoming personally acquainted with the works; while the short time allowed for submitting the report forbids my going over the line before writing it, which would require a month, and I am unwilling to enter into a more detailed description of the works from office records, as the changes and alterations have been so numerous I might fall into error.

1859-60.

15. The Company received the sanction of the India Council to their proposal on the 8th July 1859, and on the 15th September 1859 orders were received to commence such works as, after being duly surveyed and estimated, had received the sanction of the Madras Government, under which authority work was commenced at Kurnool on the 4th April 1860, the design being the diversion of the water of the Toombudra, by means of an anicut at Kurnool, into the Rivers Kundar and Pennair, in order to provide irrigation to the valley of the former and to the district of Nellore, and further, by a connection with the East Coast Canal, to afford water communication from the Presidency town to Kurnool.

Progress of Work.

16. The actual work during the year was confined to surveying and levelling constructing store-sheds and offices, and the formation of a temporary dam of rubble stone in the river bed at Kurnool, and the collection at the quarry of a further large quantity of stone for the proposed anicut.

Expenditure. Labour.

17. The expenditure to 30th April 1860 was Rupees 3,10,000, and the daily number of men employed was about 5,000.

Bellary and Nellore investigations.

18. The investigation of the upper section of the canal, from the Toombudra through Bellary to Kurnool, and the continuation of the canal from Pennair to the Eastern Coast Canal, was being actively prosecuted, all of which was included in the original scheme.

1860-61.

Progress of Work.

19. The operations were chiefly confined to detailed surveying and planning. The anicut at Kurnool and the first mile of the canal were commenced. At that time an order was received from the Secretary of State for a reduction of the original scheme, and, upon the submission of a reduced and modified design, the Local Government deemed it necessary to stop all construction pending an inquiry which they instituted regarding it, and the works were accordingly suspended on 20th November 1860, and operation resumed 25th March 1861. The reduced scheme, as proposed by the Company's Chief Engineer and which included the storage of water, provided for a complete canal for irrigation and navigation to commence from Soonkasala, a village on the Toombudra, and to terminate as originally proposed at the same point, Kistnapatam, on the Eastern Coast Canal.

20 The investigation was entrusted to Major (now Colonel) C. A. Orr, and upon his report the Government decided to sanction the commencement of such works only as would form a scheme complete in itself, and the cost of which would not be likely, after making every allowance for contingencies, to exceed the sum for which a guarantee had been allowed, viz., one million sterling, and that accordingly for the present the canal should only be extended as far as Somaishweram, some 85 miles short of what had been proposed as the Coast terminus at Kistnapatam.

21. The surveying and planning executed during the year comprised the anicut at Soonkasala, and all details of work, including estimates for 45 miles of canal, general surveys for the extension of the canal were also made, and several sites for reservoirs were surveyed.

22. The Bellary project was discontinued.

Quantity of Work and Expenditure.

23. The work executed prior to suspension was, canal excavation and stone quarried to the value of Rupees 94,781, and the establishment sanctioned aggregated Rupees 21,071-10-8. The expenditure during the year was Rupees 4,62,707, and the total to close of the official year, Rupees 6,46,689.

1861-62.

Progress of work.

24. First 17 miles nearly completed, and it was expected that water would be admitted during the season sufficient to irrigate the land between Soonkasala and Kurnool, and to meet the Municipal wants of the town. Considerable progress was made in the construction of the Soonkasala Anicut and the Hindry Aqueduct; 12 miles of canal below Kurnool were in progress; surveys for 64 miles below Nundial had been completed, and estimates for the same length were in a forward condition, and additional surveys for a length of 60 miles towards Somaishweram had also been completed, leaving

unsurveyed a link of 25 miles between the head of the Vaikalair and the confluence of the Kundar and Pennair.

25. The number of labourers varied from 14,000 to 30,000 a month during the year; the gross expenditure was Rupees 7,58,949, and the estimates sanctioned amounted to Rupees 19,91,338.

Labour.

1862-63.

26. The construction of the Main Canal through the Nellore District from Somaishweram to the coast was finally authorized by the Secretary of State.

27. The Soonkasala Anicut and subsidiary works were nearly completed. Masonry works of the 1st Section, Main Canal, nearly completed; the arches of the Hindry Aqueduct completed to one-third of its full breadth, half the earth-work and a small proportion of rock excavation executed from Kurnool to Metacondal Cut. Masonry works in the same length made considerable progress, and were proceeding satisfactorily. Any irrigation below Kurnool was found impossible this season; but it was stated that, in the section above Kurnool, water might be given if the cultivators were prepared to use it. The channel from Metacondal Cut to River Caulee was commenced, and preparations made for lockage for a fall of 200 feet, and considerable progress was made in surveying and estimating for the remaining portion of the line.

Progress of Work.

28. Surveys for distribution channels were carried on in the 5th and 6th Sections, and about 50 miles of channel laid out, but not estimated.

Distribution.

29. The exploration of sites and the surveys for reservoirs were renewed by a Survey Party specially sanctioned for the purpose.

Reservoirs.

30. The average number of labourers employed during the year was about 20,000 monthly. The expenditure was about Rs. 13,50,000, and the estimates sanctioned amounted to Rupees 6,94,960.

Labour.

31. During this year an estimate, amounting to Rupees 4,81,800, for the construction of the 10th Section, or the portion of the Main Canal between the Pennair and Cuddapah, was submitted to Government, but sanction was declined until plans and estimates in continuation from Cuddapah to the Somaishweram anicut were prepared, and could be taken into consideration at the same time. The only other portion of the Main Canal not sanctioned up to that time was the 9th Section north of the Pennair from the 146th mile down to the river.

1863-64.

32. The Soonkasala Anicut and head-sluice were completed. The additional earth-work and stone facing in the 1st Section made good progress. Considerable work was done to the Hindry Aqueduct. A large amount of work was done in the 2nd Section. The Ghooty road bridge approached completion, and the arches of the Kadrabagh aquedcut were turned. In the 3rd Section the earth-works were in

Progress of Work.

a forward state, the revetments of the interior slopes made good progress, and the masonry works were nearly completed. In the 4th Section the Nagatore bridge was completed, the other masonry works were stated to be behind hand, and the earth-works also. The Chief Engineer attributed the short progress to scarcity of labour. In the 5th Section, the principal work was the Metacondal Cut which was nearly completed, the excavations and embankments made considerable progress, and the masonry works were generally more advanced than in the preceding section. In the 6th Section the earth-works were in some miles nearly completed; in others the ground had not been broken. A bridge of two arches near Metacondal was half finished. The head works of the section (namely, a scouring sluice, head-sluice, and lock,) made suitable progress. By reason of the soil being very bad all along the section, and large foundations proving to be necessary for masonry works, which it had been supposed would be founded on rock, the cost would, it was said, be inevitably larger than was provided in the estimates. In the 7th Section the head works, consisting of sluice and regulating lock, were in progress; the earth-work of the first seven miles made good progress; masonry works were hardly commenced. In the 8th Section little was done owing to scarcity of labour. The Somaishweram Anicut was in progress, but not much advanced; small freshes in the river and want of well-sinkers being the cause.

33. No estimates were sanctioned or received during the year for the distribution of water, and the expenditure upon works of this nature was very small.

Distribution.

34. Sites on the Toonga and Budra were partly surveyed. A plan and estimate for Luckavally Dam was prepared; further progress in surveys was checked by fever.

Reservoirs.

35. The monthly average of labour was—

Labour.

Coolies	15,043
Artificers	944
Carts	397
Cattle	861

36. The expenditure during the year amounted to Rupees 15,96,463, and the estimates sanctioned amounted to Rupees 11,99,268.

Expenditure.

1864-65.

37. In this year the original estimates of the cost of the works under construction having been found generally inadequate, supplemental sanctions to a

large amount were applied for and given, the particulars are exhibited in the following statement:—

Description of Work.	Original Estimates.	Present Estimates.			Difference.			Remarks.
	RS.	RS.	A.	P.	RS.	A.	P.	
Kurnool Anicut	3,03,080	3,03,080	0	0	.....			Abandoned.
One mile of Canal from Anicut...	65,000	65,000	0	0	.....			Do.
Soonkasala Anicut and Head Works	1,25,000	3,09,650	0	0	1,84,650	0	0	
1st Section, Main Canal, miles 18.	4,60,000	8,56,777	0	0	3,96,777	0	0	
Hindry Aqueduct	1,45,000	2,18,752	8	0	73,752	8	0	
2nd Section, Main Canal, miles 14.	} 7,22,500	19,16,717	0	0	11,94,217	0	0	
3rd do. do. do. 11...								
4th do. do. do. 17...	} 5,19,830	9,52,963	0	0	4,33,133	0	0	
5th do. do. do. 12 .								
6th do. do. do. 19...	3,02,525	3,80,529	0	0	78,004	0	0	
7th do. do. do. 23 ..	2,33,160	2,35,850	0	0	2,690	0	0	
8th do. do. do. 28...	4,37,410	5,58,610	0	0	1,21,200	0	0	
9th do. do. do. 35 ..	8,02,811	8,02,811	0	0	.....			
Distribution Works	37,404	37,622	0	0	218	0	0	Not commenced.
Buildings...	36,828	41,755	0	0	4,927	0	0	Hardly do,
Somaishweram Anicut	1,33,000	1,62,470	0	0	29,470	0	0	
	43,23,548	68,42,586	8	0	25,19,038	8	0	

38. The completion of the estimates for the 10th, 11th, and 12th Sections were deferred; the Company having decided not to proceed with this portion of the work until the upper sections, 177 miles in length, had been completed and brought into use. At the same time Government declined to sanction the 1st Section of the main canal in Nellore, as it appeared improbable that the Company would be able to complete the first nine sections of the canal with the balance of the guaranteed million of capital; and after a long correspondence the Company were eventually convinced of the soundness of the opinions expressed by Government; and that the proper course would be to complete and utilize the upper portions of the canal.

Progress of Work.

39. The 1st Section, Main Canal, was so complete that water was admitted; the extent of land cultivated was only 100 acres, and a supply of water for Kurnool was also provided. The Hindry Aqueduct was nearly completed, and water passed over it in December 1864; the leakage was considerable, and the water had to be shut off, in order that improvements might be made by plastering the floor and filling in 200 yards in length of the bed of the canal with good soil. In the 2nd section the progress was very satisfactory, but considerable anxiety was felt regarding the stone walls in lieu of banks, as the dimensions and construction were not such as to render it probable that they would be water-tight. The works in 3rd Section, including Ullur Aqueduct, were in a forward state. A considerable quantity of work was done in the 4th Section. In the 5th Section, except at Teragopila Aqueduct in 63rd mile, no heavy work remained to be done, but there was much clearing and bottoming, and small masonry works still incomplete. The head works in the 6th Section made good progress, as did the surplus works for discharging

Progress.

water into the Caulee. Work was stopped at the lower or navigation portion of this section, and the labour transferred to the irrigation portion which was then pushed on vigorously.

40. Very little was done during the year in distribution-works: some few yards of minor channels were constructed in the 1st Section, one channel commenced in the 4th, and some sluices built in the first five sections.

Distribution.

41. Surveys and investigations were carried on at several sites in the Mysore country, but without definite result. A favourable site on the Chittravutty was selected and surveyed, and a good deal of time and attention was bestowed on a line of canal from Walavapore on the Toombudra viâ Darojee to Bellary.

Reservoirs.

42. The monthly average of labour employed was—

Labour.

Coolies	16,707
Artificers	1,231
Carts...	750
Cattle	1,966

43. The Soonkasala Anicut breached in July 1864 at a point where its height was greatest, and it was closed temporarily three months; afterwards the work was pushed on night and day, but freshes in the river retarded progress. The Kadrabagh Aqueduct in the 23rd mile was found to have insufficient foundations, and to be of insufficient strength in other respects. Additional works were sanctioned to increase its strength, and some defective portions were taken down and re-built. The anicut across the Caulee in the 7th Section was completed for two-thirds of its length to a height of 5 feet, and the head sluice completed; the canal itself was at this point far from complete: the progress made in the year was much less than in the upper Sections, and the earth-works and masonry works were behind hand. In the 8th section the progress was very satisfactory. In many miles the earth-work was finished on approaching completion; the masonry works were delayed that their plans might be revised, as they were found unsuitable for their positions and circumstances.

Damage sustained.

44. The expenditure under all heads during the year was Rupees 25,93,966, and the estimates sanctioned amounted to Rupees 27,48,912.

Expenditure.

45. In this year the sanction of Rupees 8,02,811 for the 9th Section, Main Canal, that is from 143rd to 178th mile, was, at the request of the Company, cancelled, and Rupees 11,084 for distribution-works connected therewith was also removed from the list of sanctions.

1865-66.

46. The following statement shows the revised estimates for works as sanctioned up to the end of this year, and as compared with the original estimates; and the higher estimates have been exceeded in some cases to a considerable extent.

Description of Work.	Original Estimates.			Present Estimates.			Increase		
	RS.	A.	P.	RS.	A.	P.	RS.	A.	P.
Kurnool Anicut	3,03,080	0	0	3,03,080	0	0	Abandoned.		
One mile of Canal from Anicut ...	65,000	0	0	65,000	0	0	Do.		
Soonkasala Anicut and Head Works ...	1,25,000	0	0	4,10,292	0	0	2,85,292	0	0
1st Section, Main Canal, miles 18 ...	4,60,000	0	0	8,56,777	0	0	3,96,777	0	0
Hindry Aqueduct	1,45,000	0	0	2,46,029	8	0	1,01,029	8	0
2nd Section, Main Canal, miles 14 ...	7,22,500	0	0	19,60,655	0	0	12,38,155	0	0
3rd do. do. do. 11 ...									
4th do. do. do. 17 ...	5,19,880	0	0	16,93,082	0	0	11,73,252	0	0
5th do. do. do. 12 ...	3,02,525	0	0	3,80,529	0	0	78,004	0	0
6th do. do. do. 19 ...	2,33,160	0	0	2,35,850	0	0	2,690	0	0
7th do. do. do. 23 ...	4,37,410	0	0	7,36,830	0	0	2,99,420	0	0
8th do. do. do. 28 ...	.....			... ..			Cancelled.		
9th do. do. do. 35 ...	25,520	0	0	25,738	0	0	218	0	0
Distribution Works*	87,526	15	8	1,02,099	9	10	14,572	10	2
Buildings	1,33,000	0	0	1,62,470	0	0	29,470	0	0
Somaishweram Anicut	44,116	0	0	44,116	0	0	... ..		
Line of Telegraph	36,03,667	15	8	72,22,548	1	10	36,18,880	2	2
Deduct retrenchment from Main Canal, 4th Section ... RS. 1,24,872									
Do. Buildings do. 2,395									
1,27,267									
.....				1,27,267	0	0	1,27,267	0	0
	36,03,667	15	8	70,95,281	1	10	34,91,613	2	2

* Exclusive of Rupees 11,884, for which the estimate was cancelled with the 9th Section Main Canal Estimate

47. The amount retrenched at the foot of the statement was a part of expenditure in the 4th Section, which the Government declined to sanction, as there was confessedly no work to show for it.

48. The repair to the Soonkasala Anicut was completed; water passed down the 1st Section of the canal throughout the season, and the works generally were found in an efficient state; 650 acres of land were irrigated, and the town of Kurnool was supplied with water. Water was carried successfully across the Hindry Aqueduct; the walls, embankments, and revetments generally, in the 2nd Section were strengthened. The more important works in the 3rd Section, necessary for maximum supply, were in progress, and all other works were postponed until funds became available. Good progress was made in the 4th Section, and the condition of heavy embankments improved. The guaranteed capital remaining unexpended was so small that operations were curtailed, and the intention of pushing on the works from the 53rd to the 73rd mile was abandoned; the work done in the 5th Section was on a limited scale. The Teragopila Aqueduct and its embankments made fair progress, but expenditure was much restricted, and almost ceased towards the end of the year. Works in the upper six miles of the section were pushed on satisfactorily up to the time when it was resolved to confine expenditure to the first four sections; progress in the 7th Section was slow, and no further work was done.

Progress of Works.

Proceedings of the Madras Government, Public Works Department, 19th November 1869.

49. The following statement will show the comparative progress made during 1864-65 and the year under review, and exhibits the extent to which expenditure was restricted by the exhaustion of the guaranteed capital of one million :—

	1864-65.			1865-66.													
				1st Quarter.			2nd Quarter.			3rd Quarter.			4th Quarter.			Total.	
	RS.	A.	P.	RS.	A.	P.	RS.	A.	P.	RS.	A.	P.	RS.	A.	P.	RS.	A. P.
Anicut and Head Works at Kurnool ...	425	1	2	.....			.....			... ..			.....			.....	
Do. do. at Soonkasala ...	56,320	3	11	13,798	3	9	3,168	6	7	503	14	2	11,911	13	9	29,380	6 3
Do. do. at Somaishweram	41,387	15	7	2,626	14	1	1,462	15	2	870	12	2	1,260	13	1	6,221	6 6
Aqueduct across the River Hindry ...	42,363	3	3	8,328	10	9	1,015	5	8	915	9	2	5,702	3	6	15,961	13 1
Canal for one mile	.....			.....			.....			.....			.....			.....	
South Main Canal, 1st Section ...	1,39,874	7	9	33,461	10	9	10,212	1	2	7,635	15	7	10,285	2	11	61,594	14 5
Do. 2nd and 3rd do.	8,20,004	15	6	1,95,922	5	9	1,38,887	12	4	72,680	13	5	34,369	10	9	4,41,860	10 3
Do. 4th and 5th do.	4,47,126	12	11	1,18,940	8	4	81,085	0	1	1,04,640	8	7	57,145	8	0	3,61,811	9 0
Do. 6th do.	1,53,129	2	10	19,909	5	6	8,743	10	11	8,631	7	10	4,724	6	6	42,008	14 9
Do. 7th do.	94,372	0	3	19,247	2	0	23,093	9	9	12,127	0	1	1,985	7	2	56,453	3 0
Do. 8th do.	1,38,204	14	3	35,743	3	6	26,525	0	10	22,775	3	7	1,486	3	8	86,534	11 7
Total...	19,33,208	13	5	4,47,981	0	5	2,94,193	14	6	2,30,781	4	7	1,28,871	5	4	11,01,827	8 10

Distribution.

50. The important distribution-works made little or no progress.

Bellary Project.

51. The investigations which were in progress last year were completed.

Labour.

52. The average monthly labour for the first eight months was—

Coolies	8,119
Artificers	682
Carts	402
Cattle	909

The falling off was in no way due to failure of supply, but to reduction of expenditure.

Damage.

53. The wall in the 24th mile was found to require strengthening; the leakage through gravelly banks and stony subsoil was great. The anicut across the Caulee received considerable damage from the year's freshes, and the Chief Engineer determined to modify the plan.

Expenditure.

54. The amount expended under all heads during the year was Rupees 13,82,548, and the estimates sanctioned amounted to Rupees 10,67,389.

1866-67.
Progress of Work.

55. The progress during the year was altogether inconsiderable; last year the Company had expended more than nine-tenths of the Guaranteed Capital, and, being unable to obtain subscriptions of further Capital without guarantee, dismissed the greater part of the executive establishment, and suspended the construction of works until means had been provided for the completion of at least a portion of the scheme. Negotiations with the Secretary of State resulted in the execution of a Supplementary Agreement on which, on certain conditions, the Secretary of State agreed to advance money as required to the amount of £600,000. The contract was signed on the 2nd October, and the Company took immediate steps to reorganize their Engineer Establishment. Work to a trifling extent was only resumed up to the end of the year, and the canal, so far as its main object was concerned, the supply of water for irrigation was no nearer working condition than it had been a year before.

56. The subjoined statement shows the sanction of estimates to the end of the year, and it was observed that further supplemental sanction to a very considerable amount would be required :—

Description of Work.	Original Estimates.			Present Estimates.			Increase.		
	RS.	A.	P.	RS.	A.	P.	RS.	A.	P.
Kurnool Anicut	3,03,080	0	0	3,03,080	0	0	Abandoned.		
One mile of Canal from Anicut	65,000	0	0	65,000	0	0	Do.		
Soonkasala Anicut and Head Works ..	1,25,000	0	0	4,27,052	0	0	3,02,052	0	0
1st Section, Main Canal, miles 18 ...	4,60,000	0	0	8,81,927	0	0	4,21,927	0	0
Hindry Aqueduct	1,45,000	0	0	2,46,029	8	0	1,01,029	8	0
2nd Section, Main Canal, miles 14 ...	5,34,000	0	0	13,81,124	0	0	8,47,124	0	0
3rd do. do. do. 11 ...	1,88,500	0	0	5,84,240	0	0	3,95,740	0	0
4th do. do. do. 17 ...	2,71,560	0	0	11,03,570	0	0	8,32,010	9	0
5th do. do. do. 12 ...	2,48,270	0	0	5,89,512	0	0	3,41,242	0	0
6th do. do. do. 19 ...	3,02,525	0	0	4,38,039	0	0	1,35,514	0	0
7th do. do. do. 23 ...	2,33,160	0	0	2,35,850	0	0	2,690	0	0
8th do. do. do. 28 ...	4,37,410	0	0	7,36,830	0	0	2,99,420	0	0
9th do. do. do. 35 ...	8,02,811	0	0	8,02,811	0	0	.....		
Distribution Works	52,724	0	0	57,870	0	0	5,146	0	0
Buildings	87,526	15	8	1,08,666	13	4	21,139	13	8
Somaishweram Anicut	1,33,000	0	0	1,62,470	0	0	29,470	0	0
Line of Telegraph	44,116	0	0	44,116	0	0	.....		
Revenue Account	295	8	3	295	8	3	.....		
	44,33,978	7	11	81,68,482	13	7	37,34,504	5	8
Deduct retrenchment from RS.									
Main Canal, 4th Section... 1,24,872									
Do. Buildings, do. ... 2,395									
1,27,267									
	... ..			1,27,267	0	0	1,27,267	0	0
	44,33,978	7	11	80,41,215	13	7	36,07,237	5	8

Distribution.

57. No progress was made. Backward as was the Main Canal, the channels of distribution were still more so.

Reservoirs and Bellary Project.

58. The estimates for a canal from Walavapore to Bellary were completed. The estimate as corrected amounted to Rupees 1,43,88,000, and included reservoir storage.

Nellore Scheme.

59. The surveys for this part of the project were completed, and the result of the investigations were understood to be satisfactory.

Labour.

60. The average monthly labour was during the year—

Coolies	20,122
Artificers	864
Carts	360
Cattle	952

61. The old breach in the Soonkasala Anicut gave way, some slips occurred in the embankments of the 1st Section; the leaky state of the embankments in 2nd Section were noticed in report of the preceding year. In this year breaches were caused by leakage in the 25th and 27th miles, and it soon became evident that nothing but a thorough reformation of the embankments would make the canal safe or capable of carrying even a moderate supply; so after three or four breaches had occurred, and the failure of the banks in numerous places appeared to be only a question of time, the water was shut off from the canal below the 24th mile, and all hope of carrying it further was abandoned.

Damage sustained.

62. The amount expended under all heads during 1866-67 was Rupees 3,01,937, and the estimates sanctioned amounted to Rupees 9,45,639.

Expenditure.

63. During the earlier part of this year the progress made was small, and in the first six months only in one or two divisions were the works fairly started, afterwards all made fair progress, and it was expected that the upper 72 miles of the Main Canal would be ready for the admission of water as soon as the supply from the Toombudra was available. During this year the estimates for many portions of th work were again revised. The following statement shows how the sanctions at that time stood, those in italics only were altered during the year under review:—

1867-68.
Progress.

Description of Work.	Original Estimates.			Present Estimates.			Increase.		
	RS.	A.	P.	RS.	A.	P.	RS.	A.	P.
Kurnool Anicut	3,03,080	0	0	3,03,080	0	0	Abandoned.		
One mile of Canal from Anicut ...	65,000	0	0	65,000	0	0	Do.		
Soonkasala Anicut and Head Works ...	1,25,000	0	0	4,27,052	0	0	3,02,052	0	0
1st Section, Main Canal, miles 18 ...	4,60,000	0	0	8,81,927	0	0	4,21,972	0	0
Hindry Aqueduct	1,45,000	0	0	2,46,029	8	0	1,01,029	8	0
2nd Section, Main Canal, miles 14.	5,34,000	0	0	18,00,150	0	0	12,66,150	0	0
3rd do. do. do. 11.	1,88,500	0	0	9,58,000	0	0	7,69,500	0	0
4th do. do. do. 17.	2,71,560	0	0	11,80,393	0	0	9,08,833	0	0
5th do. do. do. 12.	2,50,003	5	4	7,05,345	0	3	4,55,341	10	11
6th do. do. do. 19.	3,04,258	5	4	4,39,772	5	4	1,35,514	0	0
7th do. do. do. 23.	2,34,893	5	4	4,74,453	5	4	2,39,560	0	0
8th do. do. do. 28.	4,37,410	0	0	7,36,830	0	0	2,99,420	0	0
9th do. do. do. 35.	8,02,811	0	0	9,45,837	0	0	1,43,126	0	0
10th do. do. do. 8.	1,94,330	0	0	1,94,330	0	0	.....		
Distribution Works...	52,800	0	0	61,187	0	0	8,387	0	0
Buildings	78,765	14	1	99,688	9	11	20,922	11	10
Somaisweram Anicut	1,41,357	1	7	1,71,727	1	7	30,370	0	0
Line of Telegraph	44,116	0	0	44,116	0	0	.....		
Revenue Account	604	8	3	604	8	3	.....		
	16,33,489	7	11	97,35,522	6	8	51,02,032	14	9
Deduct retrenchment from— RS.									
Main Canal, 4th Section. 1,24,872									
Do. Buildings, do. ... 2,395									
1,27,267									
	.....			1,27,267	0	0	1,27,267	0	0
	46,33,489	7	11	96,08,255	6	8	49,74,765	14	9

64. The Soonkasala Anicut received no injury during the year, and the work was quite complete, except the coping of cut-stone. In the 1st Section, Main Canal, fair progress was made in providing accommodation bridges for the villages. In the 2nd and 3rd Sections the work of repair and reformation of embankments was pushed forward with considerable energy. It was hoped water could be sent down the first seventy-two miles, and irrigation commenced below the 24th. It had up to that time been confined to the country above the 24th. The 4th Section, Main Canal, was almost complete, as was the 5th, and both likely to be ready by the time water could be brought down. In the 6th Section any labour that could be spared was spent on the first six miles, the remainder of it being for navigation only. The 7th Section made little progress, owing, among other causes, to want of Indian experience on the part of Engineers in charge. The masonry works were much behind, but were being pushed on, and it was thought that in another year this portion might be fit for water. In the 8th Section there was no work, as it was already much more advanced than the 7th. In the 9th Section fair progress was made, because, as it receives its supply of water independently of the 7th and 8th, it could be brought into use irrespective of their condition.

65. No progress was made in the distribution-works, but they were at this time placed in charge of a Special Engineer.

Distribution.

66. The reservoir site in the Choardy was surveyed, and the papers were ready for submission to the Board. Estimates for the Luckavally were ready, but the surveys incomplete, and the investigation of the site on the Toonga would not, it was stated, be complete for another year.

Reservoirs.

67. The average monthly labour employed on the works was—

Labour.

Coolies	6,473
Artificers	190
Carts	178
Cattle	438

68. The expenditure in India during the year was Rupees 8,95,788; the estimates, sanctioned during the year, amounted to Rupees 15,66,685.

Expenditure.

69. The progress made during the year was much greater than in the preceding one, but not as much as might have been expected, and the number of labourers employed was much below that of the year 1864-65 immediately preceding the work being stopped. This was in some degree accounted for by the circumstance that the work in progress was masonry instead of earth-work. Again the estimates for certain works had to be

1868-69.
Progress of Work.

revised and fresh sanction obtained.—*Vide* the following statement in which the entries in italics show the alterations of the year :—

Description of Work.	Original Estimates.			Present Estimates.			Increase.		
	RS.	A.	P.	RS.	A.	P.	RS.	A.	P.
Kurnool Anicut	3,03,080	0	0	3,03,080	0	0	.....		
One mile of Canal from Anicut ...	65,000	0	0	65,000	0	0	.....		
Soonkasala Anicut and Head Works.	1,25,000	0	0	4,35,722	0	0	3,10,722	0	0
1st Section, Main Canal, miles 18 ...	4,60,000	0	0	10,60,657	0	0	6,00,657	0	0
Hindry Aqueduct	1,45,000	0	0	2,46,029	8	0	1,01,029	8	0
2nd Section, Main Canal, miles 14 ...	5,34,000	0	0	18,00,150	0	0	12,66,150	0	0
3rd do. do. do. 11 ...	1,88,500	0	0	9,58,000	0	0	7,69,500	0	0
4th do. do. do. 17 ...	2,71,560	0	0	11,80,393	0	0	9,08,833	0	0
5th do. do. do. 12 ...	2,50,003	5	4	7,29,965	0	3	4,79,961	10	11
6th do. do. do. 19 ...	3,04,258	5	4	4,39,772	5	4	1,35,514	0	0
7th do. do. do. 23 ...	2,34,893	5	4	4,82,743	5	4	2,47,850	0	0
8th do. do. do. 28 ...	4,37,410	0	0	7,36,830	0	0	2,99,420	0	0
9th do. do. do. 35 ...	8,02,811	0	0	9,45,837	0	0	1,43,026	0	0
Adimapully Anicut and Head Works across the Pennair ...	3,00,000	0	0	3,00,500	0	0	500	0	0
10th Section, Main Canal, miles 8 ...	1,94,330	0	0	1,94,330	0	0	.....		
Distribution Works	52,800	0	0	81,830	0	0	29,030	0	0
Buildings	78,765	14	1	1,00,183	9	11	21,417	11	10
Somaishweram Anicut...	1,41,357	1	7	1,71,727	1	7	30,370	0	0
Line of Telegraph	44,116	0	0	49,440	0	0	5,324	0	0
Revenue Account	604	8	3	604	8	3	.....		
	49,33,489	7	11	102,82,794	6	8	53,49,304	14	9
Deduct retrenchment from—									
Main Canal, 4th Section 1,24,872									
Do. Buildings, do. ... 2,395									
	.....			1,27,267	0	0	1,27,267	0	0
	49,33,489	7	11	101,55,527	6	8	52,22,037	14	9

70. Repairs were made to the Soonkasala Anicut and to the breaches in the 1st Section. In the 2nd Section, the reformation of the embankments was carried out with much energy and with good effect, the estimated cost, would, it was said, prove great, but the work would be efficient and secure. Similar work to a considerable extent was carried out in the 3rd Section, and for the most part with good results. In the 4th Section the works were nearly completed, and it was expected they would be finished for one and a half lacs below the last framed estimates, and the arrangements made, it was added, reflected much credit on the management of the Engineer in charge. In the 5th Section, the Teragopila Aqueduct was completed, and the works advanced enough to admit of water being passed through the Metacondal cutting. The 6th Section would, it was said, be finished by May 1870. In the 7th Section the Head Works and other masonry made considerable progress, the value of the work done in the 8th Section was Rupees 64,177. In the 9th Section the work was pushed forward well during the latter half of the year. The expenditure on the 10th Section was Rupees 32,268.

Distribution Works.

71. The progress made in these works continued very far from satisfactory; surveys were reported to be ready for some of the channels, but very little was done in actual construction, and no estimates for channels below the 53rd mile of the Main Canal had been submitted.

72. These investigations were still going on. The Massoor plans were before the Board of Directors, and the Toonga surveys were well advanced.

Reservoirs.

Bellary Project.

73. Some surveys were made for a low level line of canal for the Upper Bellary Project.

Road crossings.

74. A great many bridges were constructed, and the crossings required were all settled.

Labour.

75. The average monthly labour was as follows :—

Coolies	9,969
Artificers	611
Carts	382
Cattle	691

Damage sustained.

76. The north branch of the Soonkasala Anicut, which had hitherto stood uninjured, breached in September, owing to faulty construction. The masonry aprons were executed, and other defective parts strengthened ; but there can be no assurance, it was reported, that other defects do not remain latent. In the 1st Section, Main Canal, the embankments breached in several places by land floods. In some places the breaches were due to the banks not having been formed with sufficient care in the first instance. The masonry repairs were carried out with creditable rapidity. Two serious breaches occurred in the 4th Section from a heavy fall of rain, which raised the bed of the water in the canal 3½ feet in a few hours.

Expenditure.

77. The expenditure in India during the year was Rupees 15,58,470, and the estimates, sanctioned during the year, amounted to Rupees 5,47,272.

1869-70.

78. The Main Canal works have been making good progress since the 31st March last, but the distribution works, without which any considerable extension of cultivation is impracticable, are still very much behind-hand. Estimates for distribution to the first sub-division of the 4th Section were sanctioned in September 1868, and these works, which are intended to water 14,807 acres, are in progress. Similar estimates for the supply of water to 9,837 acres under the 3rd Section have been sanctioned recently.

Transfer of land.

79. Distribution channels under the first 72 miles of the canal, constituting the 1st, 2nd, and 3rd Sections, ought, by this time, to have been completed, but they are barely commenced. The following statement shows the extent of land made over by the Revenue authorities in each year to the Company.

Period.	Extent of land made over in Kurnool.		Extent of land made over in Cuddapah.		Total extent of land made over in Kurnool and Cuddapah.	
	A.	D.	A.	D.	A.	D.
In the year 1860-61	235	34	...	...	235	34
Do. 1861-62	2,934	87	...	...	2,934	87
Do. 1862-63	2,834	10	...	...	2,834	10
Do. 1863-64	3,809	91	...	...	3,809	91
Do. 1864-65	1,007	82	347	26	1,355	08
Do. 1865-66	2,422	96	...	...	2,422	96
Do. 1866-67	38	24	...	98	39	22
Do. 1867-68	479	46	387	28	866	74
Do. 1868-69	350	06	694	10	1,044	16
Total ...	14,112	76	1,429	62	15,542	38

Extent of land irrigated and revenue.

The following statement shows the extent of land irrigated, and the amount received for water supplied by the Company in each year :—

Period.	Extent of land for irrigation.		Amount received for Water-supply, including Kurnool Town-supply.		
	A.	D.	RS.	A.	P.
In the year 1863-64	18	36	73	6	3
Do. 1864-65	192	59	684	8	0
Do. 1865-66	816	...	1,823	9	8
Do. 1866-67	1,889	10	7,913	2	10
Do. 1867-68	1,046	45	9,772	15	5
Do. 1868-69	924	26	10,184	0	2
Do. 1869-70 up to September 1869	145	19	6,296	13	8
Total ...	5,031	95	36,748	8	0

80. In reference to the 2nd and 3rd paragraphs of the letter from the Government of India, I have to report that, so far as I have been able to ascertain, the progress made in the distribution-works continues to be trifling, and altogether incommensurate with what might have been expected. The attention of the Company's officers has always been concentrated on the Main Canal and its works, whereas the irrigation channels ought to have been pushed forward simultaneously as the Main Canal progressed, in order that the water, as a supply became available, might have been utilized, instead of running waste to the sea after having been passed down a considerable length of the canal ; but the works are still in a very backward state, and it is quite impossible, at present, to form any opinion as to when revenue, at all commensurate with the expenditure, may be expected. Recent occurrences also have raised great doubts as to how far the stability of the works may yet be relied on. Notably the failure of the under-communication, called the Sultanpore Tunnel, in the 33rd mile, which having caused a large breach in the Main Canal, necessitated the water being completely shut off just as

the Company's officers were sanguine of its being successfully passed down for the greater length, that is past the 6th Section at any rate, and which it was ardently hoped there would be no obstacle to accomplishing, for until water has been passed down two feet above normal canal level, the works cannot be said to have been fully tested, and must be a source of anxiety; and there can be no doubt that, however otherwise disposed to use the water, the ryots will be backward in applying for it until they have occular evidence of the certainty of supply.

81. In the map which accompanies, the distribution channels which have been completed up to the present date are shown in full blue lines, those finally determined on are shown in dotted blue lines, and the red dotted lines are an approximation of the future extensions for irrigation. The Agent has just informed me that the Chief Engineer is sanguine of having all the surveys for distribution channels completed and sent in by the end of March 1870, and some much sooner; if that hope is realized, their excavation would then proceed rapidly.

No. 407. ORDER THEREON, 19th November 1869, No. 3,701.

IRRIGATION, No. 20.

ORDERED that the following letter be sent :—

(Here enter No. 3,702, dated 19th November 1869.)

(True Extract.)

Colonel, R.E.,
Secretary to Government.

To the Consulting Engineer for Irrigation and Canal Company.

Exd. S. T. Augustin.

Govt. of [1869] Madr

PUBLIC WORKS.

To

THE CONSULTING ENGINEER FOR

IRRIGATION AND CANAL COMPANY.

Dated November, 19th.

Read.

G. O., 19th November 1869, No 3,701.

NOVEMBER.

Nos. 406-407

Report (Madras Irrigation and Canal Company).—Passing orders on the letter from the Consulting Engineer, submitting a general Report called for on the operations of the Company.

2.1

PUBLIC WORKS DEPARTMENT,
FORT ST. GEORGE, 19*th November* 1869.

No. 408.

No. 3,702.

To

THE SECRETARY TO THE GOVERNMENT OF INDIA,
PUBLIC WORKS DEPARTMENT.

IRRIGATION, No. 21.

SIR,—With reference to your letter of the 14th September 1869, No. 319 I., I am directed herewith to forward a letter from the Acting Consulting Engineer for the Madras Irrigation and Canal Company, in which that Officer, describing the general design of the project which is being carried out by the Company, gives the amounts of the several estimates, both original and revised, which have been sanctioned for the works from time to time, and details the progress made in each year since the commencement of operations. Colonel Carpendale also furnishes particulars of the quantity of land irrigated by the canal, with the revenue realized, and, reporting the results of the investigations which have been undertaken for determining suitable sites for reservoirs, he concludes with giving a very unfavourable view of the state of the Company's works and of their financial condition. Colonel Carpendale draws attention to the fact that the distribution works have made but little progress as compared with the main canal, although, to utilize as early as possible the water available in the latter, both descriptions of work ought to have been proceeded with simultaneously. The Chief Engineer hopes to have the requisite surveys ready for submission in a few months, and this Government will neglect no means within their reach for urging forward a description of work on the early and efficient construction of which the realization of returns from the canal so immediately depends.

2. The Government of India have long, it is believed, been aware of the manner in which, from the unfortunate system of engineering management under which the construction of the canal was undertaken, the estimates of the various portions of the work, as well as the expenditure upon them progressively increased year by year till the originally guaranteed million Sterling of capital, for which the canal was expected to be completed from Soonkasala to the coast, was exhausted, and a loan of an additional sum of £600,000 was negotiated with the Secretary of State for the completion of the first ten sections, down only as far as Cuddapah. His Excellency the Governor-General in Council will, therefore, be prepared to learn from the Consulting Engineer's Report, the extent to which, in each section of the canal, the expenditure is likely to exceed the first calculations of cost, and how little probability there is of the work being finished as far as Cuddapah for less than the full amount at the disposal of the Company, excluding all expenditure on the provision of reservoirs to supplement the supply derivable from the Toongabudra, which was an important and distinguishing characteristic of the original project.

3. The works are now, it is believed, being carried on in a more systematic, more careful, and more effective manner, and this Government have no reason to fear that the Company will not be able to fulfil their recent engagement with the Secretary of State by the prescribed date. That date is fixed by the Company's supplementary contract for the 1st of July 1871. Till then the more direct interposition of the State, which would seem to be contemplated by the Government of India, does not appear to His Excellency the Governor in Council to be practicable. Much will, in the meantime, no doubt be done by the Company to prepare the means of distributing water to all the lands to which it can be supplied from their canal as it is brought to completion, but His Excellency the Governor in Council has, nevertheless, no hope that any such extension of the area irrigated can immediately take place as will, for some time to come, materially reduce the heavy charge thrown upon the Imperial resources by the payment of interest on the great sum of money expended by the Company.

4. The series of accidents which have, season after season, marked the introduction of water into consecutive sections of the upper portion of the Company's canal, appear to have created amongst the people a feeling of distrust of the capability of the canal to maintain a permanent supply of water, and this to such an extent as not only to have checked extension of irrigation, but to have caused a diminution of that which had at first been taken up. It is not to be expected that confidence in the stability of the canal, or of the security of the supply of water to be afforded by it, will, after what has occurred, be very speedily restored. This will take time, whatever may be the future progress of the distribution, as well as of the main works of the canal, and His Excellency the Governor in Council fears that it will not be possible for many years to bring about the substantial equilibrium between the revenue derived from the canal and the charges caused by it to which the Government of India refer, and which is so desirable.

I have the honour to be,

Sir,

Your most obedient servant,

Colonel, R.E.,

Secretary to Government.

Exd. E. C. Shunker.

Consulting Engineer's Office,
Irrigation & Canal Company,
Madras, 23rd October 1869.

23

No. 87.

From,

Colonel A. Cotton, R.E.,

Consulting Engr. for P.W.D.

To,

The Secretary to Government,

Department of Public Works.

Sir,

I have the honor to submit the following General Report on the operations of the Madras Irrigation and Canal Company as called for in Govt. Order No. 3193 of 2nd October 1869 in accordance with instructions from the Government of India No. 319 of 15th September 1869.—

2. The Project as now being carried to completion under the Supplemental Contract of October 1866 consists of one Main Canal from Soonnakula 18 miles above Kurnool to Cuddapah being a distance of 188 miles and is shown on the accompanying Plan which is a modified copy of one published by the Company, and will conveniently elucidate the following remarks, both as regards the general design and the position of the more important masonry works referred to—

while

Hiddy

while the reduced longitudinal Section will shew at a glance the fall of the country which the Canal traverses, and here I must notice that a very important omission in the reduced scheme now being carried out is any provision for reservoirs to supplement the supply of water from the Coombuhra, without which the Canal will never be efficient as an irrigation work, and its value as a line of navigation will be comparatively small, and the extension of the Canal below Cuddapah to Somasingram and thence through the Nellore District to the coast, which formed part of the original scheme, is not referred to in the "Supplemental Agreement."

The other drawings which accompany are Cross Sections of the Aniuts, sections of some of the larger Aqueducts, and a general plan of a Work; all of which will it is hoped convey a sufficiently clear idea of the nature of these works and the method of their construction.

3. The Project commences with an Aniut or bund across the river Coombuhra at a point 18 miles above Turnoor, by means of which the water will be raised sufficiently high to flow 6 feet deep in the Main Canal which commences there. — The Aniut is founded on rock, and is simply a heavy wall of rubble masonry. The supplementary works are a head sluice for regulating the admission of water into the Main Canal to the extent of 1,00,000 cubic yards an hour when the river surface is level with the crown of the Aniut.

General design.

4. Aniut and waste weirs of sufficient discharging power for removing any deposits of silt or sand which may occur above the head sluice. 25

The 1st Section of the Main Canal is 18 miles long, from Soontkasala to the river Hindry at Turnoor 18 miles.

1st Section Main Canal
Soontkasala to Turnoor
18 miles.

= now 1 Mile 90 feet wide, depth of water 6 feet, has a fall ranging from 3 inches to 1'-8" a mile and will carry 40000 cubic yards an hour. The first 3 miles are excavated in rock. Thence to the 16th mile the Canal is formed by a single bank, the water on the upper side spreading according to the nature of the ground and forming small tanks, and for a further portion of its length it runs between two banks until it meets the river Hindry. Any surplus water from drainage that finds its way into the Canal by reason of the single bank formation will be discharged by masonry works called weirs (termed calingulahs in Madras) which are constructed in the bank of the Canal for the purpose. The large masonry works in this section are six accommodation bridges.

5. At Turnoor the Canal crosses the river Hindry by an Aqueduct of 14 arches each of 40 feet span, the breadth of waterway being 90 feet and depth 9 feet. After passing the

2nd Section
From Turnoor to Sultanpore.
18th to 32nd mile.

3rd Section
From Sultanpore to Nagalapore.
33rd to 43rd mile.

Hindry

Hereby the Canal takes a fall varying from one inch
& ½ to 8 in a mile, continues long a distance of 24
miles crossing deep gullies and cutting through
rocky spurs. Some portions are carried over val-
leys by masonry Aqueducts, and in others by
above turnouts by means of single banks - where
rock is met with the cuttings are comparatively
narrow - In some parts the Canal runs between
masonry walls backed by earth imbankments.
The walls are nearly vertical and in parts 25 feet
high - The masonry works are very many. At the
19th mile the Choothy road is carried over the Canal
by a bridge three arches of 30 feet span. In the
21st mile a stream is carried under the Canal by
a culvert 240 feet long. At Kudrabagh the valley
is crossed by an Aqueduct three arches of 25
feet. At Sultanpore the road is taken under the
Canal by a tunnel 14 feet span. At Allur in
the 35th mile there is an Aqueduct similar to
that at Kudrabagh - Across many valleys the
Canal is carried by lofty masonry walls where
the soil was scarce or unsuitable for imbank-
ments, or labor scarce and stone abundant. In the
24th mile one of the walls is 48 feet high. In
some places dry rubble walls filled with clay
have been substituted for masonry walls. The
number of large masonry works in the 2nd Section
is one aqueduct and three bridges, and in the 3rd Section

one aqueduct and four bridges. -

6. At the 45 mile a bridge 3 arches of 30 feet

4th Section
From Nayatore to
Cupad 44 to 66 mile.

span crosses the Canal - dou-
-ble banks and favorable
cutting continues up to 46½
mile, where a valley is crossed by a single bank R
and a bank R formed - cutting and double banks re-
-commence at 47th mile, and some further portion
is formed of single banks as before. The fall of
the Canal in this Section is 4" per mile, and the
chief masonry works are four bridges over the
Canal for villages. -

7. The principal work in this Section is the

5th Section
From Cupad to Terravoor
61 to 72 mile.

Metaconal cut at the
72nd mile, by which
the Canal passes through
the watershed that separates the river Kundar,
a tributary of the Pennair from the valley of the
Coombdra, and of the mountain stream Poiyanoor.
The cutting is 30 feet deep and the Canal on emerg-
-ing from it enters the valley of the Kundar. For
30 miles the Canal is partly within double banks,
and partly formed of single banks, the water being
comparatively shallow but of considerable spread.
There are no locks in the Canal above the cuttings
and it hereafter by means of reservoirs to supple-
-ment the flood of the Coombdra, a constant supply

of

of water becomes available, the navigation will be open throughout the year except during occasional heavy falls of rain when the current in the narrow cuttings will be too strong for anything but steamers.

8. At the 72nd mile the Canal parts with the bulk of its supply of water, which not being required for irrigation is carried off from the Canal by a cut into the river Caulee, to be again taken up and utilized by means of Aqueducts lower down. The Terraopila Aqueduct is the chief masonry work in the Section, the only other important one being the bridge over the Metaconda cut. The fall of the Canal in this Section varies from 4" to one foot and the chief masonry works are in addition to those mentioned three bridges.

9. With the commencement of this Section the Canal is of reduced dimensions - the first six miles only of it being required to carry water for irrigation - the remainder of the length being a still water canal for navigation and only having sufficient water for the Rafts passing down it. The quantity to pass down this part of the Canal will be 50000 cubic yards an hour, and the remainder will be carried off by the natural drainage improved to the Caulee, to be again taken up in the first instance by the Cootoor Anicut for the supply of the 7th and 8th Sections. In the first six miles the fall is slight, but in the lower or navigation portion a rapid fall is overcome by locks consisting of 12 lifts of 10 feet each - The other masonry works are two bridges.

6th Section from Terraycoodoor to Cootoor - 73" to 92" mile.

10. This Section commences with an Anicut across the river Caulee at Cootoor from which a canal carrying 100,000 cubic yards an hour is taken - The remainder of the water thrown into the river from the cut at the 72nd mile, will pass this cut and be taken up again below the junction of the Caulee and Kundar - Part of this Section is a deep and hard cutting - The Section is a contour line crosses a great deal of drainage where the country is flat and water courses shallow, so that the drainage culverts lie deep and are drowned for some months of the year - The Canal here has a surface width of 70 feet, the depth is 6 feet, and the fall 6 inches a mile - The chief masonry works are 2 Aqueducts and 11 bridges.

7th Section from Cootoor to Villalah 92" to 114" mile.

11. This portion of the Canal receives its supply of water from the 7th Section in the first five miles - there is a great deal of excavation in rock, and in extremely hard kunkur that is, nodular limestone - there are in this Section 17 single chamber locks of from 10 to 17 feet lift, and one bridge.

8th Section from Villalah to Rajoly 115" to 146" mile.

12. This

12. This Section of the Canal is to be executed by an Aqueduct called the Rajolypacheru the biggest Stream that flows into the Pennair River. The Aqueduct is 1000 feet long and average height 9 feet; the capacity of the Canal here is bottom width 50 feet, surface width 70 and depth 5 feet; the fall is only 3 inches a mile, and the discharge will be 50000 cubic yards an hour. The chief masonry works are 13 Aqueducts — 9 bridges of one chamber each and from 8 to 12 feet high. There are also four bridges.

9th Section.
From Rajoly to Adimapully
12½ to 17½ miles.

13. This Section will obtain its supply from the river Pennair and the surplus water of the Kundar by means of a bund called the Adimapully Anicut built across the former a little below the junction of the Kundar. The length of this bund will be 2376 feet for ⅓ of its length it will be simply a wall built on rock the remainder will be on deep sand or clay with the usual sloping apron. The dimensions of the Canal for this distance for irrigation and navigation are 50 feet width at bottom 70 feet at

10th Section.
From Adimapully to Cuddapah 179 to 197 miles.

1859-60.

surface depth 5 feet and discharge 30,000 cubic yards an hour the fall is only 10 of a foot a mile. This Section of the Canal in its course crosses some important water courses by aqueducts. The principal masonry works are two aqueducts and one bridge.

31

14. Having briefly described the general plan of the work as being now carried out I proceed to detail the progress made in each year since the commencement and here I have to apologize for the incompleteness of the foregoing description. I have only just taken up my present office and have not had an opportunity of becoming personally acquainted with the works while the short time allowed for writing the report for binding some over the line before writing it which would require a month and I am unwilling to enter into a more detailed description of the works from office records as the changes and alterations have been so numerous I might fall into error.

15. The Company received the sanction of the Indian Council to their proposal on the 8th July 1859 and on the 15th September 1859 orders were received to commence such works as after being duly surveyed and estimated had received the sanction of the Madras Government under which authority work was commenced at Kurnool

on

on the 4th April 1860 the design being the di-
=version of the water of the Coombuda by means
of an Anicut at Turnoor into the rivers Kundär
and Pennär, in order to provide irrigation to the
valley of the former and to the District of Nellore,
and further by a connection with the East coast
canal to afford water communication from the
Presidency town to Turnoor.

16. The actual work during the year was
confined to surveying and levelling, constructing
stone sheds and offices, and the formation of a temporary dam of rubble
stone in the river bed at Turnoor, and the collection
at the quarry of a further large quantity of stone
for the proposed anicut.

17. The expenditure to 30th April 1860
was Rupees 3,10,000 and the daily numbers of men em-
=ployed was about 5,000.

18. The investigation of the upper section
of the Canal from the Coombuda through Bellary to Turnoor,
and the continuation of the Canal from Pennär to the Eastern Coast Canal
having actually proceeded, all of which was
included in the original scheme.

19. The

Progress of work.

Expenditure Labor.

Bellary and Nellore investigations.

1860-61. 19. The operations were chiefly confined to
detailed surveying and planning.

Progress of work.

The Superintendent Engineer and the
first Circle of the Canal was commenced. At
that time an order was received from the Secre-
=tary of State for a reduction of the original
scheme, and upon the submission of reduced
and modified designs, the Local Government deemed
it necessary to stop all Construction pending an
enquiry which they instituted regarding it, and
the works were accordingly suspended on 20th No-
=vember 1860, and operations resumed 25th March 1861.
The reduced scheme, as proposed by the Company's
Chief Engineer, and which included the storage
of water, provided for a complete canal for ir-
=rigation and navigation to commence from
Soontavala a village in the Coombuda, and to termin-
=ate as originally proposed at the same point, that
=is at Napatam on the Eastern Coast Canal.

20. The investigation was entrusted to Major now
Colonel C. A. Orr and upon his report the Govern-
=ment decided to sanction the commencement of such
works only as would form a scheme complete in it-
=self and the cost of which would not be likely, after
making every allowance for contingencies, to exceed the
sum for which a guarantee had been allowed, namely
one million sterling, and that accordingly for the present
the Canal should only be extended as far as Commanmeram

com-

come 63 miles short of what had been proposed as the
Coast terminus at Kistnapatnam.

21. The earnings and plantings executed during the
year comprised the Amrutvat Sonkasala and other de-
tails of work, including estimates for 45 miles of canal
general surveys for the extension of the Canal to Gooty
roads, and general sites for reservoirs were carried.

22. The Bellary Project was determined.

23. The work executed prior to and previous to
Canal operations and estimate
quarried to the value of Rupees Quantity of work and
94,781 and the Establishments sanctioned aggregated Expenditure.
Rupees 21,071.10.8. The expenditure during the year
was Rupees 4,62,707 and the total to close of the official
year Rupees 8,46,689.

24. Twenty miles nearly completed and it was ex-
pected that water would be Progress of work.
admitted during the season

1861-62.

sufficient to irrigate the land between Soonkasala
and Nurnool, and to meet the municipal wants of
the town. Considerable progress was made in the
construction of the Soonkasala Amrut, and the Hindry
Aqueduct, 1/2 miles of Canal below Nurnool were
in progress. Surveys for 64 miles below Nundial
had been completed, and estimates for the varied
length were in a forward condition, and additional
surveys for a length of 60 miles towards Sonnia-
weram had also been completed leaving unsurveyed

a

a link of 25 miles between the head of the Vaika-
-lair and the confluence of the Sunder and
Primar.

35

25. The number of laborers varied from 14 to
Labor. 30,000 a month during the year.
Gross expenditure was Rupees 758949
and the estimates sanctioned amounted to Rupees
1991336.

1862-63. 26. The construction of the Main Canal through
the Nellore District from Sonnaiweram to the
Coast was finally authorized by the Secretary of
State.

27. The Soonkasala Amrut and subsidiary
works was nearly completed. Masonry work of

Progress of work. the 1st Section Main Canal
nearly completed. the arches
of the Hindry Aqueduct completed to 3/4 of its full
breadth, half the earthwork and a small pro-
portion of rock excavation executed from Nurnool
to Nundial and Masonry works in the same
length made considerable progress, and were pro-
-ceeding satisfactorily. Any irrigation below
Nurnool was found impossible this season but
it was stated that in the section above Nurnool
water might be given if the cultivators were pre-
-pared to use it. The channel from Nundial
cut to river Cooley was commenced, and preparations

made

made for lockage for a fall of 200 feet and consi-
derable progress was made in surveying and es-
timating for the remaining portion of the line.

28. Surveys for distribution channels were
carried on in the 5th and 6th Sec-
tions, and about 50 miles of Distribution.
channel laid out but not estimated.

29. The exploration of sites, and the surveys
for reservoirs, were renewed by Reservoirs.
a survey party specially sanctioned for the purpose.

30. The average number of labourers employed
during the year was about 20000 month-
ly. The expenditure was about Rupees Labor.
1350000, and the estimates sanctioned amounted
to Rupees 694960.

31. During this year an estimate amounting
to Rupees 481800 for the construction of the
10th section of the portion of the Main Canal be-
tween the Runnair and Uddapatty was submitted
to Government, but execution was declined until
plans and estimates in continuation from Ud-
dapatty to the Soonkesalla Anicut were pre-
pared, and could be taken into consideration
at the same time. The only other portion of the
Main Canal not sanctioned up to that time was
the 9th Section north of the Runnair from the 146
mile down to the river.

1863-64.

32. The

32. The Soonkesalla Anicut and head sluice
Progress of work. were completed. The addition-
al earthwork Road stone facing
in the 1st Section made good progress. Considerable
work was done to the Windy Aqueduct. A large
amount of work was done in the 2nd section. The
Choaty road bridge approaches completion, and
the arches of the Kundarbagh Aqueduct were turned
In the 3rd Section the earthworks were in a forward
state, the revetments of the interior slopes made
good progress, and the masonry works were nearly
completed. In the 4th Section the Nagatore bridge
was completed, the other masonry works were
stated to be behind hand, and the earthworks also.
The Chief Engineer attributed the short progres
d scarcity of labor. In the 5th Section, the princi-
pal work in the Section was the Metacondal cut
which was nearly completed, the excavations and
embankments made considerable progress, and
the masonry works were generally more advanced
than in the preceding Section. In the 6th Section,
the earthworks were in some miles nearly com-
pleted, in others the ground had not been broken.
A bridge of two arches near Metacondal was
half finished. The headworks of the Section, name-
ly a scouring sluice, head sluice, and locks made
suitable progress. By reason of the soil being very
bad all along the Section, and large foundations proving

to

1864-65.

37. In this year the original estimates of the works under construction having been found generally inadequate, supplemental sanctions to a large amount were applied for and given, the particulars are exhibited in the following statement:

Description of work.	Original estimates.	Present estimates.	Difference.	Remarks.
Kurnool Anicut	303080	303080		Abandoned
1 mile of canal from Anicut	65000	65000		do
Soonkesala Anicut and headworks	125000	309650	184650	
1st Section Main Canal miles 18	460000	856777	396777	
Hindry Aqueduct	145000	218528	73528	
2nd Section Main Canal miles 14	722500	1916717	1194217	
3rd do do do 11				
4th do do do 17				
5th do do do 12	519830	953963	433133	
6th do do do 19	302525	380529	78004	
7th do do do 23	233160	235850	2690	
8th do do do 28	437410	558610	121200	
9th do do do 35	802811	802811		Not commenced
Distribution works	37404	37622	218	Nearly do
Buildings	36828	41755	4927	
Somasamoodram Anicut	133000	162470	29470	
	4323548	6842588	2519088	

38. The completion of the estimates for the 10th 11th and 12th Sections were deferred. Progress of work.— The Company having decided not to proceed with this portion of the work until the upper Sections, 177 miles in length, had been completed

do be necessary for masonry works which it had been supposed would be founded on rock. The cost would, it was, also be inevitably larger than was provided in the estimates. In the 7th Section the head works, comprising sluices and regulating locks were in progress, the earthworks of the first 7 miles made good progress. Masonry works were hardly commenced in the 8th Section. Little river done owing to want of labor. The Somasamoodram Anicut was in progress, but not much advanced, small freshes in the river and want of well sinkers being the cause.—

33. No estimates were sanctioned or received during the year for the distribution of water, and the expenditure upon works of this nature was very small.—

34. Sites on the Coonga and Cudna were partly surveyed. A plan and estimate for Reservoirs. Pusturally Drain was prepared.— further progress in surveys was checked by fever.—

35. The monthly average of labor was: Labor.

Coolies	15,043
Artificers	944
Carts	397
Cattle	861

36. The expenditure during the year amounted to Rupees 1596463, and the estimates sanctioned amounted to Rupees 1199268.— Expenditure.

completed and brought into use. At the same time Government declined to sanction the 1st Section of the Main Canal in Nellore as it appeared improbable that the Company would be able to complete the first 9 Sections of the Canal with the balance of the Guaranteed million of Capital and after a long correspondence the Company were eventually convinced of the soundness of the opinions expressed by Government and that the proper course would be to complete and utilize the upper portion of the Canal.

39. The 1st Section Main Canal was so complete that water was admitted. The extent of land cultivated was only 102 acres, and a supply of water for Irrigation was also provided.

Progress.

The Hindry Aqueduct was nearly completed, and water passed over it in December 1864. The leakage was considerable, and the water had to be shut off in order that improvements might be made by plastering the floor and filling in 200 yards in length of the bed of the Canal with good soil. In the 2nd Section the progress was very satisfactory, but considerable anxiety was felt regarding the stone walls, in lieu of banks, and the dimensions and construction were not such as to ensure stability that they would be watertight. The works in 3rd Section, including Pullur Aqueduct were in a forward state. A considerable quantity of work was done in the 4th Section. In the 5th Section, except at Iruzapilla Aqueduct in 63rd mile, no heavy work remained to be done, but there was much clearing and bottoming and small masonry works still incomplete. The head works in the 6th Section made good progress, and the surplus works for discharging water into the Canal. Work was stopped at the lower or navigation portion of this Section and the labor transferred to the irrigation portion which was thereupon vigorously pushed on.

40. Very little was done during the year in Distribution. Irrigation works, some few yards of minor channels were constructed in the 1st Section, one channel commenced in the 4th and some sluices built in the first 5 Sections.

41. Surveys and investigations were carried on at several sites in the Nyeair Reservoirs. country, but without definite results. A favorable site on the Chittravutty was selected and surveyed, and a good deal of time and attention was devoted on a line of Canal from Walavapore on the Coombudra via Harapee to Bellary.

42. The monthly average of labor employed was

Labor.

Coolies	16707
Artificers	1231
Carts	750
Cattle	1966

43. The

Rupees 11084 for distribution works connected therewith was also removed from the list of sanctions.

46. The following statement shews the revised estimates for works as sanctioned up to the end of this year, and as compared with the original estimates, and the higher estimates have been exceeded in some cases to a considerable extent.

Description of works.	Original estimate	Present estimate	Increase
Kurnool Anicut	308080	303080	Abandoned
1 mile of canal from Anicut	65000	65000	Do
Soontoorala Anicut & head works	125000	410292	285292
1st Section Main Canal - miles 18	460000	856777	396777
Hindry Aqueduct	145000	246029 8	101029 8
2nd Section Main Canal - miles 14			
3rd Do Do 11	722500	1960655	1238155
4th Do Do 17			
5th Do Do 12	519830	1693082	1173252
6th Do Do 19	302525	380529	78004
7th Do Do 23	233160	235850	2690
8th Do Do 28	487410	736830	249420
9th Do Do 35	"	"	Cancelled
Distribution works ×	25520	25738	218
Buildings	87526 15 8	102099 9 10	14572 10 2
Somasamoram Anicut	133000	162470	29470
Line of telegraph	44116	44116	"
	3603667 15 8	7222548 1 10	3618880 2 2
Deduct retrenchment from Main Canal 4th Section Rs: 124873			
Do Buildings Do 2393			
127267		127267	127267
	3603667 15 8	7095281 1 10	3491613 2 2

× Exclusive of Rs: 11884 for which the estimate was cancelled with the 9th Section Main Canal estimate.

47. The amount retrenched at the foot of the statement was a part of expenditure in the 4th Section which

1865-66.

Soontoorala Anicut breached in July 1864 at a point where it is high. Damage sustained was greater and it was closed for temporarily three months afterwards. The new Road has reached on right and Aqueduct in the river bed retarded progress. The Hindry Aqueduct with 7 1/2 miles was found to have insufficient foundation and to be of insufficient strength in other respects. Additional works were sanctioned to increase its strength, and some defective portions were taken down and rebuilt. The Anicut across the Kistna Canal in the 2nd Section was completed for two thirds of its length and 5 feet of the head sluice completed. The remainder of this point for first complete.

The progress made in the year was much less than in the upper sections, and the earthworks and masonry works were behind hand. In the 3rd Section the progress was very unsatisfactory. As many miles the earthwork was finished or approaching completion. The masonry works were delayed that their plans might be revised as they were found unsuitable for their positions and circumstances.

44. The expenditure under all heads during the year was Rupees 2593966 and the Expenditure estimates for the year amounted to Rupees 2748912-

45. In this year the sanction of Rupees 202811 for the 9th Section Main Canal that is from 143rd to 178th mile was at the request of the Company cancelled and Rupees

done.—

49. The following statement will show the comparative progress made during 1864-65 and the year under review, and exhibits the extent to which expenditure was restricted by the exhaustion of the Guaranteed Capital of one million.—

	1864/65	1865/66 1st Quarter	2d Quarter	3d Quarter	4th Quarter	Total
Aniout & headworks at Kurnool	425 1 2	" "	" "	" "	" "	" "
1st Div. Canal Southward	84320 8 11	13796 2 9	31686 7	50344 2	11911 13 9	29880 6 3
2d Div. Do. Do. Do.	41387 4 7	2626 14 1	1462 15 2	3701 12 2	1260 15 1	6221 6 6
Aqueduct across the river Hindry	42363 3 3	5325 10 9	1016 5 8	9159 2	5702 3 6	15796 13 1
Canal for 1 mile South Main Canal	" "	" "	" "	" "	" "	" "
1st Section	339874 7 9	32615 10 9	10212 1 2	7655 15 7	10285 2 10	60769 14 5
2d & 3d do	570004 18 6	49722 5 9	43883 12 4	72650 15 5	34296 10 9	200553 10 3
4th & 5th do	427128 12 11	11894 8 6	81055 - 1	194648 7	57165 8 -	344763 9 -
6th do	333129 2 10	19905 5 6	8743 10 8	8631 7 10	4724 6 6	42008 14 9
7th do	94372 - 3	19247 2 -	22093 9 9	12127 - 1	1958 7 2	56453 3 -
8th do	138204 14 3	35768 3 8	26525 - 10	22775 3 7	1486 3 8	86554 11 7
Total	1733208 13 5	44790 - 5	294193 14 6	230781 4 7	128871 5 4	698827 8 10

50. The important distribution works made little or no progress.—

Distribution.

51. The investigations which were in progress last year were completed.—

Bellary Project.

52. The average monthly labor for the first 8 months was:

Labor.

Coolies ——— 8119
Artificers ——— 682
Carts ——— 402
Total ——— 909

The falling off was in no way due to failure of supply

Which the Government declined to grant. This was subsequently made up by Contributions.

48. The repair of the embankments of Main Tidal Reservoir proceeded during the year.

Progress of works.

49. The following statement will show the comparative progress made during 1864-65 and the year under review, and exhibits the extent to which expenditure was restricted by the exhaustion of the Guaranteed Capital of one million.—

50. The important Distribution works made little or no progress.—

Distribution.

51. The investigations which were in progress last year were completed.—

Bellary Project.

52. The average monthly labor for the first 8 months was:

Labor.

Coolies ——— 8119
Artificers ——— 682
Carts ——— 402
Total ——— 909

The falling off was in no way due to failure of supply

Of the Canal through the 1st Section, and the works generally were found in an efficient state, provided of Canal was tried, and the work of burning was completed with the water. Water was admitted gradually to the Hindry Aqueduct, and the walls, Embankments, Sluices, &c generally in the 2d Section were strengthened. The more important works in the 3d Section necessary for the navigation of the river were in progress, and all other works were pushed until funds became available. Some progress was made in the 4th Section, and the Guaranteed Capital remaining unexpended was considered sufficient to complete the Canal. Operations were carried on in the 5th Section, and the construction of the works from the 52nd to the 53rd mile was completed. The work done in the 6th Section was of a limited character. The progress in the 7th and 8th Sections made fair progress, but expenditure was restricted almost ceased during the latter part of the year. Works in the upper portion of the 8th mile were pushed on to the face of the Section where it was resolved to complete, as the expenditure in the 1st & 2d Sections progressed. The 7th Section was completed, no further work was done.

supply but a reduction of expenditure.

53. The wall in the 24th mile was found to require strengthening the lea Race through gravelly banks and stony subsoil was great. The Amient across the Caulee received considerable damage from the year's freshes and the Chief Engineer determined to modify the plan.

54. The amount expended under all heads during the year was Rupees Expenditure. 1382548 and the estimates provisioned amounted to Rupees 1067389:-

55. The progress during the year was altogether inconsiderable - last year the Company had expended more than 9/10ths of the Guaranteed Capital and being unable to obtain subscriptions of further Capital without guarantee, dismissed the greater part of the Executive Establishment, and suspended the construction of works until means had been provided for the completion of at least a portion of the scheme - Negotiations with the Secretary of State resulted in the execution of a Supplementary Agreement upon which on certain conditions, the Secretary of State agreed to advance money as required to the amount of £600000. The Contract was signed on the 2nd October, and the Company took immediate steps to reorganize their Engineer Establishment. Work to a trifling extent was only resumed up to the

1866/67. Progress of work.

end of the year, and the Canal so far as its main object was concerned, the supply of water for irrigation, was no nearer working condition than it had been a year before.-

56. The subjoined statement shews the comparison of estimates to the end of the year, and it was observed that further supplemental sanction to a very considerable amount would be required.-

Description of work	Original estimates	Present estimates	Increase.	Abandoned &c
Surwal Amient	303080	303080		
1 mile of Canal from Amient	65000	65000		
Contingencies Amient & head works	125000	427052	302052	
1st Section Main Canal miles 18	460000	881927	421927	
Hindry Aqueduct	145000	246029	101029	8
2nd Section Main Canal miles 14	334000	681124	347124	
3rd do do 11	188300	334240	145940	
4th do do 17	271560	1103570	832010	9
5th do do 12	248270	589512	341242	
6th do do 19	302525	438039	135514	
7th do do 23	283160	538850	2690	
8th do do 28	237410	736830	299420	
9th do do 35	802811	802811		
Distribution works	52724	57870	3146	
Buildings	87526	108666	21139	13 8
Somaisseram Amient	133000	162470	29470	
Line of telegraph	44116	44116		
Revenue Account	295	295		
	4433978 7 11	8168482 13 7	3734504	5 8
Deduct retrenchment from Main Canal 4th Section Rs. 124872				
do Buildings do 2395		127267	127267	
	127267			
	4433978 7 11	8041215 13 7	3607237	5 8

57. No progress was made - Eastward Distribution - as was the Main Canal, the channels of distribution were still more so.-

58. The estimates for a canal from Walwapore to Bellary

Reservoirs and Bellary Project:- were completed - The estimate as corrected amounted to Rupees 1538000 and included reservoir storage.-

59. The