

MADRAS RECORD OFFICE.

Government of Madras.

Revenue DEPARTMENT.

G.O. No.	2184	Press
	296.297	Mis
Dated	16 - 9 -	1918.7

Not to be folded or roughly handled

9.184

Gms

*Proceedings of the Madras Government, Revenue Department,
16th September 1867.*

No. 296. Read the following Proceedings of the Madras Government in the
Public Works Department:—

Passing orders on letter from Mr. Fraser, Execu-
tive Engineer, relative to the enlargement of Chembrumbakum tank, in Madras District. } (Here enter 11th September 1867, No. 2,797.)

No. 297. ORDER THEREON, 16th September 1867, No. 2,184.

Irrigation, No. 13.

Ordered to be recorded.

(True Extract.)

Acting Under Secretary to Government

Exd. S. T. Augustin.

Read the following letter from W. FRASER, Esq., C. E., Executive Engineer, to the Secretary to Government, Public Works Department, dated Mount Road, Madras, 17th April 1867, No. 14:—

1. I have the honour to forward the Plans and Report of the project for enlarging Chembrambakkam tank.

I was informed yesterday that I should have the Rain Table that afternoon, and I considered it better to wait for it. It was received too late to be copied until this morning.

2. The detailed Estimate and general Specification will be sent up in a few days.

3. Trusting that the Report will be found satisfactory.

REPORT ON THE PROPOSED ENLARGEMENT OF CHEMBRAMBAKKAM TANK,

By WILLIAM FRASER, Esq., C. E.

1. With this Report twenty-three sheets of plans are forwarded, as follows:—

Description of Plans. SHEET No. 1.—Index Map showing the country with the rivers, tanks, channels, &c., between the Poiny river (a tributary of the Palar) and Madras. This map has been compiled from the old Military Survey and such other maps as I could procure, for the purpose of showing, at a glance, how Chembrambakkam and other tanks, the improvement of which will form the subject of another Report, are supplied with water, and how they are connected with, and dependent upon, each other, so that the Government may, without difficulty, form an opinion on the entire question of the improvement of these tanks, channels, &c.

The Madras Water Works, now under execution, are drawn in red on this map; as also the position of the proposed Mount tank, the old Pamunal tank, the proposed Junction canal, &c.

I have to request that this map may be returned when the Government have examined it, as I shall have to refer to it when I send in a report on the enlargement of Streepermatur and other tanks.

SHEET No. 2.—*Contour map of Chembrambakkam tank.*—The red contour line on this map shows the form and extent of the natural basin at the level of the present calingulah. The red contour, shaded blue, is at the level of the top of the dam stones, to which height the Merassidars can raise the water whenever the rain-fall is sufficient. All the contour lines are one yard apart in height, and the fifth one from the present calingulah, shaded red, is at the level of the proposed calingulah; and this line shows the form and extent the tank will have when the water stands at that height.

This line also shows how the villages, lands—cultivated and waste—roads, &c., will be affected by the proposed enlargement. During very heavy and sudden rains the water may rise higher than this line, but provision will be made for preventing it over rising more than a foot or two.

On this map the proposed extension of the bund at the north and south ends is shown in red.

SHEET No. 3.—*Longitudinal Section of the present bund.*—On this plan the section of the top of the present bund is shown, as also that of the land along the foot of the slopes inside and outside of the tank. The blue line along the section shows the height of the present calingulah, and the red lines show, respectively, the height of the proposed calingulah, top of proposed bund, and the top of the proposed parapet.

At sluice No. 5, the Merassidars have certain marks to show when the tank contains three, six, nine, or twelve months' supply of water. The heights of those marks are shown on this section.

The datum line drawn upon this section is seventy feet above my general datum, which is twenty feet below mean sea level, as marked by Colonel DeHavilland, R. E., upon the north wall of the fort; so that by adding fifty feet to the heights figured upon the section, the height of any of these points above mean sea level can be ascertained. The same datum is used for all the sections.

SHEETS 4 to 9 contain twenty-four cross sections of the tank bund, showing its present height and shape, and, in red, the manner in which it is proposed to be enlarged.

SHEETS 10 to 21.—Plans of the present eleven sluices, showing how they are proposed to be altered.

SHEET 22.—Plans of the proposed calingulah.

SHEET 23.—Sections showing how Trunk Road No. 1 to Bangalore is proposed to be raised where it crosses the west end of the tank.

History of the Tank.

2. Chembrambakkam tank lies about sixteen miles S. W. by W. from Madras. There is no record of its construction; indeed, it is so very old that there is scarcely even a tradition of its origin. Upon four of the sluices there are Tamil inscriptions, three of those are not more than forty-four years old; the fourth is only partially visible, but it is evidently not of a very ancient date.

Breach in 1818.

3. I have not been able to obtain any record of this tank older than January 1818, on the 3rd of which month a most serious breach occurred in the bund at Manapakkam sluice, when the tank was quite full. This sluice is figured No. 6 on the map and longitudinal section.

The Collector of that time, Mr. W. Cooke, in reporting the circumstance to the Board of Revenue on the 8th idem, says, "This tank has been repeatedly filled this year, and after sufficient water had run off, the calingulahs were shut, retaining the usual supply of water in the tank. This has occurred several times during the season."

"3. The last time it was found requisite to re-open the calingulahs was on the 27th ultimo, and they were again closed when the usual quantity of water only remained."

He then goes on to state that the persons watching the tank during the morning saw the water coming through Manapakkam sluice. They immediately proceeded to report the circumstance and obtain assistance, but before their return the bank had given way. The Collector is at a loss to account for this accident, as the tank had been repeatedly filled during the season without the appearance of any defect.

It appears, however, that twelve or fourteen years previously this sluice had sunk, and was repaired by Colonel Caldwell, and it was supposed that there remained some defect in the foundations.

4. On the 10th February 1818, Major DeHavilland, R. E., then Inspector of Tank Estimates, was directed to report, which he did on the 16th of April.

"Paragraph 6. The breach which was made in its bank on the 3rd January last is tremendous; indeed, not less than 248 feet in extent, and excavated about fifteen feet below the natural level of the ground." He attributes the accident to the undermining of the foundation by the water giving admission to a small quantity at first, until "At length both sluice and bank tumbling in, overy impement to the rush of a terrible torrent was soon removed; and the flood, which thence made its way to the Adyar river, carrying destruction before it for some days, was so powerful as to remove large stones, blocks of masonry, trees, &c., to a very considerable distance."

5. Major DeHavilland prepared plans and estimates for the re-construction of this sluice, and also for the alteration and strengthening of the other sluices, as he considered that they were all faulty in construction, by their heads being run out so far into the tank and away from the bund, by which he considered the water more easily made its way between the earth of the bund and the masonry of the sluices. The estimated cost of all these works was Rupees 30,817-3-1, but the expenditure, as we learn from a letter of Mr. C. D. Campbell, Secretary to the Board of Revenue, dated 25th November 1819, was only Rupees 24,979-13-2.

Great storm on the 24th October 1818.

6. From a report by Lieutenant-General D. Sim, R. E., Civil Engineer Central Division, we learn that the works were still incomplete when they had to resist—

"The effects of the terrible storm which visited us on the 24th of October 1818, when very many tanks of long standing in the Jaghiro were unable to withstand the shock; but our unceasing attention and solicitude in the prosecution of the work has been fully rewarded."

"Paragraph 5. I will give your Board an idea of the rapidity of the influx of water into the reservoir on the awful day of this visitation, to state that at 7 o'clock in the morning, when it began, the water was at two months' mark; and that at 3 in the afternoon of the same day a messenger was dispatched thence in haste to inform me that it had reached above the ten months' mark: measures were immediately taken by cutting the ends of the banks for their relief."

7. The height of these two water marks will be seen upon the longitudinal section of the bund. I find, by calculating from the contoured map, that the quantity of water which flowed into the tank in the eight hours given above was 48 millions of cubic yards, or six millions of cubic yards an hour.

8. Through the courtesy of Mr. Pogson I have been enabled to examine the daily rain register of that period, and I find that when the breach took place on the 3rd of January, it could not have arisen from any sudden accession to the quantity of water in the tank, for although 19 inches of rain fell in October, and over 24 inches in November, but 6½ inches fell in December. In this month there was no rain from the 17th to the 21st; 2½ inches fell between the 22nd and 26th, and none at all from that date to the end of the month. There was no rain in 1818 until the month of April, so that the breach must have occurred from the foundations of the sluice having gradually succumbed to the pressure of the water, which shows how carefully the sluices of large tanks should be watched.

There has been no breach in the bund of this tank since 1818.

Rain-fall since 1803.

9. I have considered that it would be useful to place on record, for the purpose of easy reference hereafter, the half monthly rain-fall at Madras from the earliest period it has been registered. For this purpose Mr. Pogson has kindly permitted me to include in my report the following table:—

* Mr. J. Goldingham, Astronomer and F. R. S., who had then charge of the Observatory at Madras, gives the following description of this storm:—On the 24th of October 1818, a second violent storm occurred at Madras, the moon had passed the last quarter about two days, and was at nearly her greatest distance from the earth. The wind, which was a strong northerly gale early in the morning, before 10 in the forenoon, had increased to a storm. An awful pause of half an hour occurred about this time, after which it blew a complete hurricane from the north, with a fury never perhaps before experienced at Madras; some of the oldest trees, which had resisted the former storm, were rooted up, and the largest branches of others were torn off by the force of the wind. In some trees of a large description of wind, such branches were seen hanging down and twisted, having been whirled round and round by the fury of the storm. Such a scene of desolation was presented as had hardly been witnessed here. Numbers of native habitations were levelled, many of the large buildings injured, and some lives lost. Several ships and brigs were at anchor in the Roads; all these got under weigh, but the latter was driven on shore, and one of the ships foundered, another was driven on shore to the northward, and a third rendered not sea-worthy, while the others generally sustained great damage. The fall of rain was about 5 inches. The Barometer had fallen between 8 o'clock P. M. of the 23rd and daylight of the 24th nearly three tenths of an inch, standing at about 29.5; but during the awful fall at 10 A. M. it was at 28.750 inches—a most extraordinary and terrific depression, such as I never before heard of at this place. Towards noon it had risen about half an inch, and at sunset was at 29.65 inches.

Rain-fall at Madras

	January.		February.		March.		April.		May.		June.	
1803	...	...	...	...	...	...	...	...	...	...	...	...
4	...	...	1.05	...	...	...	...	...	...	...	1.73	0.16
5	2.35	0.03	...	...	...	0.03	...	...	...	...	0.65	0.34
6	...	0.13	...	...	...	...	...	...	...	0.34	...	0.55
7	...	...	...	...	...	...	...	...	...	...	...	0.85
11	...	...	...	...	...	...	...	...	...	...	...	...
13	...	...	...	0.05	4.68	...	...	...	...	1.70	...	...
14	...	...	...	...	0.13	...	...	...	...	...	...	...
15	...	0.08	...	...	...	...	...	...	...	...	...	...
16	...	1.64	...	...	...	...	...	...	...	...	...	...
17	0.10	...	0.73	...	...	...	...	...	...	...	...	...
18	0.35	...	...	...	...	...	...	...	...	...	...	...
19	...	...	...	...	...	...	...	...	...	...	...	...
20	...	...	...	...	...	...	...	...	...	...	...	...
21	...	...	...	...	...	...	...	...	...	...	...	...
22	3.55	0.05	...	...	...	...	...	...	...	...	...	...
23	2.30	...	...	...	...	...	...	...	...	...	...	...
24	1.45	...	...	...	...	...	...	...	...	...	...	...
25	0.17	1.10	...	...	...	...	...	...	...	...	...	...
26	0.17	...	...	...	...	...	...	...	...	...	...	...
27	...	...	...	...	...	...	...	...	...	...	...	...
28	8.58	0.02	...	...	...	...	...	...	...	...	...	...
29	0.82	0.10	...	...	...	...	...	...	...	...	...	...
30	...	0.27	3.06	0.10	...	4.36	0.70	0.02	...	...	...	...
31	...	...	...	...	...	...	...	...	...	...	...	...
32	...	0.04	...	...	...	...	...	...	...	...	...	...
33	...	...	...	...	...	...	...	...	...	...	...	...
34	0.18	...	...	...	...	...	...	...	...	...	...	...
35	0.06	...	...	...	...	...	...	...	...	...	...	...
36	...	0.06	...	...	...	...	...	...	...	...	...	...
37	...	...	...	...	...	...	...	...	...	...	...	...
38	...	...	...	...	...	...	...	...	...	...	...	...
39	0.09	3.25	1.33	...	...	...	...	...	...	...	...	...
40	...	...	...	...	...	...	...	...	...	...	...	...
41	1.90	...	...	...	...	...	...	...	...	...	...	...
42	1.74	...	...	...	...	...	...	...	...	...	...	...
43	1.82	4.68	0.02	...	...	...	...	...	...	...	...	...
44	0.21	0.55	0.52	...	...	...	...	...	...	...	...	...
45	1.64	...	...	...	...	...	...	...	...	...	...	...
46	2.94	...	...	...	...	...	...	...	...	...	...	...
47	...	...	...	...	...	...	...	...	...	...	...	...
48	...	...	...	...	...	...	...	...	...	...	...	...
49	2.50	...	...	...	...	...	...	...	...	...	...	...
50	...	0.04	4.27	...	...	...	...	...	...	...	...	...
51	...	...	...	...	...	...	...	...	...	...	...	...
52	...	...	...	...	...	...	...	...	...	...	...	...
53	0.15	2.10	...	...	...	...	...	...	...	...	...	...
54	0.42	...	0.30	...	...	...	...	...	...	...	...	...
55	0.74	0.20	...	...	...	...	...	...	...	...	...	...
56	...	...	...	...	...	...	...	...	...	...	...	...
57	0.82	...	...	...	...	...	...	...	...	...	...	...
58	...	...	...	...	...	...	...	...	...	...	...	...
59	0.62	...	...	...	...	...	...	...	...	...	...	...
60	...	...	...	...	...	...	...	...	...	...	...	...
61	...	...	...	...	...	...	...	...	...	...	...	...
62	0.38	0.11	...	...	...	...	...	...	...	...	...	...
63	...	1.95	...	...	...	...	...	...	...	...	...	...
64	...	...	...	...	...	...	...	...	...	...	...	...
65	0.20	...	...	...	...	...	...	...	...	...	...	...
66	...	...	0.21	...	...	...	...	...	...	...	...	...
Means	0.60	0.29	0.20	0.02	0.14	0.34	0.25	0.43	1.43	0.83	0.70	0.95

Observatory for sixty years.

Observatory for sixty years.												
July.		August.		September.		October.		November.		December.		Annual
0.24	1.46	0.21	0.62	3.74	3.95	1.04	10.55	7.63	22.79	0.37	11.60	66.09
0.37	0.88	0.85	2.32	0.91	0.61	3.59	8.82	4.52	1.41	5.26	...	31.11
1.91	0.75	1.09	2.31	1.28	2.14	4.15	2.31	4.84	1.32	2.19	2.80	31.21
2.70	0.65	14.10	0.18	1.55	...	23.70	7.20	...	7.30	2.70	1.00	61.51
0.12	1.34	...	1.05	...	2.28	3.02	1.49	...	...	14.25	0.30	25.65
...	0.31	1.03	...	0.61	0.73	1.62	2.10	10.30	0.42	0.58	0.25	39.67
0.08	1.20	0.35	0.48	2.32	...	3.10	2.03	16.60	14.00	3.30	0.62	47.27
...	1.59	3.76	1.15	2.42	6.07	3.05	4.05	0.97	5.75	1.64	2.07	32.60
5.17	1.30	0.27	0.53	0.90	2.00	0.24	6.02	9.30	23.88	...	4.80	56.05
1.67	3.50	3.38	1.83	3.70	5.35	1.15	5.43	9.60	2.72	1.45	...	41.16
1.45	0.15	0.55	2.92	1.60	6.07	2.18	17.34	12.25	12.08	2.40	3.85	63.55
1.95	9.80	0.98	5.47	2.52	2.87	6.24	11.64	11.56	14.06	6.50	1.27	76.20
3.28	...	0.71	0.39	13.19	1.70	1.10	1.00	10.42	0.25	0.71	...	36.33
0.74	2.68	1.87	1.07	0.60	1.10	...	11.84	0.67	3.52	5.12	7.00	61.78
0.18	1.02	2.33	0.85	6.72	0.58	0.68	7.85	10.49	0.95	0.75	3.60	42.63
0.25	0.80	2.10	4.60	2.35	0.08	10.20	10.37	10.45	10.95	2.50	0.77	59.61
0.30	2.67	0.13	3.00	3.87	0.53	2.75	7.65	0.80	0.10	...	0.20	26.61
0.03	0.22	1.95	0.70	0.32	0.15	8.10	6.25	4.60	5.67	0.13	3.82	33.71
0.60	2.47	1.20	6.47	1.07	2.43	1.95	15.52	11.08	0.03	4.92	2.43	50.09
0.95	1.15	0.90	6.72	2.07	0.25	0.20	0.62	17.29	8.75	5.23	6.82	68.77
1.65	3.25	0.38	1.90	3.50	0.94	1.12	12.59	7.74	14.38	5.76	0.22	88.42
1.85	1.52	5.69	1.71	4.72	1.00	8.32	0.88	1.79	0.82	0.29	2.17	87.89
1.29	0.48	1.10	1.84	1.06	1.95	5.75	0.40	4.28	4.71	5.37	0.12	36.87
4.15	3.05	0.55	2.18	2.70	1.57	1.24	4.98	0.17	8.70	1.45	3.00	32.43
1.28	1.85	1.60	7.90	4.89	2.31	3.12	6.23	0.24	7.69	0.68	1.51	44.85
0.68	0.89	1.57	0.69	2.23	5.48	1.27	4.01	0.07	0.34	...	...	18.45
0.40	0.77	0.17	6.94	2.42	1.52	2.88	6.81	8.31	1.60	0.21	3.06	37.12
4.05	3.03	0.28	3.82	4.70	0.17	5.34	1.70	1.31	6.65	1.31	0.30	39.00
2.43	2.68	0.75	2.26	2.17	1.09	6.56	3.12	6.58	4.38	1.33	0.24	40.06
2.11	2.49	5.46	3.54	0.29	0.65	...	8.51	1.05	17.59	0.81	1.18	41.68
0.58	2.07	1.28	0.41	1.55	2.25	0.37	15.42	14.02	3.15	2.82	0.37	49.26
1.58	0.79	2.94	1.75	...	8.78	1.06	5.21	21.54	0.35	4.22	...	62.33
1.96	2.60	3.08	3.73	10.10	1.04	...	0.99	21.11	0.16	...	...	53.07
0.50	3.93	1.03	6.79	5.87	2.49	0.60	9.47	26.72	0.53	...	0.12	58.63
1.05	0.39	1.93	6.73	3.69	1.33	12.34	12.39	5.08	1.20	0.17	1.06	58.35
1.35	1.94	0.99	2.13	1.67	3.93	0.34	7.57	11.41	1.19	0.03	0.16	36.48
0.07	1.30	0.81	1.42	0.75	3.45	4.15	2.16	5.27	...	7.10	0.49	50.28
0.81	2.56	1.23	1.49	3.86	8.65	10.75	3.14	2.39	1.01	6.33	16.48	65.36
0.99	1.91	1.69	0.26	2.15	1.90	3.01	0.29	1.12	3.79	5.69	9.41	37.65
7.34	1.78	4.47	0.21	0.86	0.06	2.51	28.08	1.04	18.35	3.60	3.30	78.19
0.97	2.12	6.12	3.59	0.47	5.40	5.48	10.84	13.42	5.21	20.51	1.64	80.99
1.24	2.63	3.42	1.71	0.56	2.53	4.16	9.77	7.14	10.15	3.11	...	54.78
1.03	2.63	2.85	2.04	1.48	0.17	9.18	0.01	1.44	4.70	0.09	6.71	39.81
0.24	1.29	1.36	1.70	2.89	0.15	1.95	2.37	4.31	3.81	5.47	0.19	36.88
3.67	2.83	2.90	1.44	0.33	1.36	5.06	0.57	19.57	5.28	1.39	0.06	64.32
2.04	5.96	0.86	1.40	6.49	0.29	9.40	11.20	10.59	8.81	5.78	3.14	72.69
3.64	0.60	1.27	0.11	1.57	0.66	0.35	8.72	11.88	0.11	...	...	35.82
2.46	1.84	6.16	0.89	4.80	1.57	0.32	9.90	3.28	6.00	1.83	2.19	43.20
0.40	2.29	0.65	1.10	2.36	1.39	6.60	4.01	0.92	0.55	7.10	1.98	32.32
1.20	2.12	0.60	5.18	0.51	0.55	2.39	1.49	2.92	14.05	9.70	0.01	40.99
0.81	1.58	0.55	0.37	0.29	1.26	10.20	27.53	4.61	1.21	0.56	0.44	54.95
2.08	1.00	1.64	0.47	2.82	0.79	10.12	1.95	13.89	8.23	...	...	48.50
6.85	1.19	1.03	1.43	3.32	5.24	2.11	5.61	4.25	15.21	...	...	55.14
0.34	1.73	0.62	1.94	1.79	3.18	2.71	11.36	0.86	1.22	0.03	0.20	27.64
2.19	0.89	4.33	3.55	2.51	6.74	0.02	1.52	12.32	...	0.04	...	37.19
4.23	0.30	3.82	0.74	0.84	2.76	1.43	6.77	1.59	3.03	4.69	2.31	38.18
6.30	0.77	1.75	1.39	1.83	1.21	5.31	11.78	...	2.03	13.34	0.04	54.61
1.16	1.04	3.93	3.39	0.46	0.37	0.97	12.79	2.37	10.11	1.50	0.84	47.23
1.42	0.60	3.65	3.54	0.27	1.01	0.64	5.18	8.01	14.75	5.57	...	41.86
0.25	1.22	0.69	3.28	1.43	0.99	6.19	2.51	3.33	8.60	20.54	1.26	51.39
1.75	1.78	2.05	2.33	2.46	2.12	3.89	7.01	6.94	5.96	3.48	1.94	47.82

Reasons for making the enquiry.

10. I have been enabled to give this sketch of so much of the history of Chembrambakkam tank through the kindness of the Acting Collector, Mr. Cockerell, who had the old records of his Office examined for the purpose. I was induced to seek this information, because in proposing to increase the head of water in the tank by 15 feet, a very important question arises as to whether the foundations of the sluices are sufficiently sound to bear the additional pressure. I had heard, when making inquiry on the ground, that the heads of all the sluices had been re-constructed according to plans prepared by Colonel DeHavilland and under his superintendence, and it is satisfactory to know, from the records of the period, that they were re-constructed by so skilful, cautious, and careful an Engineer as he was. Had I discovered that this was not the case, I should have hesitated to build the necessary additions upon the old work.

11. There are only ten sluices included in Colonel DeHavilland's estimate. The eleventh one was probably constructed since his time. On inspecting it I decided on re-constructing its head, as also that of the tenth sluice.

In April 1820 the foundations of the Chetty sluice, No. 10, showed signs of weakness, but from a report of Lieutenant-General Sim, who was then Civil Engineer of the Central Division, I am led to believe they were carefully repaired under his superintendence.

Former proposition for enlarging the tank.

12. I had supposed that several propositions had been made, from time to time, for the enlargement of the Chembrambakkam tank, but the only one of which I can get any record was made by Colonel Lawford, R. E., towards the end of 1857 or the beginning of 1858. I have been unable to procure Colonel Lawford's report, but this is of the less importance, as I find from a letter of Mr. C. J. Shubrick, then the Collector of the Madras District, (No. 162, dated 14th June 1858,) written in opposition to the scheme, that Colonel Lawford proposed to increase the quantity of water in the tank by 20 millions of cubic yards,* but that no surveys had ever been made and no plans prepared.

Description of tank.

13. Chembrambakkam tank is so well known that I need not occupy much space in describing it. The bund, which is about 7,100 yards, or four miles and sixty yards, in length, runs for the most part in a nearly north and south direction; the north end resting upon the high ground which lies on the south side of the Bangalore road, and about three miles west of Poonamallee; and the south end running out upon a ridge of gneiss rock near Sirrukullattur, on the old road to Bangalore.

The extreme west end of the tank is crossed by the present Bangalore road between the 19th and 20th miles.

14. The greater part of the land around the tank and in the bed is waste. Close around the margin of the present limits there are twelve or thirteen small tanks, and under these small patches of land, mostly in the bed of the tank, are irrigated. See the map, sheet No. 2, upon which these tanks and lands are shown. When the main tank is full the greater part of these lands is swamped, but as the water recedes, the Merassidars extend the cultivation.

All the cultivated land within the limits of the proposed extension will, of course, be under water when the tank is filled to the proposed height, and must be purchased; but it will not cease to be available for cultivation.

* In another place the additional quantity is stated to be 74 millions.

The small tanks will still be filled either as they are now, or, independently of local rains, by being submerged in the main tank; and, as the water recedes, the land can be cultivated as it is at present. The crops, however, may not be so valuable as they are now, as they will probably be produced later in the season. For this reason, that the lands will still be available either for cultivation or grazing, the amount of damage done by enlarging a tank is not so great as it is generally supposed to be.

Present supply.

15. Besides receiving the rain-fall from the laterite hills which nearly encompass it on three sides, Chembrambakkam tank is now supplied with water from the Palar and the Cortilliar.

The supply channel, which was cut from the Palar anicut to Streepermatur tank* (see sheet No. 1), was intended to convey the Palar water so far; but I am informed that until the time of the last monsoon, when a dam at Malasur was removed, no Palar water had ever reached Streepermatur.

There is a direct surplus channel from Streepermatur into Chembrambakkam tank, which gets also the surplus water from Pillipakkam tank.

16. On the north side there is a regular system of supply from the Cortilliar, across which a dam is built at Kesavaram, from whence a channel, the old Bungairoo, connects the river with the surplus channel from Kuam tank.

These two channels form the head of the Kuam river.

17. At Koratur a dam is built across the Kuam for the purpose of sending the water, by the new Bungairoo channel, to Chembrambakkam tank. As the Kuam tank has lately been supplied with water from the Palar, Chembrambakkam is thus now supplied with Palar water on two sides.

It receives also the surplus water of Nemam, and of nearly all the other tanks which lie on the south of the Kuam and west of the new Bungairoo channel. It is, in fact, most favourably situated for receiving an abundant supply of water; for the map, sheet No. 1, will show that it must get the surplus water from nearly all the tanks, and the lands which lie within the Kumbankal on the south, the Poiny river and the Cortilliar on the west, and the Kuam and Bungairoo channels on the north and east.

18. The area of this tract of country is about 400 square miles, or 1,239 millions of square yards, over which about four inches in depth of rain in the year would yield the additional 141 millions of cubic yards, which I propose to store in Chembrambakkam tank. This would probably not be one-tenth or one-twelfth of the annual rain-fall. Within the limits of this area there are about 320 irrigation tanks. Many of these, however, are but partially supplied by local rains, as the Poiny and Palar waters are now made available for this purpose; and it is probable that their use will increase as the channels and tanks become better regulated.

19. The surplus channel from Streepermatur and Pillipakkam tanks requires rectification; on sidelong ground it is embanked on the lower side and the water spreads on the upper side, occasioning accumulations of sand which lead to the bursting of the banks and consequent loss of water.

* This channel is known by different names at different parts of its course; near Streepermatur tank it is called the Kumbankal.

Old Bungairoo channel.

The old Bungairoo channel, that which connects the Cortilliar with the surplus channel from the Kuam tank, and which is about six miles in length, is also in great need of improvement. The upper part is too narrow, and lower down it is too shallow, and thus the water is prevented from passing down the channel freely, so that when there is a tolerable fresh in the river, the water passes over or breaches the dam, the latter which occurred last year. The dam has been repaired and on estimate framed by the Executive Engineer for removing the obstructions in the channel.

The Kuam river.

20. The channel of the Kuam is tolerably free from obstructions to Koratur dam, a distance of about fourteen miles.

In this reach of the river nineteen supply channels are taken off, fourteen to tanks on the north, and five to tanks on the south side. Off the new Bungairoo channel four tanks are supplied. In the following table is given a statement of these supply channels, showing that five only have head sluices:—

Statement of supply Channels taken off the old Bungairoo Channel and the Kuam river between Kasaveram and Koratur Anicuts.

No.	Name of Channels.	TAKEN OFF		Remarks.
		North side.	South side.	
1	Condanjerry channel ...	...	1	No Head Sluice.
2	Pinjivakkam do. ...	...	1	
3	Athigathore do. ...	...	1	
4	Agamy do. ...	1	...	
5	Kasam Nullatore do. ...	1	...	
6	Cadumbathore do. ...	1	...	Head Sluice and Shutters.
7	Yagatore do. ...	1	...	
8	Poongatore do. ...	1	...	
9	Salay do. ...	1	...	
10	Peryacoppam do. ...	1	...	
11	Pooliyancoppam do. ...	1	...	
12	Cacalore do. ...	1	...	
13	Poottore do. ...	1	...	
14	Thunneercolam do. ...	1	...	
15	Tholoovoor do. ...	1	...	
16	Thiroovoor do. ...	1	...	Head Sluice and Shutters.
17	Aranvoyal do. ...	...	1	
18	Goodapakkam do. ...	...	1	
19	Thinnanore do. ...	1	...	
Total channels both on north and south		19	...	

Supply Channels taken off the new Bungairoo Channel between Koratur Anicut and Chembrambakkam lake.

No.	Name of Channels.	TAKEN OFF		Remarks.
		East side.	West side.	
1	Nadoonjerry channel ...	1	...	Head Sluice and Shutters.
2	Peroymbet do. ...	1	...	
3	Thiroomalishay do. ...	1	...	Head Sluice and Shutters.
4	Manumbedoo do. ...	1	...	
Total channels ...		4	...	

From the absence of head sluices, the supply to these tanks cannot be regulated I believe the Superintending Engineer has directed an estimate to be prepared for this work, which must be done, and the sluices put under proper control if Chembrambakkam is enlarged.

Koratur Dam.

21. Koratur dam, which turns the water down to Chembrambakkam, is 392 feet in length and 3 feet in height above the bed of the river. Near the north end there are eight openings for sluices, amounting to 24½ feet in width; and, near the south end, eleven openings, amounting to 55 feet in width; at this end there is a solid mass of mason work 107 feet in length, and nearly 12 feet in height, which separates the dam from the head sluice of the new Bungairoo channel.

Koratur Head Sluice.

22. The head sluice consists of three bays arched over; each bay being divided into three semi-circular headed openings, 5 feet 2 inches in width, and about 7 feet 9 inches in extreme height. The whole water-way is 46 feet 6 inches in width by 7 feet 9 inches in height; but the area is diminished by a horizontal stone laid along the face of the sluice, 12 inches in height, with its under surface at the level of the springing of the small arches. Under the floor of the head sluice there is a small under sluice 3 feet 2 inches in height and 2 feet 6 inches in width, for drawing off spring water from the deep bed of the river.

23. The highest flood known at this head sluice rose to the top of the cross stones, at which time there must have been 3 feet 1 inch depth of water passing over the dam. The bed of the river at the dam is greatly silted up, as is also the channel to the head sluice.

Proposed works at Koratur.

24. Whether Chembrambakkam tank be enlarged or not there are certain alterations and improvements which should be made, but they would be imperatively necessary if the tank were increased in capacity.

The dam should be raised 1½ or 2 feet, and another set of sluices put in the middle.

These, as well as the present sluice openings, should be provided with proper gates, which could be raised to any required extent, so that the sand which now accumulates above the dam might be removed by the under current. During the freshes a few coolies with rakes could dispose of the sand with the gates only slightly raised. This arrangement of gates would involve the construction of a gang-way or foot-bridge over the dam. This foot-bridge would be a great convenience, not only to the parties in charge of the dam and sluice, but also to the villagers on both sides of the river, which is impassable during floods.

25. The head sluice is not capacious enough. Another bay of three openings should be added at the south end, and the cross stones should be removed, so as to leave whole area of the openings available for the discharge of the water.

To these openings proper sluice gates should be fitted to work with screws, so that they could be opened or shut readily to any extent, as occasion required.

I had the advantage of examining Koratur dam, the Kuam, and the old Bungairoo channel to Kasavaram dam on the Cortilliar, with Colonel Boileau, R. E., the Superintending Engineer, and I think we are agreed as to the necessity for executing the works I have suggested.

New Bungairoo channel.

20. The new Bungairoo channel from Koratur to Chembrambakkam tank is greatly obstructed throughout its course. Its length is about $7\frac{1}{2}$ miles, and its entire fall from the floor of the head sluice to the level of the calingulah is $24\frac{1}{2}$ feet, or an average of 3.30 feet per mile, a fall which is sufficient if it were properly distributed. At Vellavetty Chuttrum a bridge of three arches crosses the channel. I have not seen this bridge during a flood, but I am of opinion, from the information I received at the place regarding the head of water it creates, that it is not of sufficient capacity to discharge even the present required supply.

As it approaches the bridge by which it is crossed by Trunk Road No. 1, the Bungairoo ceases to be a channel at all, and the water flows across the fields in a natural hollow. Here it is joined by the surplus channel from Nemam tank.

The capacity of the bridge on the Bangalore road is ample, but the channel from it through the laterite ridge to the tank should be deepened.

Capacity of tank.

27. The following table shows, in a condensed form, the area, capacity, and circumference of the natural basin in which the tank is situated at each yard in height from a horizontal plane two yards below the level of the calingulah, to a height of seven yards above that level. The several columns show the area in square yards, acres, and square miles; the capacity, in cubic yards, at each yard in height, and the circumference, in miles, at each yard in height.

The figures are the result of a careful survey.

Table showing the capacity and area of the Basin in which Chembrambakkam Tank is situated at each Contour line on the Plan No. 2.

No. of contour yards.	Area at each contour in square yards.	Average area of each pair, average cubic yards between each pair of contours.	Total No. of cubic yards at each contour.	Area in square miles.	Area in acres.	Circumference in miles.	Remarks.
7	40,842,468	39,296,758	272,396,301	13.185	8,438.526	23.325	Highest contour surveyed.
6	37,631,048	36,225,618	233,099,543	12.155	7,779.142	22.324	Level of proposed calingulah.
5	34,800,188	33,602,195	196,873,925	11.234	7,190.121	21.275	
4	32,404,203	31,348,746	163,271,730	10.461	6,695.083	20.525	
3	30,993,288	29,012,144	131,922,984	9.779	6,258.943	19.375	
2	27,731,000	25,113,600	102,910,840	8.952	5,729.545	18.575	Level of top of dam stones.
1	22,496,201	22,191,778	77,797,240	7.262	4,647.975	17.375	Level of the three calingulahs at the south end of bund.
0	21,887,356	20,224,317	55,605,462	6.715	4,298.035	16.093	
1	18,581,279	17,054,486	35,381,145	5.992	3,834.975	14.487	
2	15,547,693	4,839,193	18,326,659	5.019	3,212.333	13.606	Capacity between the W. S. and lowest contour level of water surface when the survey was made.
0	13,457,466		13,487,466	4.354	2,786.666	14.037	

Calingulabs.

28. There are six calingulabs to Chembrambakkam tank, five of them being near the south end, and one near the north end of the bund, as follows, counting from the south end:—

No.	1.	Vettumadday calingulah	Length—feet.	No. of dam stones.
"	2.	Rosanbeg do.	58	23
"	3.	Thattan do.	130	39
"	4.	Nalliaman do.	115½	30
"	5.	Poniaman do.	40	18
"	6.	Vettumaddy do.	223	48
			61	80

Total length in feet ... 643½
Deduct the aggregate width of the dam stones ... 82

Total clear length ... 561½ feet.

Of these calingulabs, numbers 1, 2, and 3 are at the same level, 4 and 5 are 6 inches to 12 inches higher, and No. 6 is nearly 2 feet higher. They are all, with the exception of No. 6, very solidly built with dressed gneiss, and, with the same exception, they have all dam stones 3 feet in height; as these calingulabs are all to be removed, plans of them are not sent up.

Sluices.

29. The sluices are eleven in number, and are of the usual description found in first class tanks, with a needlessly heavy mass of masonry at the heads, and vents stopped with posts or plugs of timber in the ordinary way.

The following is a statement of the dimensions, &c., counting from the south end:—

Number from south end.	Name of sluices.	Bottom of culvert below present Calingulah.	Dimensions of Culvert.
1	Palauthandilam	Feet.	Feet.
2	Kavanur	14'50	56 x 2 x 4
3	Therunudlivakum	14'80	65½ x 2½ x 4
4	Kunatur	17'50	54 x 2 x 3'3"
5	Mangadu	19'	59 x 2'8" x 6'0"
6	Munapakum	16'	116'6" x 2' x 4'3"
7	Chetty sluice	21'75	81'6 x 2 x 5'6"
8	Malayambakkam Muttu	19'30	123'3" x 2'3" x 5
9	Poonanallee	9'40	6'1'9" x 2'3" x 3'3"
10	Maypur	8'70	58'9" x 3'6" x 2'6"
11	Agaram	8'30	53'6" x 1'6" x 2'3"
		3'75	52' x 1'6" x 2'3"

It is said that in two or three of these sluices the culverts are leaky. They were not leaking when I examined them, but at that time the tank was not more than one-fourth filled.

Bund.

30. The tank bund is revetted on the water side, for the greater part, with undressed blocks of gneiss, the remainder with laterite stone. The thickness of the mass of stone ranges from 2 to 4½ feet, and is generally loosely put together.

The greater part of the bund is covered with palmyra and other trees. The northern portion has lately been raised and repaired at a cost of, I believe, ten thousand Rupees.

Land now irrigated.

31. Chembrambakkam has always been highly valued as an irrigation tank, as the cultivation of a large portion of the irrigated land lying on the west of Madras depends on it. It irrigates the whole, or parts of fifty-eight villages, the Nunjah Ayacut* of which is 8,604 cawnies, assessed at 63,842 Rupees. This includes 1,163 cawnies of Inam land, assessed at 10,190 Rupees.

Very seldom, however, has there been sufficient water to irrigate the whole Ayacut. I have obtained, from the Tahsildar's Cutcherry, such information as has enabled me to give the following table, showing the numbers and names of the fifty-eight villages; the Ayacut in each of the Circar and Inam lands; the average area irrigated during the last fourteen years; and the number of cawnies in each Circar village under dry cultivation, or of waste land, or of both, which could be converted into wet cultivation if there was sufficient water.

* Nunjah Ayacut means the whole or greatest quantity of land in a village, or under a tank, supposed to be capable of being irrigated with the ordinary full supply of water.

The Punjah Ayacut means the greatest quantity of land under dry cultivation.

Statement of the Aynul Assessment, &c., of the fifty-eight villages irrigated from Chembambakkam Tank.

Statement of the Aynul Assessment, &c., of the fifty-eight villages irrigated from Chinnampalattagaram									
Registered number of village.	Names of villages under the tank.	Circar Lands.		Inam Lands.		The average number of cawnies under wet cultivation for the last 14 years.	The number of cawnies of either dry cultivation or waste in each village that could be converted into wet cultivation.		
		The Aynul of each village.	The assessment of each village.	Aynul.	Assessment.				
								3	4
1									
156	Mangadoo...	428	3,566	153 5	1,723 8	337 4	14		
157	Matavelagam ...	37	261	10 11	46 12	29 6	2		
158	Ragoonathapooram ...	40	326	13 8	104 14	34 7	2		
159	Chikkaroyapooram ...	44	315	16 13	126 8	33 1	15		
160	Olagamcathavelagam ...	34	227	5 14	28 4	27 15	1		
161	Keelaperoomalpattagaram ...	13	114	8 0	73 11	9 4			
162	Nalamcuttaly ...	41	255	9 11	55 7	32 0	4		
167	Malayambakkam ...	312	2,429	44 9	402 5	124 9	266		
163	Chinnappunnichary ...	29	225	5 0	39 9	25 11	1		
168	Sathampallam ...	4	28			3 11			
169	Kalacuttolary ...	59	372			7 12	32		
170	Malaperoomalpattagaram ...	38	311	3 2	43 14	29 9	8		
171	Vellanthangal ...	25	181	17 9	127 9	13 11	1		
172	Kolimarayvakkam...	97	752	17 11	215 7	07 0	2		
173	Siryanthangal ...	3	24			2 8	2		
176	Cannampully ...	30	210	4 6	46 8	16 6	44		
177	Catoopakkam ...	94	633	21 7	138 15	66 7	34		
178	Ponparappu ...	39	282	5 11	39 4	24 1	2		
179	Thiroovirumbavelagam...	7	45	1 0	6 6	6 15	3		
180	Sireenivassapooram ...	74	582	11 14	107 1	47 14	3		
183	Paranjiothoor ...	69	542	18 0	152 5	53 3	19		
196	Connathoor ...	1,258	8,532	92 0	744 12	612 15	76		
197	Vengatapuram ...	48	306	4 9	41 5	35 11	14		
198	Thiroonacaseram ...	31	239	3 9	32 5	19 10	11		
199	Mananjary ...	79	678	9 11	115 8	59 4	4		
200	Collachary ...	49	361	4 6	43 9	30 5	13		

201	Malayadrachary...	12	91	3 12	42 6	8 2	11
202	Moanamcuttaly...	66	500	6 8	69 1	49 12	57
207	Caroor...	283	2,116	59 3	555 15	162 1	40
208	Poothavadoo...	9	78	2 10	25 12	9 8	4
209	Ponparappu...	22	151	1 13	13 9	10 10	10
203	Sirocalathoor...	217	1,653	35 8	284 4	138 4	134
204	Cavanoor...	149	1,002	19 9	159 7	74 14	33
205	Talanthandalam...	478	3,612	42 13	564 11	287 11	60
206	Thiroomoodavakkam...	601	4,284	38 2	354 14	388 11	5
248	Nanthumbakkam...	219	1,042	23 14	186 8	117 6	44
9	Mathanuntlapooram...	161	900	19 14	153 10	95 12	3
70	Iyeppeuthal...	134	631	24 15	181 5	85 14	34
71	Colathooranjary...	97	1,026	40 3	203 7	39 4	2
64	Manappakkam...	127	137	27 5	390 11	80 7	94
65	Ettivally...	21	66	3 5	21 11	9 14	7
66	Mittanmally...	17	155	9 10	51 3	10 6	4
67	Ponnavadoo...	28	954	14 5	105 11	10 15	131
74	Thundlam...	141	528	20 8	125 14	55 6	4
75	Peryapanichary...	69	769	12 0	195 2	86 0	35
80	Reddancuttaly...	110	708	12 0	79 11	72 11	87
91	Tharappakkam...	106	2,930	80 6	873 10	174 15	7
152	Poonthamally...	324	350	6 13	62 2	21 13	2
153	Agraharam...	47	148	2 10	15 15	16 5	10
154	Mooppathoovetty...	30	1,516	12 6	102 9	46 12	15
165	Agaram...	190	498	9 3	106 8	32 9	6
166	Peroombady...	60	280	7 4	36 7	14 1	40
250	Gargumbakkam...	32	2,578	93 14	508 8	235 2	
	Candiy...	371	313	6 2	45 12	33 4	18
	Chithuthore...	42	243	3 4	7 5	19 12	20
	Mavoolivakkam...	102	207	16 11	80 8	27 15	
	Mogalivakkam...	177	900	20 0	105 14	86 4	
Total villages 58 ...		7,441	53,652	1,163 0	10,189 14	4,347 10	1,534

32. It will be seen from Column No. 7, that the average area irrigated during the last fourteen years was only 4,345 cawnies, or little more than one-half of the Ayacut; and even over this area there was generally but one crop obtained in the year.

The average annual revenue received during these fourteen years was 33,975 Rs., but this includes a period at which the assessment was much higher than it is now. If we take the average number of cawnies cultivated at the present rate, the average annual revenue will be 21,725 Rupees.

I cannot help expressing the opinion that the diminished revenue is greatly due to the supply channels and other subsidiary works not being kept in proper order, and to the reckless waste of water by the cultivators. I have no doubt but that if the channels, dams, and head sluices were put into proper condition, and the tank sluices altered and put under proper control, there would be water enough for the whole Ayacut.

Proposed works.

33. It is proposed to enlarge the tank by placing the new calingulah 15 feet above the level of the present three southern calingulahs. This would be 12 feet above the top of the dam stones, to which height the Morasidars are permitted to raise the water when they can; but it is evident from what has been already stated, that during the last fourteen years the average height of the water has but little exceeded that of the six months' mark, above which the proposed height is 19 feet, or equivalent to an additional quantity of water of nearly 200 millions of cubic yards. But we will take the level of the present calingulah as our starting point.

Height of proposed calingulah.

34. By referring to the table of capacity, appended to paragraph 27, it will be seen that at the level of the calingulah the capacity of the tank is 55,605,462 cubic yards, and that at the fifth contour, or five yards above the present calingulah, the capacity is 196,873,925 cubic yards. This is the height at which I propose to place the new calingulah, thus giving an additional quantity of water equal to 141 millions of cubic yards.

35. The table will show that if the new calingulah were placed one yard higher, the quantity would be increased by 36 millions of cubic yards, and if two yards higher, at the seventh contour, which is the highest one surveyed, there would be an additional quantity of over 75 millions of cubic yards. I stopped at the fifth contour, because if raised higher the water would swamp portions of several villages, and, besides, I considered it safer to feel our way as regards the probable quantity of water available. If the experience of a few years shows that with the calingulah at the fifth contour a certain quantity of surplus water passes away, it will be a very simple and inexpensive matter to increase the height to such an extent as will reserve the whole or a portion of the surplus. The principal expense attending any increased height would probably be the necessary compensation for damages, as the quantity of material required for the additional work would be trifling.

Bund.

36. The bund is proposed to be raised to a height of 6 feet above the new calingulah, and over this there will be a rough stone parapet 2 feet higher. I consider the parapet necessary, as with so great a water area as 11½ square miles, the wash upon the bund with strong westerly winds will be considerable.

The top width of the bund at the base of the parapet will be 9 feet, or 6 feet in clear of the parapet.

Road upon top of Bund.

37. This width is sufficient for the stability of the tank, but as the bund almost connects the old and new Bangalore roads, and as it lies in the line of a considerable amount of bandy and other traffic between a large number of villages, and as the present road is often impassable, having to cross rice fields, supply and surplus channels, it seems desirable that the bund should be made to serve the purpose of a public road.

I have consulted the Superintending Engineer on this point, and he agrees that a road along the top of the bund would be very useful. To accomplish this the top should be widened, as shown on cross section No. 4, sheet No. 4, which would add about 7,000 Rupees to the estimate.

38. The inner or revetted slope of the bund is proposed to be 1½ to 1. The outer slope, which is to be turfed, is to be 2½ to 1.

Trees on Bund.

I have already mentioned that the greater part of the bund is covered with palmyra and other trees.

I have ascertained that old palmyra trees may have their stems covered up with earth for 10 or 12 feet without suffering any injury; many of those on this bund were so treated some years ago, and they are now healthy and vigorous. All such trees as can bear this treatment I propose to leave standing, but all others are to be dug out by the roots.

39. The manner in which the bund is to be enlarged is shown on the cross sections, sheets No. 4 to No. 9. For a more particular description as to how all the work is to be done, see the general specification.

Sluices to be altered.

40. The sluices are proposed to be altered as shown on plans Nos. 10 to 21.

It is said that the present sluices are too small for the irrigation of the whole Ayacut, even if there were water enough. I am of opinion that when the obstructions in the way of cross and covering stones are removed, and when altered as shown in detail on sheet No. 21, they will be found capacious enough.

The present system of closing the sluices with timber plugs is to be abandoned. Grooves are to be cut in the sides of the culverts, and proper sluice gates, worked with screws, as shown on plan No. 21, are to be substituted.

New sluices.

As it may be found necessary to provide more sluicing power than at present exists, the cost of two additional sluices, with culverts 4 feet by 3 feet, is included in the estimate. These, if found necessary, can be built at such places as may hereafter be decided upon.

Old Calingulahs to be removed.

The present six calingulahs are to be removed, and their sites filled up uniformly with the rest of the bund. The cost of their removal is not included in the estimate, because the materials which can be used up in the new calingulah, and in the additions to the sluices, will be worth more than the cost of removal.

New Calingulah.

The new calingulah is to be built at the north end of the bund. It is to be 700 feet in length, and 3 feet in height above the apron. The whole will be in solid cutting where the foundation is nearly altogether of gneiss rock. Should the excavation turn out sufficiently hard and homogeneous, one-half or more of the building may be dispensed with, but I have estimated for the full dimensions.

Importance of having a long Calingulah:

41. In fixing the length of the new calingulah, the following points have to be taken into consideration:—

In all reservoirs their safety very much depends on their calingulahs (or "waste weirs" as they are called in England) having length enough to discharge, at a low level, any sudden accession of water when the reservoir is full. Many of the disastrous accidents we have read of, have arisen from neglect to provide sufficient length of waste weir; the result of which is, that if the tank is full, and if a sudden rain-storm occurs, the short weir is unable to discharge the water fast enough, which then rises upon the face of the bund, and is washed over where the waves are heaviest, until a small breach is made, which goes on increasing until at length no power on earth can cope with the resistless torrent which carries destruction and ruin in its course. Major DeHavilland has given us a description of the "terrible torrent" which burst from this tank on the 3rd of January 1818, when it could not have contained more than 77 millions of cubic yards of water. This "terrible torrent" would be but a mill stream in comparison with that which would be poured towards the Adyar if the tank burst when filled with 107 millions of cubic yards of water, as is now proposed.

42. I write this for the purpose of showing that the utmost care must be observed not only in the designing, but in the construction of a work of this nature; but especially where it is situated so close to, and at the higher part of, a populous district such as that which lies to the west of Madras. In all works where water is to be dealt with, the greatest care and caution are necessary, but in constructing works for the storage of a large body of water under such circumstances as obtain in this case, there is one maxim which should never be absent from the mind of the Engineer, that "the strength of the whole is the strength of the weakest point."

43. I have already stated, paragraph 7, that on the occasion of the great storm on the 24th October 1818, the quantity of water poured into this tank in eight hours was about 48 millions of cubic yards, or an average of six millions per hour.

This was evidently a very exceptional case, as appears both from General Sim's remarks and those of Mr. Goldingham.

When making inquiry on this part of the subject amongst the Merassidars, I ascertained that, on some rare occasions, the tank had been filled to the level of the calingulah in twenty-four hours. This is equal to 55½ millions of cubic yards in twenty-four hours, or an average of nearly 2·31 millions per hour.

The Merassidars also stated that, on other occasions, the water had risen from the level of the calingulah to the top of the dam stones in twelve hours. The quantity between those two contours is over 21½ millions of cubic yards, showing an average of nearly two millions of yards per hour.

But in all these cases the maximum hourly influx will be greater than the average.

44. We shall have a good idea of how the tank would be affected by any sudden influx of water, by supposing that it was full to the level of the proposed calingulah; and that, in eight hours, 48 millions of cubic yards were added to it; and that, until the 48 millions were in, no water was allowed to flow out. It will be seen by the table of capacities appended to paragraph 27, that between the fifth and sixth contours the tank would hold 36½ millions of cubic yards, and that one foot

higher would provide for the remaining 11½ millions; thus the whole 48 millions would raise the surface of the tank about four feet above the calingulah. But during all this time the discharge over the calingulah would be rapidly increasing, and should the depth over it reach three feet, the discharge per hour would be nearly 1·75 millions of cubic yards, whilst, at the same time, all the sluices might be kept open.

It is evident from this that, even under the very exceptional conditions supposed, conditions not likely to arise more than once in fifty years, the water could never rise so high as to endanger the stability of the bund.

Alteration of Trunk Road No. 1.

45. Where Trunk Road No. 1 to Bangalore crosses the west end of the tank, it must be either diverted along the high lands on the west or raised upon its present line. I had not an opportunity of deciding upon the ground, which of these plans is the best; but as the raising of the road does not increase its length, and as this is the most expensive plan, I have estimated for it. The present road is embanked across the valley, and there are several small culverts under it. These may be closed, as I propose to build one large culvert of three arches at the lowest part. This will be sufficient to carry off all the water.

The embankment is to be revetted with rough stone on the tank or south-east side.

Length of Bund unfavourable.

46. In one respect, the great length of bund to be raised, this project is unfavourable; but this is, perhaps, balanced by the advantage it possesses of presenting, at the level of the present calingulah, a plane of 22 millions of square yards, or 6½ square miles, upon which can be raised the additional water we propose to store.

Materials for the work convenient.

The materials for the work can be readily procured. Earth for the bund can be got for a great part of the length from the bed of the tank, at places where its excavation will not be injurious; and I am informed that all along the outside of the bund a strip of land, 30 yards in width from the toe of the slope, has been reserved for the use of the bund. In the hill which lies upon the north-west side of the surplus channel from Streepermatur tank, and close to the margin of Chembrambakkam tank, any required quantity of laterite stone can be had; it can be carted across to the bund when the tank is dry, or boated across when it is wholly or partially filled.

Clay for puddle can be had near the centre of the bund, and turfing under the village of Chembrambakkam on the north side of the tank.

Estimate.

47. The following abstract of the detailed estimate will show the cost of the proposed works. The prices are a little higher than those which prevail in that locality at present.

Abstract of the Estimate for enlarging Chembrambakkam Lake.

Number of Items on estimate.	Description of Works.	No.	Amount of each Work.	Total.
	<i>Lake Bund.</i>		Rs. A. P.	Rs. A. P.
1	Removing the present revetment ...	...	1,615 14 0	
2	Removal of unsound earth behind the present revetment, and carrying the same to bund ...	...	510 2 3	
3	Excavating for foot of new revetment and carrying the excavated earth to the bund ...	...	2,022 6 0	
4	Puddling ...	...	45,603 6 0	
5	Graveling at rear of revetment ...	...	8,707 6 0	
6	Revetment, new ...	...	1,02,194 12 0	
7	Do. with old materials. ...	...	8,618 0 0	
8	Earth-work for the bund ...	...	69,519 10 0	
9	Turfing ...	...	5,494 14 4	
	Total for the Bund ...			2,44,286 0 0
10	New calingulah ...	1		13,689 0 0
11 to 22	Irrigation sluices, old ...	11		4,871 0 0
23	Irrigation sluices, new ...	2		3,616 0 0
24	<i>Alteration of Trunk Road No. 1, on the 20th mile.</i>			
	Raising the embankment ...	...	6,221 0 0	
	Metaling ...	...	732 0 0	
	Turfing ...	...	488 0 0	
	Revetment ...	...	5,648 0 0	
	Three-arched bridge ...	1	2,681 0 0	15,768 0 0
	Total cost of altering road ...	...		2,82,460 0 0
25	Contingencies and sundries at 5 per cent ...	...		14,124 0 0
				2,96,584 0 0
26	Compensation for land ...	...		58,851 0 0
	Total ...	...		3,55,435 0 0

Value of project.

48. We have now come to a very important part of this inquiry, namely, the financial aspect of the project; and we have to answer the question *will it pay?* On this part of the subject I have to make the following remarks:—

In answer to this question I might fall back upon an old idea, suggested in connection with the re-construction of the old Pammal tank, and say that the water proposed to be stored in Chembrambakkam tank would or might be used for the water supply of that portion of Madras which lies south of the Kuam. If I put the scheme forward in this way, there would be no necessity for me to go into its merits in an agricultural point of view; for if looked upon as a means of supplying a portion of Madras with wholesome water, the value of the project would cease to be tested by money consideration only. But I am of opinion that if proper measures are taken to conserve the rain-fall upon the Nagiry hills, the project which I have already submitted, and which is now being executed, will be found ample not only for the supply of Madras, but for the irrigation of all the waste land lying to the east of the Red Hill and Cholavaram lakes, and between the Cortilliar river and the railway.

Water can be brought to Madras.

49. As it is possible, however, that the Nagiry supply might sometimes fail, it is satisfactory to know that there is another source from which Madras could be

supplied with water; for there would be no difficulty in connecting Chembrambakkam tank with the Spur tank in Madras, where I propose the filters and pure water basin shall be.

The bed of Chembrambakkam tank is about 46 feet higher than the general level of the Spur tank, and as the distance is about thirteen miles, the fall would be ample. At the same time, except in a case of emergency, I would not recommend drawing from the Chembrambakkam tank for the supply of Madras with drinking water; because, being supplied principally by the surplus water from irrigation tanks and the drainage from rice and other fields, its water must be flat and wanting in that briskness and sparkle which are so much desired in drinking water.

50. The additional quantity of water proposed to be stored is 141 millions of cubic yards. A simple way of estimating the value of this quantity is to see how many cawnies of land it would irrigate under rice cultivation. If we assume that nine thousand cubic yards of water are required to mature one crop of rice on one cawny of land, then 141 millions of yards would be sufficient for 15,666 cawnies, which, at 5 Rupees a cawny, amounts to 78,330 Rupees. This may be taken as the annual value of the project estimated in this way; and on the probable cost of the works it would be equal to 22 per cent. per annum.

Cultivation of Ayacut.

51. It is probable, however, that the first use made of the water would be to complete the cultivation of the present Ayacut, and of the other irrigated lands which lie between it and Madras, and bounded by the Kuam on one side and the Adyar on the other.

Whatever quantity of water remained after this could be used partly in the cultivation of the whole or a portion of the dry cultivated or waste lands within the same limits, and partly for other purposes which will be suggested hereafter.

52. I have already shown that of the 8,604 cawnies of the Ayacut, only 4,317 have been cultivated on an average during the last fourteen years, leaving 4,257 cawnies uncultivated.

The additional cultivation of the Ayacut would stand thus:—

I. First crop off 4,257 cawnies at 5 Rupees per cawny	Rs. 21,285
II. Second crop off 8,604 cawnies at 3 Rupees	25,812
Total additional Revenue off Chembrambakkam Ayacut	47,097

Other villages may be cultivated.

53. Between the Chembrambakkam Ayacut and Madras (or rather Nungambakkam and Mylapore tanks) and within the rivers Kuam and Adyar, there are twenty-eight villages, regarding which the following table is a statement similar to that given of Chembrambakkam Ayacut appended to paragraph 31, with the exception that the average cultivation is given for only five years.

Number of Villages.	Names of villages not under the tank.	Circar.		INAM.		Circar.		The number of cawnies either cultivated or waste in each village that could be converted into wet cultivation
		The Ayacut of each village (the whole).	The assessment of each village (the whole).	Ayacut.	Assessment.	The average number of cawnies under wet cultivation for the last five years.	The average revenue during the last five years.	
1	2	3	4	5	6	7	8	9
249	Teroomoor	717	2,814	8	40	109	883	63
68	Colappakkam	287	1,314	32	167	93	507	88
2	Senjary	56	148	2	6	18	59	3
3	Nesappakkam	39	176	2	12	30	147	24
4	Agaram	31	125	2	8	10	40	15
5	Matavelagam	4	21	..	..	4	21	..
11	Aroombakkam	195	910	26	132	35	168	28
255	Valasaravakkam	85	402	98	276	67	312	205
253	Kodumbakkam	422	1,416	63	266	364	1,257	301
13	Saligramam	294	946	15	64	21	98	99
1	Poroor	267	1,545	193	1,215	121	931	41
16	Vanagaram	217	1,839	167	966	130	1,005	20
17	Carumbakkam	35	275	27	197	16	162	23
22	Chettyaragaram	70	522	12	95	36	403	4
18	Vellicothum	13	108	1	11	12	102	..
19	Sirabootham	37	207	4	16	34	210	9
20	Ramapooram	160	700	21	121	83	368	135
21	Thelleyaragaram	86	531	7	44	10	88	9
69	Thoonlam	120	689	15	108	65	382	5
12	Viraganbakkam	343	1,413	26	158	55	348	80
254	Mathooravoyal	579	2,515	42	201	410	1,900	114
174	Pidacalacoppam	79	502	9	56	40	322	18
175	Varootherajapooram	127	622	9	45	69	355	10
184	Parryvakkam	180	822	45	261	155	693	27
185	Keelparryvakkam	11	71	3	22	8	56	..
182	Pedarythangal	63	398	11	88	54	331	20
181	Vadacundlam	16	100	2	15	8	55	..
155	Aryamanalloor	80	358	9	62	34	198	6
Total Villages 28		4,615	20,949	851	4,661	2,201	11,481	1,347

54. This statement shows that of 4,615 cawnies only 2,201 have been under cultivation (and one crop only has been produced), leaving 2,414 cawnies uncultivated:—

I. First crop off 2,414 cawnies, at 5 Rupees per cawny	12,070
II. Second crop off 4,615 cawnies, at 3 Rupees per cawny	13,845

Total additional revenue off the wet Ayacut of these twenty-eight villages ... 25,915

55. These two calculations show, if the figures are correct, that if used in the complete cultivation of the wet Ayacuts of these eighty-six villages alone, the value of the water stored would be 73,012 Rupees, equal to 20½ per cent. on the estimated cost of the works.

There would be one great advantage in applying the water to those lands which are already prepared for wet cultivation, that no expensive works of distribution would be necessary, as in most cases the water could be applied direct, without delay and without additional cost.

56. The two revenue tables show that in the eighty-six villages there are 2,881 cawnies of land under dry cultivation or waste, which are so situated as regards relative height, &c., that they could be converted into wet cultivation. I do not know whether it would be desirable to irrigate these lands beyond that which would be necessary to enable them to produce first class dry crops. My own opinion is, that when so large a proportion of the land is irrigated for the cultivation of various description of rice, it is not only more profitable, but is more to the advantage of the community, that a small quantity of water should be expended over a large area of the remaining land in the production of the several description of dry grains, oil-seeds, &c., &c. A few thousands of cubic yards of water judiciously expended in this way would, I believe, be of immense value.

57. I must not omit to point out that one of the uses to which a portion of the water stored in Chembrambakkam tank is proposed to be put, is the supplying of the junction canal with fresh water should that work over be executed. The Mylapore and Nungambakkam tanks, or at all events portions of them, might be kept full for the whole or a greater part of the year, which would be invaluable to the garden cultivation of that part of Madras.

The proposed Mount tank could also be kept full, and a portion of the water might be brought across the valley of the Adyar, at a high level, to the neighbourhood of Palaveram and the Mount; but all these questions will be fully discussed in a subsequent report.

Quantity of water required for one Acre.

58. In dealing with this part of an irrigation project, that is, the appropriation and value of the water, we have always a great difficulty to contend with in not knowing how much water is required for the cultivation of rice or any other crop, wet or dry.

In this Presidency we are in the habit of assuming on, I believe, a statement made by Major-General Sir Arthur Cotton, B. E., that 7,000 cubic yards per acre are required for the cultivation of one crop of rice during the hot season, and 5,000 yards during the monsoon. I believe that Sir Arthur Cotton considered this estimate too high, and I am of opinion that if the water were carefully distributed, a much smaller quantity would be found sufficient.

As regards the value of this project, I should be glad if the opinion of the Collector was obtained, as he is better able to judge correctly on a question of this kind than I am.

Comparison with other projects. 59. It would be satisfactory if I could compare the merits and demerits of this project with those of any other, but I am not aware that any similar one has been put forward in this Presidency.

The Nairgoonamaudoo (Neilgherry) reservoir, for which I sent up plans in 1857, is of a different character, being intended for the storage of water for the irrigation of lands, at a great distance, through the medium of a large river, and the site being in a locality where no land could be irrigated within many miles of it.

Proposed tank at Ekrookh, Bombay. 60. The only project I can discover which at all resembles this one of Chembrambakkam, is the proposed tank at Ekrookh near Sholapore, in the Bombay Presidency.

It is described in "Selections from the Records of the Bombay Government, "Irrigation Series, No. 1."

The Report, with plans, was published last year, and I believe it is looked upon as descriptive of a class of work which, so far as it is possible, should be undertaken, or at all events reported on, in the other Presidencies.

61. The following table gives a brief comparison of the two projects:—

No.	Description.	Ekrookh.	Chembrambakkam.
1	Bund, length Yards.	2,400	7,100
2	Do., maximum height Feet.	72	45
3	Do., height above calingulah "	31	61
4	Parapet, height above bund "	31	21
5	Sluices No.	3	13, two new.
6	Calingulah, length Feet.	250	700
7	Do., depth of flood over "	8	say 3
8	Water, quantity stored and available ... Cubic yards.	81,560,726	141,278,463
9	Do., total quantity in tank available for irrigation "	81,560,726	106,873,925
10	Land to be irrigated, one crop Acres.	8,000	8,659
11	Do., do. two crop "	8,000	8,821
		16,000	17,480
12	Estimate for reservoir works only, cost of distribution left out Rupees	7,06,112	3,65,435
13	Area, at level of calingulah "	58,333,333	34,800,188

62. The simplest way of comparing these two projects is to see how many cubic yards of water each will store for one Rupee. In making this comparison, I will contrast the whole Ekrookh tank capacity, minus the twenty millions of cubic feet "lost in the bottom," with the capacity of the Chembrambakkam tank between the present and proposed calingulah levels.

At Ekrookh the quantity of water available for irrigation is 81,560,726 cubic yards, and the estimated cost, leaving out the cost of works for distribution, is 7,06,112 Rupees: dividing the former by the latter number we got 115, which is the number of cubic yards stored for one Rupee.

The additional quantity of water proposed to be stored at Chembrambakkam is 141,268,463 cubic yards, and the estimated cost is 3,65,435 Rupees. These figures

give us 397 cubic yards for one Rupee. I do not consider this a very favourable case of storage, but it is probably as favourable as it is possible for any case to be in the plains, and so near to the coast. It is, at all events, much more favourable than the Ekrookh project.

63. There seems to be a great difference between Bombay and Madras in the estimated quantity of water required for the cultivation of one acre.

I have ascertained from the Revenue Inspectors here, that the second crop will require about three-fourths of the quantity of water necessary for the first crop.

If we assume that General Sir Arthur Cotton's estimates of 7,000 cubic yards for one crop is correct, the quantity required for the cultivation of the land at Ekrookh would stand thus:—

	Area.	Cubic yards.	Cubic yards.
One crop land	8,000	$\times 7,000 =$	56 millions.
Two crop land	8,000	$\times 12,250 =$	98 "
	16,000		154 millions.

Showing that to cultivate the 16,000 acres, as proposed, they should provide 154 millions of cubic yards of water instead of 81½ millions.

If we assume that the 81½ millions is sufficient, and adopt the proportions given above, the quantity required for each acre would be—

One crop land	3,705 cubic yards per acre.
Two crop land	6,483 do. do.

These figures show but a little over one-half the quantity we are in the habit of calculating as necessary for the cultivation of one acre.

If these quantities are correct, the Chembrambakkam project would yield nearly double the amount of revenue I have estimated.

(Signed) W. FRASER, C. E.,
Executive Engineer.

MADRAS,
April 1867.

Small Sept 1/19 & 1898

Recd: 24/1/67

No. 5,380.

PROCEEDINGS OF THE BOARD OF REVENUE, dated 20th August 1867.

Read the following letter from G. THORNHILL, Esq., Acting Collector of Madras, to the Acting Secretary to the Board of Revenue, dated Sydapet, 22nd July 1867, No. 227:—

1. I have the honour to acknowledge the receipt of the Board's Proceedings of the 17th May last, conveying the orders of Government, in the Public Works Department, dated the 15th idem, and calling for a report from me on the scheme submitted by Mr. W. Fraser, regarding the enlargement and further improvement of the Chenbrambakam tank, and its various supplying channels.

2. The additions and improvements contained in Mr. Fraser's scheme are as follow:—

1st.—Raising the tank bund by fifteen feet above its present height.

2ndly.—To do away with the existing numerous calingulaks, and to have one only, 700 feet long.

3rdly.—To make certain alterations in the existing sluices, and to add to their number.

to the Bungara channel; and

5thly.—To make a road on the top of the bund when it has been raised to its proposed height.

3. Mr. Fraser appears to have given the subject every consideration, and to have established conclusively the possibility of constructing a reservoir of the proposed capacity, and of collecting a sufficient proportion of the rainfall to keep it fully supplied with water.

4. It is obvious that almost the entire area of land included between the Coorum and the Adyar, which lies to the eastward of Chembrambakam, would be under command of the water from the tank, and the twenty-eight villages named by Mr. Fraser will, of course, be open to its influence, in addition to the fifty-eight villages now watered from it.

5. Mr. Fraser calculates the probable increase of revenue to Government from all eighty-six villages at Rupees 73,042, or Rupees 20 per cent. of the estimated total cost of the work. His calculations are based on the last fourteen years' average cultivation, and agree with the returns received in this office so far as the area under cultivation is concerned; but, as regards assessment, I find he has taken 5 rupees as the average Nunjah assessment per canny, and has calculated the increase at that rate upon the whole available waste both wet and dry including Iruam lands under both heads.

6. I now beg to submit a Statement, showing, first, the actual cultivation of Fusly 1275; secondly, the average cultivation of the last five years; and, thirdly, the average cultivation of the last fourteen years with the increase in all the three cases calculated on the existing assessment of the land.

7. It will be seen from the Statement that the increase over the actual cultivation of Fusly 1275, rather a good year, for wet crops, is Rupees 62,705, or eighteen per cent. of the outlay required. On the five years' average, which includes both good and bad years, the increase amounts to Rupees 66,887, or nineteen per cent. of the total cost. On the fourteen years' average it is Rupees 63,982, or eighteen per cent. on the estimated cost of the work, and Rupees 9,400 less than the probable increase, as shown by Mr. Fraser.

13. I am informed, but I cannot vouch for the accuracy of the statement, that even at Saidapett, a distance of nearly ten miles from the tank, the supply of water in the wells depends greatly ~~on the~~ quantity in store in the Chembram tank.

16. Mr. Fraser remarks, that the channels are not in good order and that repairs are urgently needed will be seen by a reference to the marginal table, which shows the supply of water the tank received from Fusly 1270 to 1274. An estimate for raising the Korattur anicut has been sent in by the Superintending Engineer, and will be submitted at once for sanction.

Fusly	1270...	1271...	1272...	1273...	1274...	Monthly supply.
	...	...	...	...	...	4
	...	...	...	...	...	3
	...	...	...	...	...	4
	...	...	...	...	...	6
	...	...	...	...	...	12

18. In short, whether this large project be sanctioned or not, the supply channels for the existing tank should be at once placed in an efficient state.

(Signed) G. THORNHILL,
Acting Collector.

SYDNEY,
22nd July 1867.

1. Submitted to Government, with reference to their Order, dated 15th May 1867, Public Works Department.

2. The Collector's remarks have the Board's full concurrence, and they have nothing to add to them. They do not, however, quite understand on what principle Mr. Thornhill's calculations are framed. The Nunjah Ayacut is given as 12,056 Cawnies, assessed at Rupees 74,601—6½ rupees per Cawny. The assessment on the average cultivation is rather more than 8 rupees per acre, and that on the average waste nearly 5 rupees, yet the Water Cess on 2,881 Cawnies of Punjab is put down at only Rupees 5,762, or 2 rupees per Cawny, and that on 1,988 Cawnies of Inam land Rupees 975, or 8 annas. The Collector is accordingly requested to explain his calculations.

(True Copies and Extract.)

(Signed) B. A. DALYELL,

Secretary.

To the Secretary to Government, Department of Public Works.
.. the Acting Collector of Madras.

Exd. J. Wright.

Submitting report from Collector of M.
on Mr. Fraser's scheme for enlargement
improvement of Chembrumbakam tank as
supply channels, and requesting the Collec
explain his calculations.

No. 6,380.

Received
Dated 20th August 1867.

PROCEEDINGS OF THE BOARD OF REVENUE.

No.

1867.

Department

Proceedings of the Madras Government, Public Works Department,
11th September 1867.

Read the following papers:—

No. 244. From W. FRASER, Esq., C. E., Executive Engineer.

Submitting his Report on the project for en- } (Here enter 17th April 1867, No. 14.)
larging Chembrumbakam tank.

No. 245. Proceedings of the Board of Revenue.
(Here enter 20th August 1867, No. 4,667.)

No. 246. ORDER THEREON, 11th September 1867, No. 2,797.

IRRIGATION, No. 7.

1. The Chembrumbakam tank, situated about seventeen miles south west of Madras, is one of the finest irrigation works of the Carnatic, being formed by an embankment 7,100 yards in length connecting high ground on one side with a rocky spur on the other, and creating thereby a reservoir covering when full an area of nearly seven square miles, and commanding for irrigation the lands of eighty-six villages capable of wet cultivation to the extent of 14,570 acres.

	Acres.
Within the Ayacut	11,378
Outside the Ayacut	3,192
	14,570

2. The tank is provided with ample waste water outlets in six calingulaks, aggregating 643½ feet in length, and is furnished with eleven irrigating sluices. It is, however, incapable of containing in its present state sufficient water for the irrigation of much more than half its Nunjah Ayacut, and, in consequence, the revenue derived from it has averaged, at the low rate of assessment now charged, only Rupees 21,725 during the past fourteen years, instead of Rupees 63,842 which it would have yielded had it been possible to store in it sufficient water. This defect seems to have induced Colonel Lawford in 1857-58 to recommend its enlargement, but no details of his proposals can be found on record, and the scheme now submitted by Mr. Fraser appears to have been suggested by the necessity of providing the means of supplying from some artificial source or another water to the high level Junction Canal, which he has for some years past been projecting, to connect Cochrane's Canal on the north with the Sadras Canal on the south of the Presidency.

3. The Chembrumbakam tank is well situated for this purpose, being on such a level as to have full command of the whole of Madras, and after the requirements of irrigation to the whole available land under the tank are fully supplied by its enlargement, there will probably be a sufficient surplus to keep the Junction Canal full if, instead of being made a tidal canal, it be carried out as a high level fresh water canal.

*Proceedings of the Madras Government, Public Works Department,
11th September 1867.*

4. The scheme therefore comes before Government as a very beneficial and remunerative undertaking. It consists of—

Raising the bund sufficiently to enable the tank to retain five yards additional depth of water	Rs. 2,44,286
Constructing a new calingulah 700 feet in length and removing the present six calingulahs	13,889
Alteration of present sluices and construction of two additional sluices	8,517
Raising portion of Trunk Road No. 1 at the west end of tank	15,768
Compensation for lands	58,851
Contingencies and Sundries	14,124
	3,55,435

5. For this expenditure of Rupees 3,55,435, which includes a large sum for the payment of compensation for lands to be submerged, Mr. Fraser calculates upon increasing the capacity of the tank from 55,605,462 cubic yards, which it now holds when full to the crest of the calingulah, to 196,873,925 cubic yards. Thus 141 million cubic yards of water would be stored in addition to the quantity now retained, and estimating the value of water so stored on the usually accepted data of 9,000 cubic yards being sufficient for the irrigation of a Cawny of rice land, he shows that the proposed outlay ought to yield a return of Rupees 78,330 at the low charge as water rate of Rupees 5 per Cawny or Rupees 3-12-6 per acre. This may very fairly be taken as the real value of the additional water to be stored, and Mr. Fraser shows that nearly that amount will be obtained by the complete irrigation for two crops of the total wet lands under the fifty-eight villages contained in the Ayacut of the tank and under the twenty-eight villages outside of that Ayacut, but possessing land so situated as to be readily irrigated from the tank.

6. The Collector, however, taking some exception to the rate of 5 Rupees per Cawny assumed by Mr. Fraser as the rate to be paid for water, shows, in accordance with the actual results of irrigation which at present exists under the tank, that the probable increase of revenue which will be derived in consequence of the storage of a large additional quantity of water will be 62,705 Rupees, as compared with the revenue collected in the year 1865-66, (which was rather a good year) or Rupees 66,887 as contrasted with the average collections of the last five years, or Rupees 63,982 on the average of the past fourteen years.

7. These estimates by the Revenue Officers are sufficient to confirm Mr. Fraser's calculations of the favorable financial results to be expected from the enlargement of the tank, and the Government have little doubt that the work will be remunerative.

8. The Government have no reason to believe that the means of fully supplying the tank will be wanting. It is described as so situated as necessarily to receive the surplus drainage of a tract of country of itself sufficiently extensive to yield a full supply of water in all ordinary years, and the tank is now not only connected with the Cortilliar, but has lately been brought under the influence of the Palar anicut by means of the Kumbum kal channel. The dam across the Cortilliar to

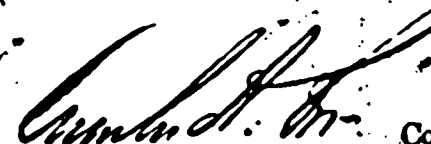
*Proceedings of the Madras Government, Public Works Department.
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divert water into the Bungairoo channel which flows towards Chembrumbakam, has lately been renewed and strengthened, the head of the channel has been improved, and operations are in progress for removing obstructions in it. The supply of the tank from this source will therefore be improved and increased, and by the contemplated raising of the Koratoor anicut, it will be greatly perfected. On the other hand the supply from the Palar will year by year be in the same manner augmented in consequence of the improvement of the channels taking off from the anicut across that river, and is practically capable of any requisite expansion.

9. Viewed then from all points, the project is one which, in the opinion of Government, it is very desirable to carry out as speedily as possible, and they accordingly resolve to submit Mr. Fraser's project for the sanction of the Government of India, and, in anticipation of its approval, to direct the entry of an appropriation in the outgoing Budget to admit of the commencement of the work next year.

(Here enter No. 2,798, dated 11th September 1867.)

(True Extract.)


Colonel, R. E.,
Secretary to Government.

To the Superintending Engineer, 4th Division.
.. Board of Revenue.
.. Revenue Department.
To W. Fraser, Esq., C. E.
To the Controller of Public Works Accounts.
.. Accountant General.

T. Augustin.

Sept 1883. 1884.
of 1883 and 1884.

Proceedings in the
P. M. District.

State of 1883. 1884.
Revised 11 of 1883.
E-1. 1883-1884.

For the year ending
on 6th of Jan. 1884.
Census for 1883.
Live to the end of the year
of 1883.
back in March 1884.

1883-1884.

FILED 1883.

1883-1884.

1883-1884.